Universitatea de Vest din Timişoara

60 Ani FEFS FACULTATEA DE EDUCAȚIE FIZICĂ ȘI SPORT

FEFS FACULTATEA DE EDUCAȚIE FIZICĂ ȘI SPORT

filo diritto editore DAL 2008

FEFSTIM 2020

THE 6TH INTERNATIONAL CONFERENCE OF UNIVERSITARIA CONSORTIUM

„FEFSTIM: Physical Education, Sports and Kinesiotherapy – implications in quality of life”

6 - 7 NOIEMBRIE 2020

01.10.2020: **rezumat**
05.10.2020: **full-text**

SUSȚINERE ONLINE
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PROCEEDINGS OF THE

6th International Conference of Universitaria Consortium "FEFSTIM: Physical Education, Sports and Kinesiotherapy – implications in quality of life".

6th-7th of November
Timișoara, Romania

Editor
Adrian Nagel

FILODIRITTO INTERNATIONAL

ISBN 979-12-80225-05-4

First Edition December 2020

filodirittoeditore.com
inFOROmatica srl, Via Castiglione, 81, 40124 Bologna (Italy)
inforomatica.it
tel. 051 9843125 - Fax 051 9843529 - commerciale@filodiritto.com

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FORWARD

Welcome to the Conference Proceedings volume of the e 6th International Conference of the University Consortium "FEFSTIM: Physical Education, Sports and Kinesiotherapy – implications in quality of life", which will take place from 6 to 7 November 2020, in Timișoara, Romania, scientific event which continues a series initiated in 2014 and since then provided a comprehensive overview of recent developments in Physical Education, Sports and Kinesiotherapy fields, trying to offer new approaches and oriented solutions to important practical issues.

We realize the importance of sharing with a wider audience the excellent work that we all see at our Conference. Thus, having the opportunity to publish an in extenso paper in the Conference Proceedings volume will provide a better visibility of our community and also the possibility to create scientific bridges between researchers and research institutions.

Therefore, this issue together with the previous ones, serve as a milestone for our community.

We are particularly proud of the diversity of subjects presented in this edition the Conference program being specially designed around the main theme – "Physical Education, Sports and Kinesiotherapy - implications in quality of life".

We would like to thank the authors and co-authors of the articles published in this Proceeding's edition, for their contribution in presenting their research and results. A debt of gratitude is offered to our reviewers who provided the critical insight into the publication worthiness of the submitted manuscripts.

Finally, we wish you a productive year and hope that you find this edition compelling and a useful tool.

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Study on the Efficiency of the Playmaker in Modern Football

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Abstract

Throughout history, a lot of playmakers have proven to be the engines of the teams they played in, culminating their on-field performances with individual and team awards. The advanced playmaker, the classic number 10 of a football team represents the player who is widely responsible for the offensive capability of his team. His most important stats are key passes, assists, goals, chances created and dribbled adversaries.

However, in the last decade, the presence of these advanced playmakers has diminished both in club and international football. Although this drop is simple to observe, we have launched a few hypotheses which aim to clarify the reasons why this player type is disappearing. Thus, we consider that due to the congestion of the area of the field in which the advanced playmaker operates, the change in tactical popularity towards systems which do not include an advanced playmaker and the efficiency of deep-lying playmakers that the no.10 is disappearing from modern football.

In this paper, we have analyzed the three-hypothesis using statistical analysis which was available online, as well as data from the period during which the advanced playmaker was an important part of the tactical register of every professional football team.

We have reached a clear conclusion: the advanced playmaker has almost completely disappeared from modern football and his tasks were taken over either by deep lying playmakers, or by atypical playmakers, such as a false nine. However, tactics are known to be cyclical in nature, which means that we might see a resurgence of this role in the future of the game of football.

Keywords: modern playmakers, modern no. 10s, advanced playmakers, dynamic 3-man midfield

Introduction

Throughout the history of football, the playmaker was the player in a team whose primary responsibility was represented by connecting the team's more defensive midfielders with the strikers, delivering the last passes, creating the opportunities and finishing the actions in some cases. Traditionally, the role of the playmaker was played by technical, ingenious players with a good game vision, very good ability to pass the ball, as well as finishing abilities [1].

Advanced playmakers can be divided into several categories, depending on several factors.

Thus, depending on their offensive appetite, the following types were noted: offensive main playmakers and support main playmakers.

Depending on the frequency with which they leave their dedicated pitch area the playmakers are static or mobile.

Aim

The aim of this study is to analyze the efficiency of the playmaker in modern football, as well as to follow the reasons why this role disappeared from the 2020 football tactical register.

Nowadays, most national teams and clubs prefer tactical systems without an advanced playmaker.

Methods

We looked for modern football players who have a profile as close as possible to that of the classic advanced playmaker and who performs this role in the club teams they are contracted to. Moreover, we have sought to include players who have at least 20 club-level matches in that position and are not in the first season of professional football.

All players from the sample respect the following criteria:

- Have the qualities required to perform the role of advanced playmaker above the average (pass, finishing, adaptability, speed in play, creativity)
- Play in a tactical register that allows them to complete their tasks as advanced playmakers
- They are, in general, the most played creative players in their teams (they have the most ball touches in the opposite half)
- They play usually, behind the striker/strikers, but not necessarily in a central position. In modern football, the advanced playmaker sometimes has to take a more lateral position
- Are above the average of the championship which they come, for the respective post on the pitch
- We have chosen players from different championships

Thus, the players we analyzed in this paper are:

- **James Madison** – Leicester City – Premier League;
- **Kai Havertz** – Bayer Leverkusen – Bundelisga
- **Hakan Calhanoglu** – AC Milan – Serie A
- **Julian Brandt** – Borussia Dortmund – Bundesliga
- **Christian Eriksen** – Inter Milan – Serie A
- **Bruno Fernandes** – Sporting Lisabona/Manchester United – Premier League;
- **Lionel Messi** – Barcelona – La Liga
- **Mesut Ozil** – Arsenal – Premier League

The methods which we use for testing is:

Viewing method- watch football matches which involved the players listed below up.

Method of statistical analysis -analysis the game data of these players from official sources (Fig. 1, Fig. 2).

	Kevin De Bruyne Manchester City Premier League - 2019/2020	James Maddison Leicester Premier League - 2019/2020
	 Age: 28 M(CLR),FW	 Age: 23 AM(CLR)
Apps	25(1)	**27(1)**
Mins	2156	**2404**
Assists	**16**	3
KeyP	**3.7**	2.7
AvgP	**56.5**	47.4
PS%	81.7	**83**
Crosses	**2.5**	2
LongB	**3.2**	2.4
ThrB	**0.3**	0.2
Rating	**7.92**	7.34

Fig. 1. Comparison between Madison's parameters and De Bruyne's parameters

	Lionel Messi Barcelona LaLiga - 2019/2020	Luka Modric Real Madrid LaLiga - 2019/2020
	 Age: 32 AM(CR),FW	 Age: 34 M(C)
Apps	**21(1)**	**14(8)**
Mins	**1891**	1355
Assists	**12**	4
KeyP	**2.5**	1.3
AvgP	**55.5**	43.9
PS%	82.9	**88.8**
Crosses	**0.6**	0.5
LongB	2	**3.4**
ThrB	**0.5**	-
Rating	**8.61**	6.91

Fig. 2. Comparison between Messi's parameters And Modric's parameters

The parameters that have been followed are:

- Execution of key passes to attack coleagues, to create clear chances of goal
- Racing" to destabilize the opposing defence
- Execution of passes in the upper third of the pitch
- Finishing the actions with a shot
- Taking the opponent out of the game by dribbling
- Use the freedom of movement to escape marking
- Percentage of correct passes
- Number of passes per game

Results

From all points of view, we can see why advanced playmakers disappear from the tactical register of modern football. Advanced playmakers have comparable or better numbers on key passes, but are most often less accurate than defensive midfielders. The percentage of correct passes is much lower in the case of advanced playmakers, as well as the number of passes. It has been found that while advanced playmakers perform the game tasks they are assigned correctly (most of them, on the offensive and transition phases) and have the technical, physical and tactical capabilities above the average required for the position which they operate, their influence on the game of their teams is not, in all cases, sufficient to justify their use. Because of this, many teams have chosen to use other tactical systems, where the game tasks of the advanced playmakers are taken by the other players-either those from middle area, the strikers or multiple players [2].

The number of teams which use a tactical system with advanced playmaker is small:

- Premier League: 7/20,
- Bundelisga: 8/20,
- Ligue 1: 5/20,
- Serie A: 6/20,
- La Liga: 6/20.

In general, the number of teams which use an advanced playmaker is around 38% of the total number of teams in that championship (Fig. 3).

It has been found that in all championships exist both types of teams, very good teams (top 4-top 6) and very weak teams (on the verge of relegation or beyond) that use systems with advanced playmaker, but none of these teams are in the first place. The only exception is FC Barcelona, in Spain, where Lionel Messi also plays the role of advanced playmaker, but where we noticed many differences from other teams: the quality of the team, another more defensive midfielder next to him and the quality out of common of the football player.

The following graph (Fig. 4) shows on the left number of teams that use an advanced playmaker, and below the graph are the places in the leaderbord that occupy that teams which use this type of player.

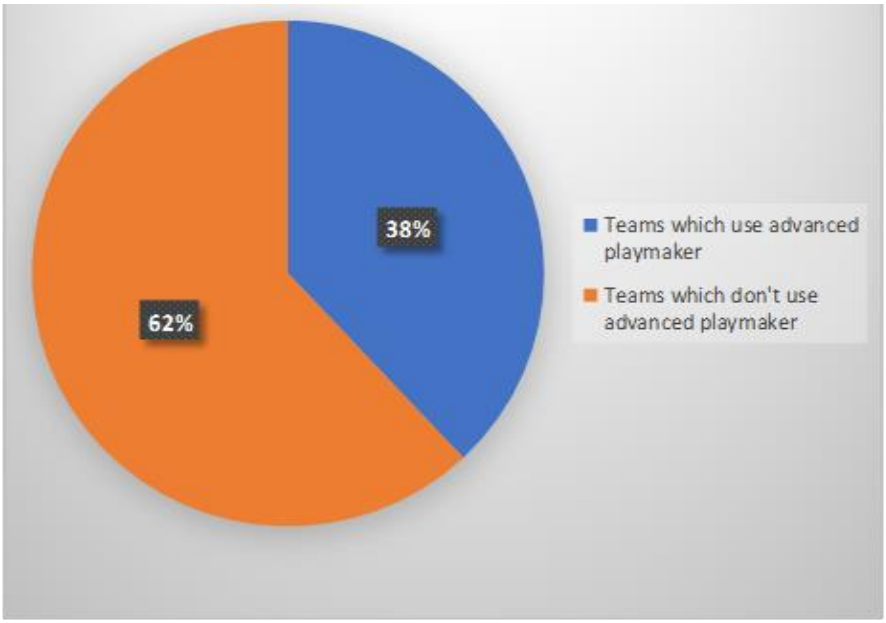

Fig. 3. Teams which use/don't use advanced playmaker

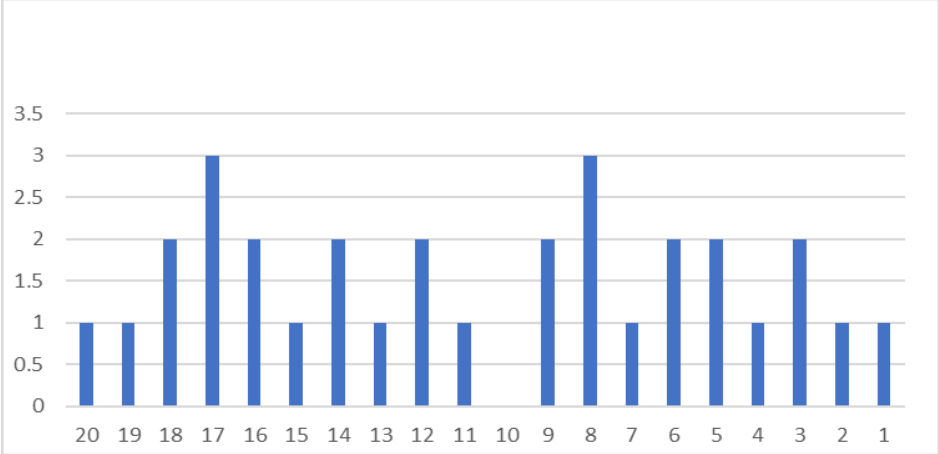

Fig. 4. Rank and number of teams which use an advanced playmaker

Discusions

In modern football, the tasks of the playmaker can be taken over (either wholly or partly) by the following types of roles in the field:

- The deep lying playmaker. This is the most commonly observed solution in practice. Creative midfielders most often appear in a triangle system of 3 central midfielders, with 1 primarily defensive midfielder to the defense and 2 mediators in front of it. In this system (4-3-3), the center midfielders play at a considerable distance from the strikers.
- The box to box midfielder. In some systems, the creative tasks of playmakers are taken over by labor midfielders, classic numbers 8 [3].
- Classical wingers. Especially in cases where the winger plays the ball with his primary foot, but lies on the opposite side of the field (inside forward), the winger can take over the offensive tasks of the advanced playmaker [4].

- Wing type playmaker. There is a category of players who, although active in the wing, have tasks that fold perfectly into the role of the advanced playmaker. Examples: Lionel Messi, Juan Mata.
- Striker – False nine. In some systems, the most advanced player has the task of withdrawing from the opposing backline, taking the ball and using these actions exactly as an advanced playmaker.
- The wing back. This role represents a very recent development of the football phenomenon, used with the greatest success by Jurgen Klopp at Liverpool. From this role, the right defender, Trent Alexander Arnold has the highest number of assists in Premier League.

Conclusions

Although the advanced playmaker was a role that had a strong influence on football over the years, its influence on the game has decreased recently. This role is going through either a period of extinction or a period of quite significant change.

A multitude of teams, more than two thirds of Europe's five most powerful championships, now use tactical registers that do not contain an advanced playmaker, or a classic 10. These teams transferred the tasks the advanced playmaker was performing to other players with various degrees of success. The most common tactical systems in modern football are 4-3-3 and 3-5-2, and both have no dedicated place for an advanced playmaker [5].

However, while its role on the pitch is no longer so well defined or present, its tasks remain important for the teams it is part of. These tasks were thus transferred to other offensive players.

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Kinematic Analysis of the Centre of Mass Variation and It's Influence on the Backward Tucked Salto

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Abstract

Backward tucked salto (BTS), an acrobatic flight element from group 5, is a fundamental element that has to respect all the techincal indications specified in the International Gymnastics Federation Code of Points2017-2020. The aim of the study consisted of the evaluation of the infuence of the center of mass (COM) deviation, recorded in the upsurge phase of the element, on the correctness of the performing technique. The study was conducted on components of the senior and junior Olympic teams (n=16, 14±1.93 years, 149.35±7.94 m and 40.01±7.41 kg). The BTS was performed on the floor. All gymnasts have been equipped with a multiple sensor suit.

In order to characterize the correctness of the element execution both, the unbalance of COM recorded within the upsurge phase of the element and the trunk bending within the landing phase have been analyzed. The kinematic parameters used in order to evaluate the influence of the COM deviation on the correctness of element execution were analyzed at two different moments (M1 – the standing phase and M2 – the launching phase of the salto) and are as follows: initial position/MaxHeightCOM angle (∡COM_M1, grade), last foot contact/MaxHeightCOM angle (∡COM_M2, grade), distance of jump (DJ, m), distance of imbalance (COMD, m), Difference COM height in Standing vs. Max COM (m) (HmaxCOM-HCOMs, m) and Vertical_T8 Joint angle in Landing (VT8J angle, grade). Our results revealed a strong negative correlation between ∡ COM_M1 and COMD (r-*Pearson*=-0.8123, p<0.001). Regarding the landing phase, the VT8J angle is not influenced by the COM deviation (r-*Pearson*=0.1926, p-ns). In conclusion, for an accurate execution of the salto, analyzed from the maximum height of COM, a reduced imbalance of COM during the launching phase is a necessary, even if it is not an exclusive, condition for obtaining a greater amplitude of the element. Regarding the landing phase, the amplitude of the trunk bending is not influenced by the initial imbalance of the COM. Further research is necessary to a more complete kinematic analysis of the backward tucked salto.

Keywords: kinematic analysis, center of mass, backward tucked salto, amplitude of the salto

Introduction

Backward tucked salto, an acrobatic flight element from group 5, is found in most of the routins in both women and men's Artistic Gymnastics. Being a fundamental element, it can be incorporated in exercises performed both on floor and the beam. Though, the technical value differs according to the aparatus. Thus, in floor exection it counts for 0.1 points (A) and it is graded with higher score if it is performed on the beam, 0.3 points (C) [1].

The techincal execution of the salto has to respect all the indications specified in the Code of Points of the International Gymnastics Federation 2017-2020. Backward tucked salto consists in a succesion of elements starting from stand position as follows: the first element is represented by the upsarge performed with the participation of the upper limbs that are oriented backwards and balanced forward in order to maninatin the body equilibrium.

Forward, the combination of the dynamic forward upper limbs balance simultaneously with the generation of a strong impulse within the lower limbs will propel the body in a vertical elevation, followed by the the taking of moment of the salto. The vertical rising of the body has to be performed by maintaining a stretched posture until the maximum flight amplitude is reached and the knees are lifted and bended towards the chest, while the arms are grabbing the legs at shin level. The end of rotation corresponds to the moment when the gymnast is facing down the floor and is followed by the fast stretching of the body a mandatory action that preceds the landing finalized with the restoring of the vertical position (Fig. 1.) [2].

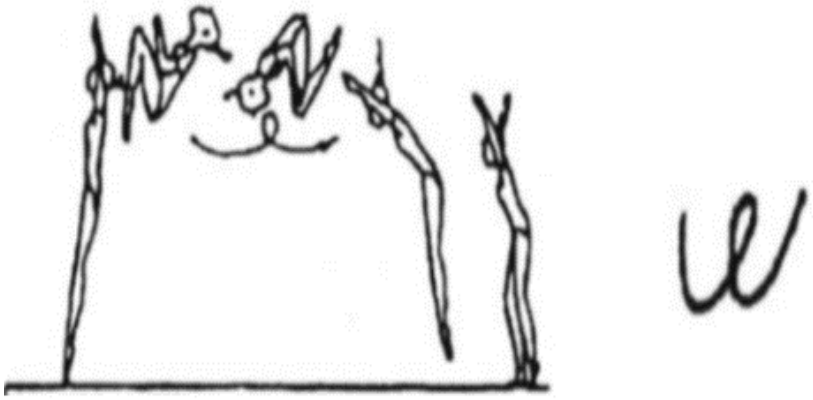


Fig. 1. Graphic representation and symbol of backward tucked salto [1]

Material and methods

Participants: The components of the senior and junior Olympic teams camped at the National Sports College- "Cetate Deva". (n=16 artistic gymnasts, 14±1.93 years, 149.35±7.94 m and 40.01±7.41 kg) were enrolled within the study. All gymnasts were included in a weekly training program consisting of a training plan averaged at 30±2 hours. All participants were physically fit and free from injury at the time of data collection.

The backward tucked salto was performed on the floor by all the gymnasts who have been equipped with a suit provided with multiple sensors (Xsens Technologies) to record the execution [7], [9].

The study was conducted with the agreement of the National Gymnastics Federation and the board and technical team of the National Sports College – "Cetate Deva", Ethical Committee of the Physical Education and Sport Faculty – West University of Timisoara. All the personal and experimental data collected within the study respected the GDPR legislation.

The kinematic parameters used in order to evaluate the influence of the COM displacement on the correctness of element execution were analyzed at two different moments (M1 – the standing phase and M2 – the launching phase of the salto) and are as follows:

- The angle between the vertical line passing through the center of COM, during initial standing position and the line marking the maximum height of COM during the flight of the salto (Fig. 2A) back initial position/MaxHeightCOM angle (∡COM_M1, grade).
- The angle between the vertical line passing through the center of COM, at the last foot contact, just before taking off, and the line marking the maximum height of COM during the flight of the salto (Fig. 2B) last foot contact/MaxHeightCOM angle (∡ COM_M2, grade).
- Distance of jump (DJ, m) measured as the distance between foot contact at take-off and landing.
- Distance of imbalance during the launching phase of the salto (COMD, m) measured as the COM horizontal displacement from initial standing position till the last foot contact, just before taking off (Fig. 2C).
- Difference of COM height between standing position vs. maximum COM height during the flight(m) (HmaxCOM-HCOMs, m).
- The angle between the vertical line and the eighth thoracic vertebra (T8) line at first foot contact during landing (VT8J angle, grade) (Fig. 2D).

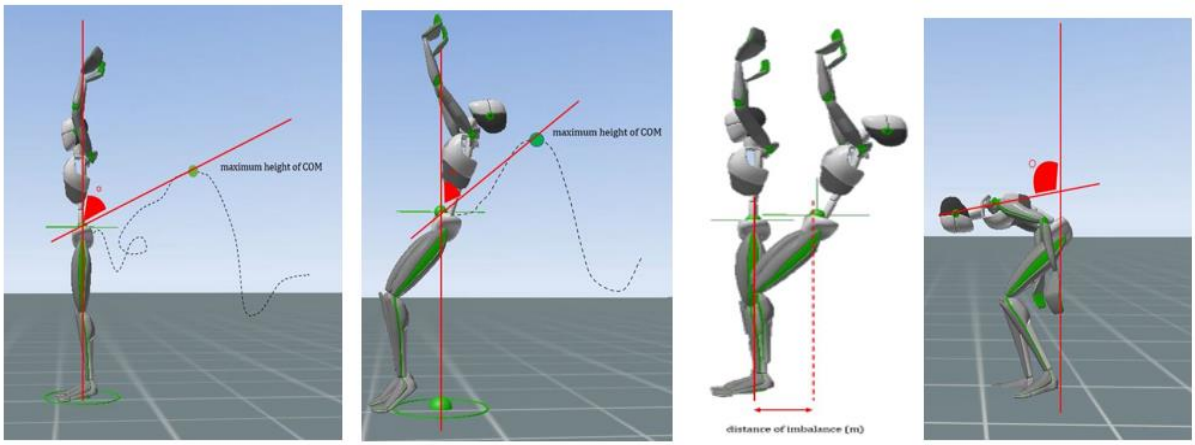


Fig. 2. Representation of COM angles and distance of imbalance: A – vertical at initial standing position – maximum height of COM joint angle (COM_M1 angle); B – launching phase of the salto – maximum height of COM joint angle (COM_M2 angle); C – The distance of imbalance;
D – vertical – T8 vertebra joint angle (VT8J angle)

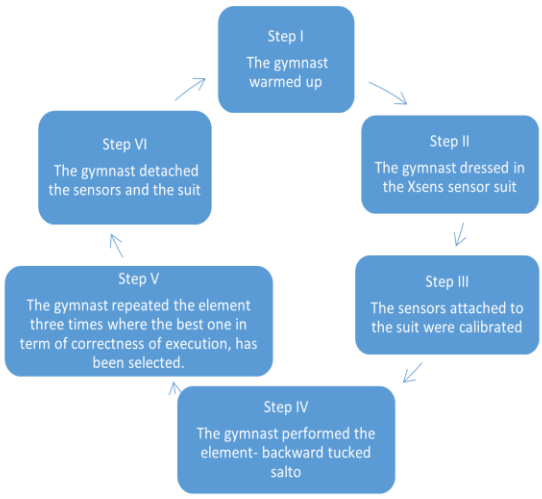


Fig. 3. The stages of the experimental procedure

Data analysis

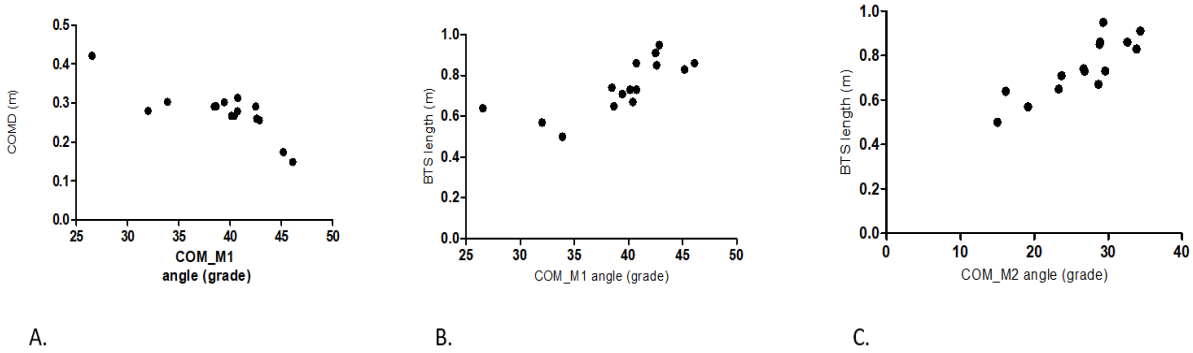
All data have been simultaneously collected from all 17 sensors of MVN-Xsens, positioned on segments, on special location, following Xsens recommendation. Each data acquisition has been exported in MVNX format in order to be analyzed. Therefore, data of 3D positions of all 23 segments, 3D joint angles and center of mass position of the body have been imported into Microsoft Excel and used for analysis. For the actual research, in calculating special angles as defined in experimental procedure, geometric and trigonometric formulas have been used.

Statistical analysis was performed by using statistical functions from Office Excel 2016 and Graph Pad 5.0 software. Pearson correlation coefficient (r) has been calculated. The results were considered significantly different when the probability was less than or equal to 0.05 ($p \leq 0.05$)

Results

Our result relevate a strong and very significant negative correlation betewen the ∡COM_M1 (grade) and the elevation of COM from the initial standing position to the maximum amplitude of the salto ($p<0,001$). The calculated correlation coefficient (Pearson-r=-0,8123) indicated an indirect influence between the parameters, which means that a higher imbalance recorded at the beginning of the salto leads to a lower amplitude (Fig. 4A).

Another interesting result was revealed when the correlation between COM_M1 and COM_M2 angles and the length of the salto has been analyzed (Fig 4B, C). Although both angles were strongly correlated with the length of the salto the greatest influence is observed in that case of COM_M2 (r-*Pearson*=+0,8467, $p<0.0001$). This suggests that the most important factor regarding the influence of the centre of mass variation on the correctness of the element performance is represented by the imbalance of the body during the launching phase of the salto in a greater manner that the imbalance of the body recorded during the upsurge pahse of the element.



A. B. C.

Fig. 4. Correlation between COM_M1 and/or COM_M2 angles with the parameters of the salto: A. Correlation between COM_M1 -amplitude of the salto; B. Correlation between COM_M1 angle – length of the salto; C. Correlation between COM_M2 angle – length of the salto

Regarding the landing phase, the VT8J angle is not influenced by the COM deviation (r-*Pearson*=0.1926, p-ns).

Discussions

To achieve a BTS as correct as possible, the launching phase of the element must be performed as vertically as possible. Moreover, the analysis of the COM trajectory, within the launching phase determined the identification of several factors that could influence the element performance. Even from the beginning of the execution there was recorded a deviation of the COM projection outside the support area in the take-off phase of the BTS.

This can influence the correctness of the salto by two facts: the diminishing of the optimum salto amplitude characterized by the COM maximum height during the flying phase and vertical elevation of the gymnast, respectively. A BTS with a lower amplitude can determine compensatory movements that will be performed by the gymnast to finalize the salto execution with lesser inaccuracy as possible. Also, a lower amplitude of the salto could become a crucial fact during the landing phase. Also, a poor execution of the jump could become harmful for the gymnast due to the imminent danger of falling during the landing phase.

Our results confirmed the Code of points [1] indications regarding the correctness of the element performance, especially on the first phases of the salto. We showed that a reduced imbalance of the body within the upsurge phase, objectified by a smaller deviation of the COM projection during the upsurge will determine a greater amplitude of the salto. On the other hand, obtaining positive correlation with a great statistical significance when analyzed the correlation between the length of the BTS and the deviation of the COM at two deferent moments of the take-off phase, we demonstrated that a higher deviation will induce a more horizontal trajectory of the COM which will affect the amplitude of the salto and thus the correctness of the element.

An interesting observation regarding the landing phase opens new possible direction of kinematic investigation within further research. The code of points indicates that the gymnast must land also in a position as vertical as possible in order to avoid the imbalance during the finalization of the element. Still, the data analysis revealed that the gymnasts executed the landing presenting different bending angles, the mean value of the group being around 120.16±21.86. Although, we found that the bending of the trunk, expressed as the angle between the line that crosses T8 vertebrae with the vertical line is not influenced by the initial deviation of

the COM. This indicates that there are other influencing factors that intervene during the following phases of the element.

Conclusion

In conclusion, for an accurate execution of the salto, analyzed from the maximum height of COM, a reduced imbalance of COM during the launching phase is necessary even if it is not an exclusive condition for obtaining a greater amplitude of the element. Regarding the landing phase, the amplitude of the trunk bending is not influenced by the initial imbalance of the COM.

Further research is necessary to a more complete kinematic analysis of the backward tucked salto.

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Performance Aspirations in Sports and Career in a Men's Volleyball Team

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Abstract

The paper identifies the status of the members of the men's volleyball team of CS Politehnica Timişoara (1980) and CSU Universitatea de Vest din Timişoara (2020). The university environment has offered and continues to offer opportunities for affirmation in sports, as well as preparation for a future honorable career. The relationship between the aspirations on the sports line and the preoccupations of the subjects for their professional achievement was pursued, as well as the change of the professional orientation of the athletes throughout the years, as a result of the diversification of the opportunities arising in the university environment. The research methods used in the elaboration of the paper were: the study of the specialized bibliography, the practical documentation, the interview, the statistical-mathematical method and the method of graphic representation. The athletes' localities of origin, their age, as well as their profession at the time of the research were investigated. The higher education institution under whose tutelage the studied teams carry out their activity puts its mark on the athletes' options regarding the university studies. We report the same percentage (50% of the team members) of students at the Polytechnic Institute for the 1980 team, and at the West University in the case of the 2020 team.

The teams under study capitalize, above all, on the sports potential of the young people from Timişoara and Banat, the share of players from other localities in the country being more evident in the current team. We point out the superior homogeneity of the team of the '80s, the stability and maturity of the group differentiating it from the current one, sometimes subjected to less glorious influences coming from other teams.

Keywords: aspiration, performance, sports, career

Introduction

Choosing performance involves the engagement of the entire personality. The athlete's status, personality features, echo of his recent successes or failures, all structured in the context of the highest competitiveness, contribute to the determination of the level of aspiration.

Maintaining a high level of aspiration and working hard for achieving it also depend to a large extent on the personality structure. [1]

The personality of a social group, in our case a sports team, is understood as "a phenomenon through which the concept of individual entity extends to the ones of collective entity. As each individual has a certain personality, each social group has its specific features." [2]

"The sports team's personality stands out by a structure made of similar (common) bio-psycho-social elements of the athletes who compose it and who, following their common experience of living together, get to a similitude of manifest (noticeable) psychological features such as attitudes, behavior and group conduct." [2]

"The level of aspirations is part of the motivational constellation of an activity, either a sport or a professional activity, and it fulfills specific roles. Therefore, if the aspiration is high, it will generate a good preparation for this activity, and if it is low, it will generate a weaker energy and will limit the use of the available capacities." [3] "Motivation always answers the question "why?", in relation to a certain human behavior. Therefore, only by resorting to motivation can we explain the fact that, in different situations, the reactivity of the same person varies, and different people react differently in the same situation; motivation explains why a behavioral act can have a special meaning for a subject, while for another it has a very weak meaning, sometimes being completely absent. Thus, motivation is included as an indispensable link in the mechanisms of behavior regulation. It is the one that conditions nature and, above all, "the meaning of the actions of regulatory systems." [4]

Purpose and hypotheses of the paper

By closely documenting on the performance related opinions within a traditional sports team in Timisoara, we checked if:

a) the aspirations on the sports line are doubled by a constant preoccupation for an honorable professional achievement;
b) the athletes' professional orientation has changed over the years as a result of the diversification of opportunities arising in the university environment.

Therefore, we will identify the status of the men's volleyball team members of CS Politehnica Timişoara (1980) and of CSU Universitatea de Vest din Timişoara (2020).

This sports group has evolved during this time for 40 years, especially in the first division of Romanian volleyball, maintaining continuity, which is not to be neglected, and activating under different names, even if it was one and the same sports group: Politehnica Timişoara (1980-1992), Universitatea Timişoara (1992-2015) and CSU Universitatea de Vest din Timişoara (2015 – present).

Subjects and methods

As shown above, the university environment has offered and continues to offer opportunities for affirmation in sports, but also for preparing for a career in a chosen profession. We identified the members of the student volleyball team in Timişoara from 1980 and 2020, as well as the players' status at the time in question.

The research methods we used in this study were:

a) the review of the literature included in the bibliography, which provided the theoretical support of the paper;
b) the practical documentation provided us with the objective data necessary for approaching our topic;
c) the interview, as a research method, in parallel with conversation, allowed us to get to know those who put their mark on the evolution of the team under study;

d) the statistical-mathematical method, marked out, according to the specificity of the research, exclusively by calculating the percentage and averages which make clear for us the actual situation at that moment;
e) the graphical representation method which allows the visualization of the study results.

Table 1. Politehnica Timişoara volleyball (m) - 1980

No.	*Surname and forename*	*Locality of origin*	*Profession/ University*
1.	V.N. (captain)	Timişoara	teacher
2.	B.I.	Timişoara	economist
3.	M.V.	Timişoara	teacher
4.	L.C.	Oţelu Roşu	student/IPT
5.	C.T.	Timişoara	worker
6.	P.A.	Caransebeş	student/IPT
7.	K.R.	Timişoara	student/U
8.	G.S.	Reşiţa	student/U
9.	C.S.	Arad	student/IPT
10.	D.C.	Baia Mare	student/IPT
11.	T.M.	Arad	student/IPT
12.	M.D.	Constanţa	student/IPT

Table 2. CSU Universitatea de Vest din Timişoara volleyball (m) – 2020

No.	*Surname and forename*	*Locality of origin*	*Profession/ University*
1.	R.E.	Oţelu Roşu	teacher
2.	R.S.	Arad	student/UVT
3.	C.S.	Timişoara	student/UVT
4.	C.C.	Timişoara	pupil
5.	R.R.	Câmpulung Muscel	student/UVT
6.	M.L.	Oţelu Roşu	student/USAMVB
7.	H.V.	Fălticeni	pupil
8.	U.D. (captain)	Oţelu Roşu	engineer
9.	S.S.	Timişoara	teacher
10.	G.T.	Oţelu Roşu	student/UVT
11.	M.S.	Blaj	student/UVT
12.	M.C.	Oradea	student/UVT
13.	D.C.	Oţelu Roşu	student/USAMVB
14.	V.R.	Timişoara	student/UVT

Results

This research aims at identifying enlightening aspects on the choice of performance in sports, and orientation to a future career.

Thus, we reveal the individual and group characteristics of the studied team.

Locality of origin

By analyzing table 1, we find that within the team of Politehnica Timişoara 1980, the highest share is represented by the players from Timişoara (5 out of 12 players), i.e., 41.66% of the team members. The explanation consists of the fact that, at that time, Timişoara was producing outstanding junior players who then made it to the senior team as well.

It is worth pointing out that the team also included players coming from other localities in Banat (Arad, Caransebeş, Oţelu Roşu, Reşiţa), i.e., 5 (41.66%), as well as 2 players from other localities in Romania (16.66%).

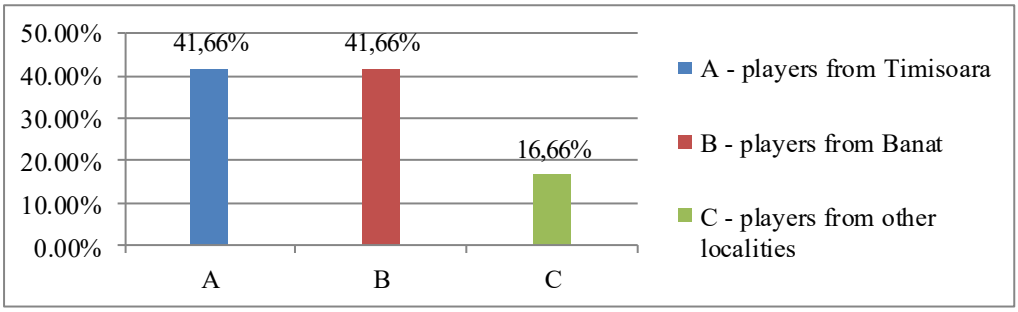

Fig. 1. Share of players within Politehnica Timişoara team according to localities of origin

Following the same aspect and viewing table 2, we will analyze the team of CSU Universitatea de Vest din Timişoara 2020.

The highest share is represented by the players from Oţelu Roşu, a center with a recognized tradition in raising young volleyball players, due to the passionate and dedicated coaching of prof. Pavel Craia. These players, i.e., 5, represent 35.71% of the team members, while the players from Timişoara (i.e., 4) represent 28.57%. We point out that team includes one player from Banat (Arad, 7.14%), while the other 4 team members (28.57%) come from other localities in Romania.

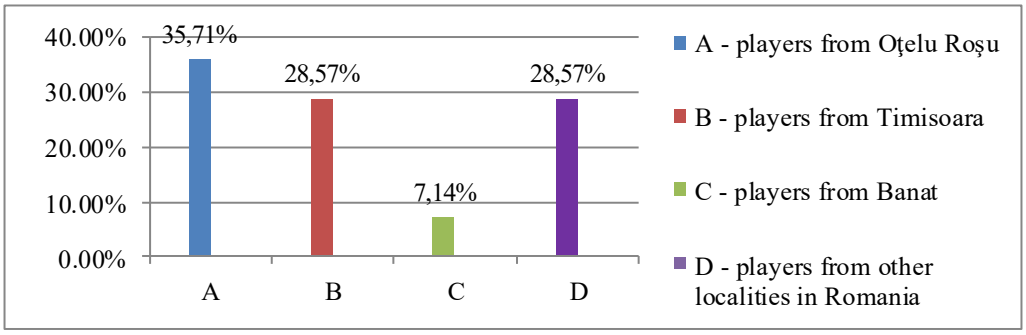

Fig. 2. Share of players within CS Universitatea de Vest din Timişoara team according to localities of origin

The players' profession

As we well know, the volleyball players from Timisoara have never been and are not professional or semi-professional players, but only beneficiaries of some facilities offered to them by the club or university.

While playing volleyball, they are also engaged in another activity, either educational (pupils, students) or practicing a profession after graduation. We will go into detail concerning this aspect in what follows.

Coming back to table 1, we find that the vast majority of the athletes (11 out of 12) attended or graduated from university, students (i.e., 8) representing 66.66% of the team members. It is worth pointing out that 6 of the students studied at the Polytechnic Institute, representing 50% of

the total number of athletes, while only 2 (16.66%) went to the University. Also, 3 of the players graduated from university (25%), while only one athlete (8.33%) did not pursue higher education.

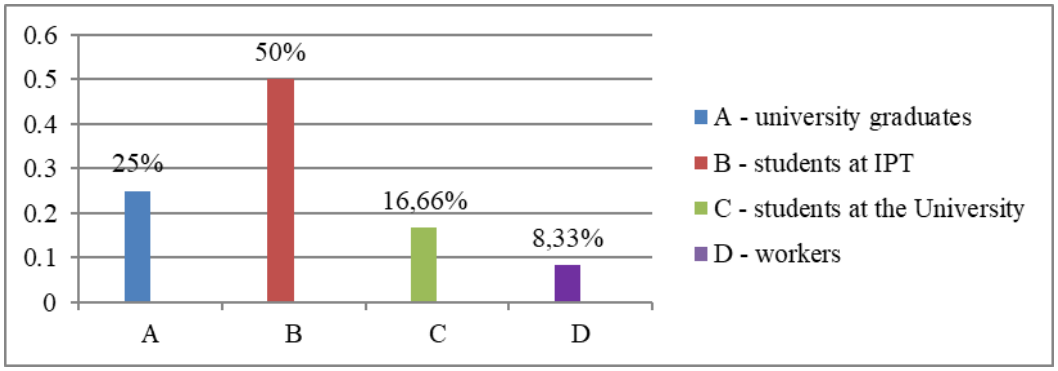

Fig. 3. Profession of the players within the team of Politehnica Timişoara 1980

The Fig. 3 above shows the high share of students from technical faculties, this being a characteristic of that period which generated a massive influx of young people to the university environment of this profile.

By analyzing table 2 and seeing the professional options of the players in team CS Universitatea de Vest din Timişoara 2020, we find that the share of students is, in this case, overwhelming, as they (9 out of 14) represent 64.28% of the team members. We point out that 7 of the students (50% of the team) are attending the West University of Timişoara and were part of the university team who won the national championship in 2019.

We should note that the team also includes 2 students from the USAMVB (*Banat University of Agricultural Sciences and Veterinary Medicine*), who represent 14.28% of the team members, as well as 2 pupils representing the same percent.

Also, 3 of the team members (also including here the player-coach) are university graduates, the team captain being having graduated the "Politehnica" University of Timisoara.

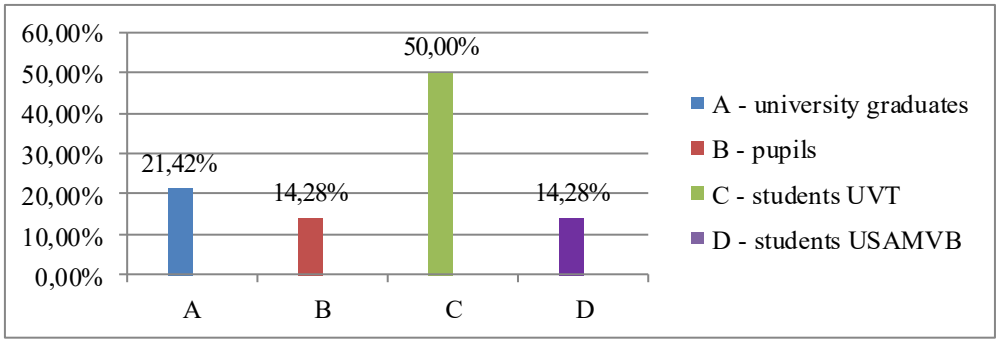

Fig. 4. Profession of the players within the team of CS Universitatea de Vest din Timişoara 2020

Discussions

In sports, as in other activities, performance involves various factors pertaining to the specialty, but also to sciences, without which the success of an endeavor does not become possible.

Most authors believe that attitudes and motivation are in a close relationship, a natural aspect if we consider the fact that this is also a system of subjective states which direct human activity based on trends or needs.

One of the successful expressions referring to the attitudes that fall within the sphere of character orientation belongs to B.G. Ananiev, who distinguishes the attitudes towards society, towards work, towards peers and towards oneself. This is the starting point of the path undertaken by a young person towards performing while practicing performance sports, as well as after turning from the sports activity to an honorable profession, useful to society.

Conclusions

This study reveals the following conclusions:

1. The university sports clubs have offered and continue to offer to the volleyball team reasonable conditions for affirmation on the sports line, as well as training conditions in the university environment.
2. The concern for performance on the sports line in parallel with acquiring skills for a professional career for which they have prepared or are preparing in higher education institutions proves to be constant over a long period of time.
3. We highlight the superior homogeneity of the team of the 80s, as the stability and maturity of the group differentiates it from the current team that is sometimes subject to less fortunate influences coming from other teams.
4. The higher education institution under whose tutelage athletes carry out their activity puts its mark on the options of the athletes in terms of university studies.
5. We point out the same percentage (50% of the team members) of students at the Polytechnic Institute for the 1980 team, and at the West University in the case of the 2020 team.
6. The present period offers a variety of opportunities in higher education, an aspect which is reflected by the presence, in the current team, of students from 3 universities.
7. Although it bore the title of the two great universities of Timisoara, this group was and still is the team of Timisoara's students, without any resentment as to the student affiliation of its members.
8. In this sense, it is eloquent to mention that the captain of the Politehnica team in 1980 was a graduate from the West University, and the captain of the CS Universitatea de Vest Timişoara team in 2020 is a graduate of the Politehnica University Timişoara.

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Is the Strength Training a Key for Performance in Cycling? – A Case Study

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Abstract

Performance is the goal of any athlete, but this is hard to achieve without a propper physical training. Thus, in order to obtain great results, the training methods and techniques in cycling have undergone dramatic changes by including within the physical preparation plan strength training and trainings from other sports such as athletics or swimming. The aim of the study consisted of an analysis of the strength training influence on the muscular endurance of cyclists when it is performed during the preparatory period. The study was carried out on a selected cyclist (male, 31 years old) from the cycling team of the West University of Timișoara who was subjected to a 12-weeks strength training program combined with specific workouts. The evalauted parameters were the value of the lactate threshold and the peak power expenditure after a ramp test. At the end of the 12-weeks program the results revealed a 13.2% increase in the lactate threshold and 10.5% of the maximum strength, compared to the initial ramp test. In the analyzed case, the implementation of strength trainings led to the improvement of both evaluated parameters. Due to the lack of work sample, we cannot generalize the results and we cannot make recommendations for the mass population. Further research is needed in order to standardize the training protocol in order to implement it as a training tool for general use in the world of cycling.

Keywords: cycling, endurance, power, muscle resistance

Introduction

The physical condition of cyclists is a defining element in achieving the desired performance.

To become a high-performance cyclist, an athlete must have an above-average aerobic effort capacity and the ability to develop as much strength as possible relative to body weight over a long period of time. According to studies, it has been shown that adding strength training to the annual training program for cyclists, brings benefits in their development [1].

The only way to develop exercise capacity is through physical training, both specific and general. Physical training aims at two main goals: "increasing the athlete's effort potential" and "maximizing the biomotor skills specific to the sport" [2].

The aim of the study was to assess the improvement of the aerobic effort capacity of a cyclist in the preparatory period, using strength training, strategically correlated and organized with the specific training between November 2019 and March 2020, the preparatory period of performance cyclists.

Materials and methods

A selection process was made within the cycling team of the West University of Timișoara, UVT-DEVRON West Cycling Team and the selected athlete was the 31-year-old R.F. He has a 15-year history in cycling (amateur, then professional) and 7 years in fitness.

An advantage was his experience as a practitioner and personal trainer in the field of fitness.

Thus, we were able to shorten and optimize the time by going over the period of accommodation and explanations regarding the exercises used in training.

To identify the training level of the athlete at the beginning of the study (initial tests), during the study (intermediate test) and at the end of the study (final test) 2 types of tests were used as follows:

1. "Ramp test" – for determining the lactate threshold (LT) is the primary area of developmental focus for competitive cyclists. It is the best predictor of race performance (FTP – Functional Threshold Power). The test was performed on a Home-Trainer type installation, composed of a Tacx Neo Smart type Smart Trainer and the subject's competition bike. The test was monitored using a system of specific sensors, namely: Heart rate – Chest band Garmin HRM-DUAL ANT + BLUETOOTH; Power-Powermeter SRAM Quarq Red AXS; Cadence-Powermeter SRAM Quarq Red AXS. The test was recorded on a Garmin Edge 530 device and uploaded to the https://connect.garmin.com platform for interpretation.
2. Tests for maximum force – 1RM – to determine the maximum force of the subject. We used as exercises full squat, bench press, leg press and military press.

The trainings took place over a period of 12 weeks with a structure organized in 4 mesocycles (4x4 microcycle of 6 days x1 training session/day). Strength training was combined with specific training on the bike. The athlete performed in each microcycle 6 days of training with at least 1 training session per day. Strength training was alternated with specific training in different weights depending on the mesocycle. The number of strength training sessions was established according to the number and intensity of specific training hours. Thus, at the beginning of the preparatory period we have a small volume (by frequency, duration and intensity) of specific training (bicycle training) and a large volume of strength training (4 strength training for each microcycle).

This ratio will be reversed during the next 3 macrocycles, reaching a large volume of specific training (by intensity and frequency) and a small volume of strength training (by frequency – 2 strength training for each microcycle). This gradual transition to a large volume of specific training, has as main purpose the preparation of the athlete for the pre-competition stage.

The evaluation of the subject was performed at 3 different times: initial testing (IT) – at the beginning of the preparatory period, control testing (CT) – in the middle of the preparation period and final testing (FT) at the end of the 12 weeks.

The followed parameters were; load (W), heart rate reached during exercise (bpm) and force distribution between the lower limbs (%). The lactate threshold (W) and the lactate threshold / kg (w/kg) were calculated.

Results

According to the tests, at the time of the control test, the subject had an increase of 8.4% of the lactation threshold and an increase of 5.5% of the maximum power compared to the initial test. In addition to this increase, due to strength training we managed to reduce the discrepancies in the muscles of the lower limbs, and the subject went from a left/right ratio of 52/48, to a ratio of 51/49. The body weight decreased by 2kg.

In table 1 are depicted the performance parameters according to the moment of testing:

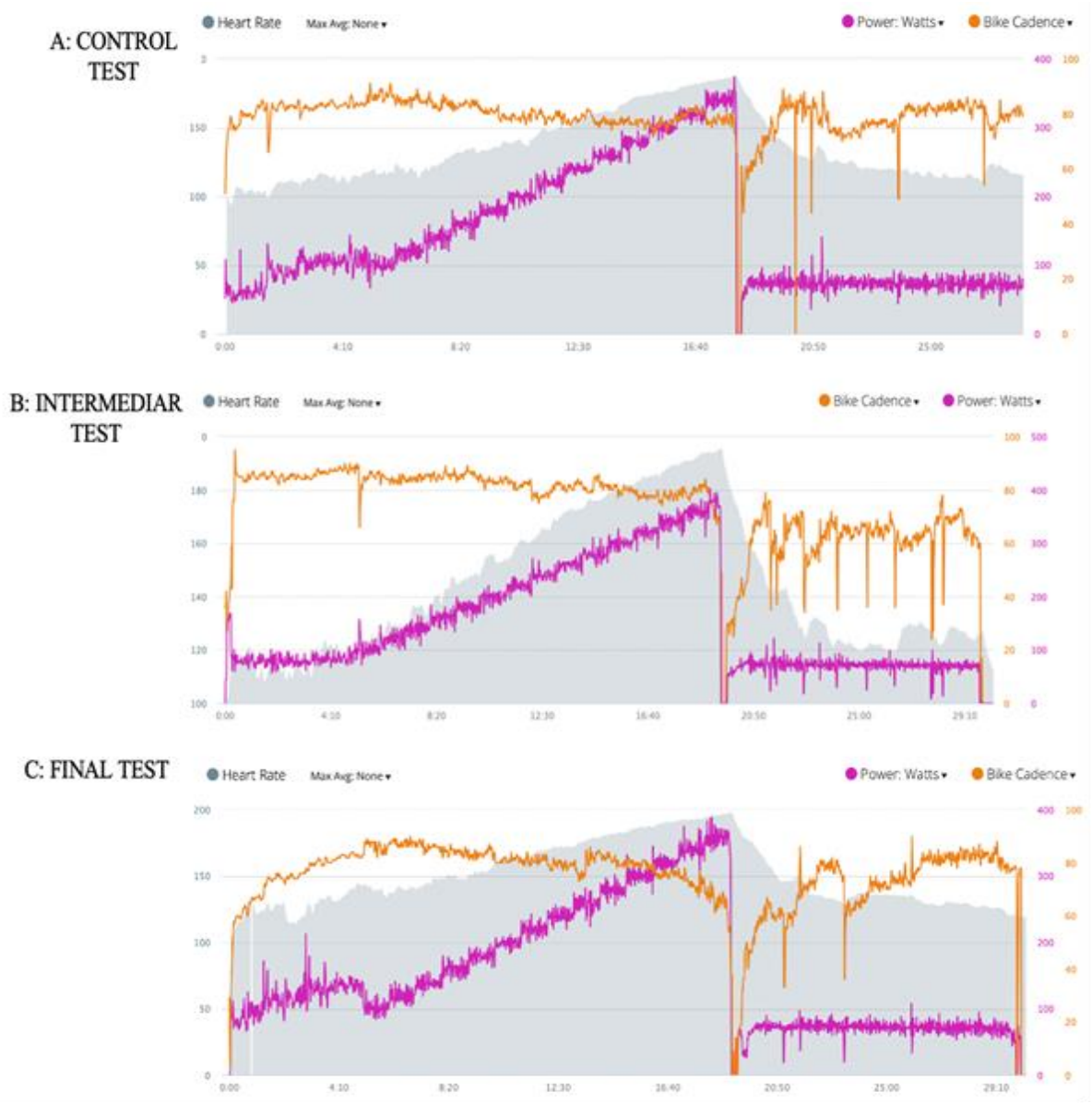

Fig. 1. Evolution of HR max during the tests: A – Initial testing, B- control testing (intermediate), C –final testing

Table 1. Performance parameters

Parameter / Value	HR bpm			Power (W)			Cadence		
	IT	CT	FT	IT	CT	FT	IT	CT	FT
Max value	187	198	196	374	389	403	91	90	95
Average value during the test	135	150	144	144	150	149	79	75	74

Following the final test, the subject showed an increase of 5.3% of the lactate threshold and 5.2% of the maximum power compared to the control test and an increase of 13.2% of the lactate threshold and 10.5% of the power maximum than the initial test. The evolution of the lactate threshold and power can be analyzed in Fig. 2 and Fig. 3. Also, at the end of the preparatory period we can observe the equalization of the power of the lower limbs, the subject reaching a left/right ratio of 50/50. The subject's weight remained unchanged from the weight during the control test.

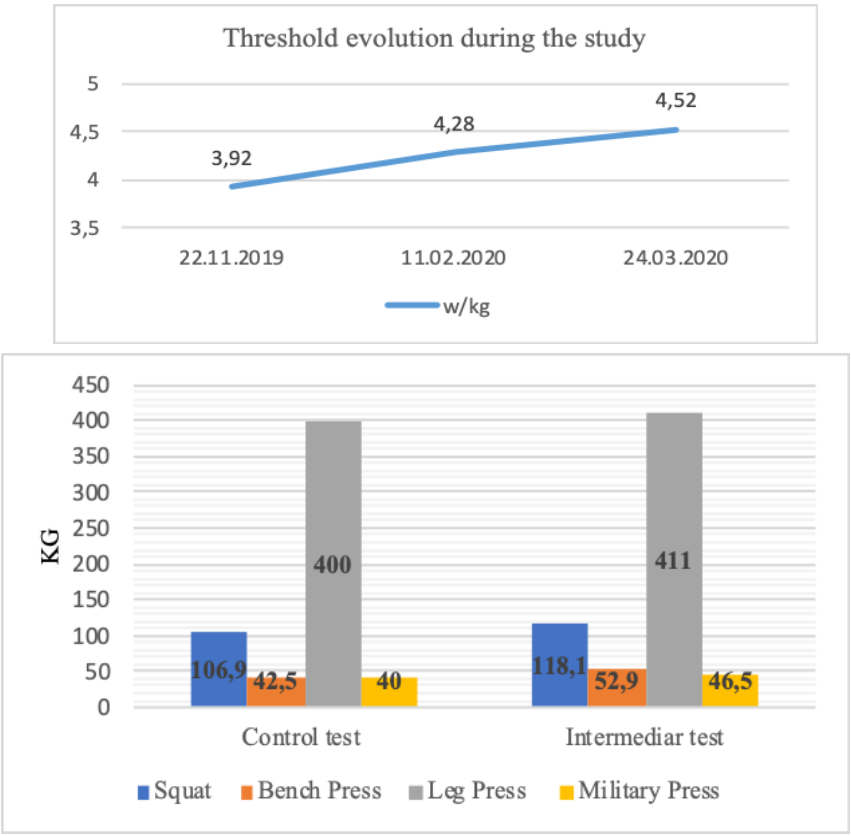

Fig. 3. Power evolution during control and intermediar tests

Discussions

The aim of the study was to determine the effect of strength training on cyclists' performance during the preparatory period. After the implementation of the strength training program carried out over a period of 12 weeks, there was an improvement of 10.5% of the maximum power and 13.2% of the lactate threshold. The results obtained are consistent with the results of studies in the modern literature [3-7] which showed that the introduction of strength training in the training program for cyclists leads to an increase statistically significant maximum strength and lactation threshold with equalization of the power exercised by to the lower limbs while pedaling.

Our results regarding the reduction of body weight (-2kg) are consistent with the findings of Rønnestad *et al*., (2016) [3]. The research conducted by Rønnestad (2016) was carried out on an 8 weeks period and they demonstrated a reduction of bodyweight comparable with our results.

Also, the equilibration of the body composition in favor of lean mass induced an augmentation of physical performance of the cyclists on all tested parameters including lactate threshold [3]. Another study runned by the team of Rønnestad *et al*., (2016) revealed that performing a training program consisting of heavy strength sessions in combination with endurance training within a short period of only 10 weeks leads to an increase of physical performance of the cyclists both in 30-s sprint and power output at 4 mmol L-1 [La-] compared to endurance training only [4]. Our results also revealed that the association between heavy training sessions with other types of endurance trainings induces a similar augmentation of the performance in our subject [4]. Moreover, in early studies Rønnestad *et al*., (2014), showed that strength training is beneficial for the cyclists by improving the cycling performance evidenced by the improvement of parameters that we also tested: power output and mean power output during 40-min all-out trial [5]. Thus, our results become consistent evidence regarding the benefits of the association of strengths training within the physical preparatory period, indicating that this approach should be taken into consideration when the goal is to improve elite cyclist's performance. On the other hand, Kristoffersen *et al*., (2019) showed that in case of elite cyclists, even a shorter preparatory period of only 6 weeks of training, from which only 4 weeks was associated with the implementation of strength training sessions is beneficial for the augmentation of power output at a lactate threshold [La-] of 4 mmol x L^{-1} [6].

Conclusion

In the analyzed case, the implementation of strength trainings led to the improvement of both evaluated parameters. Due to the lack of work sample, we cannot generalize the results and we cannot make recommendations for the mass population. Further research is needed in order to standardize the training protocol in order to implement it as a training tool for general use in the world of cycling.

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Strength-Endurance: Interaction Between Force-Velocity Condition and Power Output

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Abstract

Strength-endurance mainly depends on the power output, which is often expressed relative to the individual's maximal power capability (P_{max}). However, an individual can develop the same power, but in different combinations of force and velocity (force-velocity condition).

Also, at matched power output, changing the force-velocity condition results in a change of the velocity-specific relative power ($P_{max}v$), associated with a change in the power reserve.

So far, the effect of these changing conditions on strength-endurance remains unclear. The aim was to test the effects of force-velocity condition and power output on strength-endurance.

Fourteen sportsmen performed i) force- and power-velocity relationships evaluation in squat jumps and ii) strength-endurance evaluations during repeated squat jump tests in ten different force-velocity-power conditions, individualized based on the force- and power-velocity relationships. Each condition was characterized by different i) relative power (%P_{max}), ii) velocity-specific relative power (%$P_{max}v$), and iii) ratio between force and velocity (R_{Fv}).

Strength-endurance was assessed by the maximum repetitions (SJ_{Rep}), and the cumulated mechanical work (W_{tot}) performed until exhaustion during repeated squat jump tests. Intra and inter-day reliability of SJ_{Rep} were tested in one of the ten conditions. The effects of %P_{max}, %$P_{max}v$, and R_{Fv} on SJ_{Rep} and W_{tot} were tested *via* stepwise multiple linear regressions and two-way ANOVAs. SJ_{Rep} exhibited almost perfect intra- and inter-day reliability (ICC=0.94 and 0.93, respectively). SJ_{Rep} and W_{tot} were influenced by %$P_{max}v$ and R_{Fv} (R^2=0.975 and 0.971; RSME=0.242 and 0.234, respectively; both p<0.001), with the effect of R_{Fv} increasing with decreasing %$P_{max}v$ (interaction effect, p=0.03). %P_{max} was not considered as a significant predictor of strength-endurance by the multiple regression's analysis. SJ_{Rep} and W_{tot} were higher at lower %$P_{max}v$ and in low force-high velocity conditions (i.e., lower R_{Fv}). Strength-endurance was almost fully dependent on the position of the exercise conditions relative to the individual force-velocity and power-velocity relationships (characterized by %$P_{max}v$ and R_{Fv}). Thus, the standardization of the force-velocity condition and the velocity-specific relative power should not be overlooked for strength-endurance testing and training, but also when setting fatiguing protocols.

Keywords: force-velocity relationship, power-velocity relationship, test to exhaustion, repeated jump test, power reserve, force-velocity ratio, power-velocity-endurance profile

Introduction

Power production capabilities depend on movement velocity and are well represented by the parabolic power-velocity (*P*-*v*) relationship during multi-joint movements [1-3]. The apex of the *P*-*v* relationships corresponds to the maximal power attained at optimal velocity (P_{max}).

The ability to maintain power over a series of movements (i.e., strength-endurance) depends primarily on the output magnitude and is well illustrated by the power-time relationship.

However, the same absolute or relative-to-P_{max} (%P_{max}) power output can be developed in high force-low velocity conditions or in low force-high velocity conditions, and these different force-velocity (*F*-*v*) conditions can be interpreted as distinct ratios between the force output and the movement velocity (R_{Fv}). The effect of R_{Fv} on strength-endurance has been studied indirectly by investigating the effect of movement velocity using cyclic (e.g., cycling) and acyclic movements (e.g., knee extension). Due to the specificity of cyclic movements, velocity is indirectly controlled by adjusting movement frequency (i.e., the pedaling cadence) or using a specific set-ups[4,5]. During tests to exhaustion performed at constant power output, only cyclic movements (i.e., cycling and paddling) were used to study the effect of R_{Fv} on strength-endurance. However, there is a lack of consensus since some studies reported lower strength-endurance at higher movement frequencies[6,7] and others, lower strength-endurance at lower movement frequencies[8,9]. Moreover, the sole effect of R_{Fv} cannot be examined when using cyclic movements due to the concomitant influence of both movement frequency and velocity on strength-endurance. Indeed, movement frequency alone impacts strength-endurance by changing i) rest between repetitions and ii) contraction number during a test of fixed duration[10]. Overall, investigating the effect R_{Fv} on strength-endurance requires i) the use of an acyclic movement, allowing the dissociation with the effect of movement frequency, and ii) the use of time-to exhaustion at constant power to control force-velocity and power output conditions throughout the test. In parallel to R_{Fv}, strength-endurance can also be influenced by the power reserve.

Indeed, due to the parabolic shape of the *P*-*v* relationship, a change in R_{Fv} at a matched %P_{max} is associated with a change in the power reserve. This reserve corresponds to the difference between the maximal power value at a specific velocity and the power output at the same specific velocity[11-13]. This reserve can also be interpreted as a velocity-specific relative power (%$P_{max}v$): the lower %$P_{max}v$, the larger the power reserve. When considering the same %P_{max}, low force-high velocity conditions (often close to the optimal velocity) are associated with larger power reserve and lower %$P_{max}v$, and might improve strength-endurance[11-13]. Nevertheless, due to the concomitant change of R_{Fv} and %$P_{max}v$ at matched %P_{max}, it remains unclear whether the influence of R_{Fv} on strength-endurance is independent of %$P_{max}v$. Also, as matched %$P_{max}v$ can lead to different %P_{max}, the question of which of the two indices better represents exercise intensity remains unanswered. The aim of the present study was to test the effects of force-velocity condition (i.e., R_{Fv}) and power output (i.e., %P_{max} and %$P_{max}v$) on strength-endurance using an acyclic movement.

METHODS

Participants & design

Fourteen healthy participants (12 males and 2 females, age=20±2 years, mass=73±7 kg and height=1.79±0.09 m) gave their written informed consent to participate in this study. All participants were free of musculoskeletal pain or injury during the study.

The main limitations of previous works were addressed in this study by using jumping exercises due to the possibility to dissociate rest between repetitions from movement velocity.

To test the effects of $\%P_{max}v$, $\%P_{max}$, and R_{Fv} on strength-endurance, repeated squat jumps (RSJ) tests to exhaustion were performed in various force-velocity-power (*F-v-P*) conditions.

Overall, 10 *F-v-P* conditions were determined relative to individual *P-v* relationship, which meant conditions were graphically positioned on or under the *P-v* curve (grey points, **Fig. 1**).

Each *F-v-P* condition was characterized by different power output (P_1 to P_5) and velocity (v_1 to v_6), expressed relative to the individual *P-v* relationship. In addition, the positioning of *F-v-P* conditions follows the constraint imposed by dynamics principles during a vertical jump with and without additional load (represented by the white area under the *P-v* curve and the dashed grey line, respectively, **Fig. 1**). The remaining crosshatched area represents *F-v-P* conditions requiring a simulated reduction in body weight with assistance.

Note that all *F-v-P* conditions were determined only using power and velocity values to graphically position them relative to power capability as a common reference (i.e., *P-v* relationship), but changes in velocity across all different power conditions correspond also to changes in R_{Fv}.

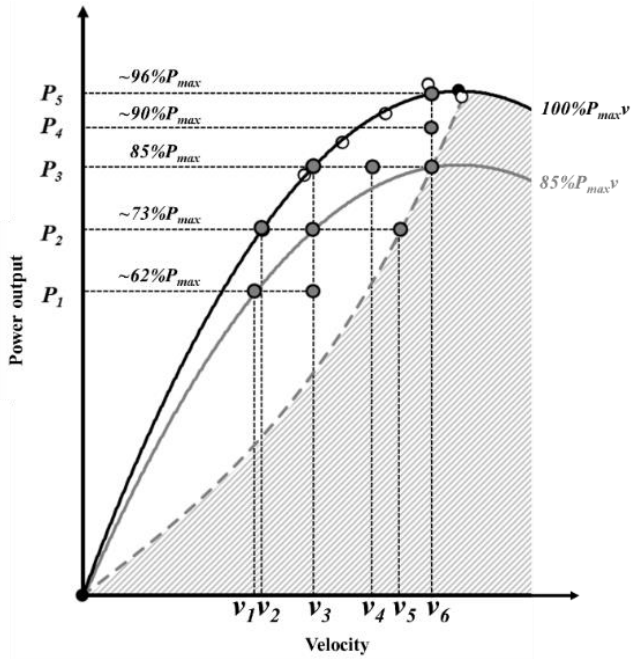

Fig. 1. Typical individual power-velocity relationship representing 100 (black curve) and 85 $\%P_{max}v$ (grey curve), associated with single maximal squat jumps in different loading conditions (white points) and the 10 *F-v-P* conditions (grey points). The dashed grey curve represents the different power-velocity conditions for jumps without load, from sub-maximal to maximal jump height

Protocol & data analysis

This study comprised 6 sessions, separated by more than 48-h of rest. The six sessions began with body mass measurements and a standardized warm-up. The first session familiarized

participants in performing i) single maximal effort squat jump (SJ) with and without load and ii) unloaded RSJ test until exhaustion. Also, individual starting position for RSJ tests and Force-velocity (*F-v*) and *P-v* relationships' assessment was recorded and was standardized throughout the study. Individual push-off distance was determined as the difference between the length of the lower limbs extended with maximal foot plantarflexion (iliac crest-toe distance) and the vertical distance between iliac crest and ground in the starting position. In the second session, individual *F-v* and *P-v* relationships of the lower limbs were evaluated from SJ with and without additional loads. The determination of individual *F-v* and *P-v* relationships included 5 SJs with loading conditions ranging from 0 to 100% of body weight, with each condition performed twice. After this evaluation, an RSJ test (**Fig. 2**) was performed in one specific *F-v-P* conditions (P_3v_4) for inter-day reliability analysis. From the third to the sixth session, each participant performed 12 RSJ tests randomly organized into 3 per session and separated by 30 min of passive rest, which corresponded to: 1 RSJ test in each of the 10 *F-v-P* conditions, 1 RSJ test repeated one more time to assess intra-day reliability in the specific *F-v-P* conditions (P_3v_4).

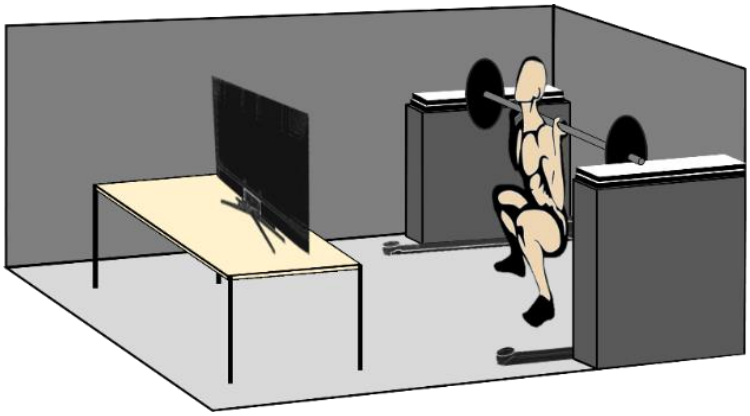

Fig. 2. Schematic setup for all squat jumps performed to determine individual *F-v* and *P-v* relationships and during RSJ tests to exhaustion

For each RSJ test, the practical setting of a given *F-v-P* condition consisted of modulating the additional load and the jump height based on fundamental laws of dynamics and following the equations proposed and validated by Samozino *et al*., (2008). Participants were instructed to reach a targeted jump height under a specific loading condition, which allowed them to perform an RSJ test in targeted *F-v-P* conditions. The jump height was self-controlled and aided by continuous visual feedback of the jump height that was displayed, repetition by repetition, to the screen in front of the participant. The jumping frequency was adjusted via audible beep at each RSJ test, considering 2.5 seconds rest time between 2 successive SJs.

Participants were encouraged to maintain the targeted jump height as long as possible (i.e., until exhaustion). For SJs performed during RSJ tests and *F-v* and *P-v* relationships assessment, force, velocity, and power developed during the push-off phase were computed using the equations proposed by Samozino *et al*., (2008). For each of the 10 RSJ conditions, R_{Fv} was computed as the ratio between the force developed (expressed relative to F_0) and the velocity (expressed relative to v_0). Exhaustion was defined as the inability to perform 3 consecutive jumps above 95 % of the targeted jump height. Strength-endurance was quantified by i) the maximum repetitions (SJ_{Rep}) and ii) the cumulated mechanical work output (W_{tot}) associated to SJ_{Rep}. SJ_{Rep} corresponded to all repetitions preceding exhaustion, excluding the 3 jumps below

the limit of 95% of the targeted performance and W_{tot} was computed as the sum of the mechanical work of all repetitions of SJ_{Rep}.

Statistical analysis

Intra- and inter-day reliability of SJ_{Rep} in P_3v_4 condition were assessed with the standard error of measurement (SEM). Relative intra- and inter-day reliability of SJ_{Rep} in P_3v_4 condition were assessed with intra-class correlation coefficient (ICC), which was interpreted as almost perfect (0.81 to 1.00), substantial (0.61 to 0.80), moderate (0.41 to 0.60), fair (0.21 to 0.40), slight (0.01 to 0.20), or poor (<0.01). The difference between the two trials was tested with the paired sample t-test. The respective effects of $\%P_{max}$, $\%P_{max}v$, and R_{Fv} on both SJ_{rep} and W_{tot} were examined using two separate stepwise multiple linear regressions performed from averaged data of the 10 *F-v-P* conditions of RSJ tests (n=10). To test the main effects of $\%P_{max}$, $\%P_{max}v$ and R_{Fv} on both SJ_{rep} and W_{tot}, as well as their interaction, 2 two-way ANOVAs with repeated measures were performed on SJ_{rep} and W_{tot}. Holm's post hoc test was used to highlight significant differences between conditions, as well as simple main effects to test the effect of the first main factor at each level of the second factor, and *vice-versa*. For all statistical analyses, an alpha value of 0.05 was accepted as the level of significance.

Results

The SEM, ICC, and *t*-test's *p*-values between the trials performed in the P_3v_4 condition to assess intra-day and inter-day reliability were 2.36, 0.94, p=0,363 and 3.34, 0.86, p=0.952, respectively. SJ_{Rep} and W_{tot} associated with the 10 *F-v-P* conditions are presented in **Table 1**.

The stepwise multiple regression analysis with SJ_{rep} as the dependent variable showed that $\%P_{max}v$ (88.4 % of the variance explained, beta-weight of -0.812) and R_{Fv} (9.1% of the variance explained, standardized beta-weight of -0.327) accounted for a significant amount of SJ_{rep} variability (p<0.001; F=134.187). The regression model obtained was ln (SJ_{Rep})=17.042–0.144($\%P_{max}v$) – 0.649(R_{Fv}), which indicated a very high goodness of fit (R^2=0.975, p<0.001), with low residuals (RSME=0.243). The stepwise multiple regression analysis with W_{tot} as the dependent variable showed that $\%P_{max}v$ (89.2% of the variance explained, beta-weight of -0.825) and R_{Fv} (7.9% of the variance explained, standardized beta-weight of -0.305) accounted for a significant amount of W_{tot} variability (p<0.001; F=116.866). The regression model obtained was ln (W_{tot})=22.140 – 0.132($\%P_{max}v$) – 0.545(R_{Fv}), which indicated a very high goodness of fit (R^2=0.971, p<0.001), with low residuals (RSME=0.234). The two-way ANOVA with repeated measures testing the effect of $\%P_{max}$ and R_{Fv} on SJ_{rep} showed a main effect of R_{Fv} (p<0.001) and R_{Fv} × $\%P_{max}$ interaction (p<0.001), but no main effect of $\%P_{max}$ (p=0.129). Post-hoc comparisons revealed significant differences (p<0.001) for all comparisons between the three R_{Fv} levels, with an increase of SJ_{rep} when R_{Fv} decreases. A simple main effect of $\%P_{max}$ was observed at the highest level of R_{Fv} (p<0.001), but not at the two lower levels (p=0.129 and p=0.782, for the lowest and the middle level, respectively). A simple main effect of R_{Fv} was observed at the two levels of power (p<0.001). The two-way ANOVA with repeated measures testing the effect of $\%P_{max}$ and R_{Fv} on W_{tot} showed a main effect of R_{Fv} (p<0.001) and $\%P_{max}$ (p<0.001), and R_{Fv} × $\%P_{max}$ interaction (p<0.001). Post-hoc comparisons revealed significant differences for all comparisons between the three R_{Fv} levels (p<0.001), with an increase of W_{tot}

when R_{Fv} decreases. A simple main effect of $\%P_{max}$ was observed at the low level of R_{Fv} ($p<0.001$), but not at the moderate and high levels ($p=0.954$ et $p=0.323$, respectively). There was a simple main effect of R_{Fv} at the two levels of power ($p<0.001$). The two-way ANOVA with repeated measures testing the effect of $\%P_{max}v$ and R_{Fv} on SJ_{rep} showed a main effect of R_{Fv} ($p<0.001$) and $\%P_{max}v$ ($p<0.001$), and $R_{Fv} \times P_{max}v$ interaction ($p=0.03$). Post-hoc comparisons revealed significant differences in all comparisons between the three R_{Fv} levels ($p<0.05$), with an increase of SJ_{rep} when R_{Fv} decreases. A simple main effect of $\%P_{max}v$ was observed at each level of R_{Fv} ($p<0.001$). There was a simple main effect of R_{Fv} at 85 $\%P_{max}v$ ($p<0.001$) and a trend at 100 $\%P_{max}v$ ($p=0.078$). The two-way ANOVA with repeated measures testing the effect of $\%P_{max}v$ and R_{Fv} on W_{tot} showed a main effect of R_{Fv} ($p<0.001$) and $\%P_{max}v$ ($p<0.001$) and $R_{Fv} \times \%P_{max}v$ interaction ($p<0.001$). Post-hoc comparisons revealed significant differences at the three R_{Fv} levels ($p<0.05$), with an increase of W_{tot} when R_{Fv} decreases. A simple main effect of $\%P_{max}v$ was observed at the three levels of R_{Fv} ($p<0.001$).

There was a simple main effect of R_{Fv} observed at 85 $\%P_{max}v$ ($p<0.001$), but only a trend at 100 $\%P_{max}v$ ($p=0.134$).

	P_5	P_4	P_3			P_2			P_1	
	v_6	v_6	v_6	v_4	v_3	v_5	v_3	v_2	v_3	v_1
Maximum repetitions	6.21±4.56	17.00±9.43	58.79±37.39	19.86±7.47	4.21±2.97	148.21±88.56	20.64±10.97	2.93±2.53	124.07±86.76	12.64±6.85
Cumulated mechanical work (J)	4079±2925	9288±5381	29702±19616	12016±5391	2892±2099	70858±41274	11804±6254	2046±1777	62586±44091	8455±5203

Table 1. Mean ± SD of the maximum repetitions and cumulated mechanical work for each of the 10 *F-v-P* conditions

Discussion

The main finding of this study was that strength-endurance in repeated jumping depends on force, velocity, and power conditions, expressed relative to force- and power-velocity relationships. The large intra-individual differences in both the maximum repetitions and total work produced across the 10 *F-v-P* conditions studied (from ~3 to ~150 repetitions and from ~2000 to ~70000 Joules) were almost entirely explained (~98%) by both the velocity-specific relative power and the ratio between force and velocity to generate power. Strength-endurance was higher at lower velocity-specific relative power and in lower force-higher velocity conditions. Intra- and inter-day reliability of the repeated squat jump test to exhaustion was acceptable and congruent with previously reported reliabilities for tests to exhaustion of approximately similar duration [14]. In comparison to $\%P_{max}$ and R_{Fv}, $\%P_{max}v$ was the mechanical condition that affected the most strength-endurance (i.e., ~88-89 % of the variance explained in SJ_{rep} and W_{tot}). $\%P_{max}$ was not a predictor of strength-endurance, notably since it does not consider the change in power capability with the force-velocity condition. Indeed, at the same $\%P_{max}$, the power output relative to the velocity-specific P_{max} (i.e., $\%P_{max}v$), representing the power reserve, can represent drastically different force-velocity conditions and substantial differences in strength endurance performance. It is worth noting that among the 10 *F-v-P* conditions, a lower $\%P_{max}$ was not systematically associated with a higher strength-endurance.

For example, the 3 *F-v-P* conditions at ~85 $\%P_{max}$, ~73 $\%P_{max}$, and ~62 $\%P_{max}$ were associated with performances of ~58, ~21, and 12 repetitions, respectively. This further highlights the inability of $\%P_{max}$ to represent exercise intensity, notably when the exercises are not performed in the same force-velocity condition. Since the force-velocity condition varies

during field performance and physical testing due to changing loading/resistive conditions and levers/equipment used, the common implementation of $\%P_{max}$ to represent exercise intensity could be challenged[15]. Instead, it appears that $\%P_{max}v$ better represents exercise intensity, since it considers the change in the individual maximal power capabilities according to the force-velocity condition. Thus, strength endurance seems to depend primarily on power output, expressed relative to the velocity-specific maximal power, and not to the maximal power value developed at optimal velocity. This supports the importance of the power reserve[11-13], and in turn, the influence of maximal power capacities (i.e., the *P*-*v* relationship) on the individual ability to maintain sub-maximal power over time, notably at high exercise intensities. The second strongest mechanical predictor of strength-endurance was R_{Fv}, which explained ~8-9% of the variance in SJ_{Rep} and W_{tot}. Note that the remaining variance (~2-3%) is likely due to measurement errors. Decreasing R_{Fv} (i.e., increasing movement velocity and decreasing the force output at matched $\%P_{max}$ or $\%P_{max}v$) resulted in increased strength-endurance. These results confirm that, when standardizing rest time between repetitions, a change in force-velocity condition influences strength-endurance independently from a change in $\%P_{max}v$ or a change in $\%P_{max}$. These findings contrast previous hypotheses suggesting that increasing movement velocity is unbeneficial[6,16,17], notably due to potentially higher proportions of fatigable type II muscle fiber recruitment[18,19].

However, as these studies did not use standardized rest time between contractions and fixed repetitions across velocity conditions, the negative effect of low rest time in high-frequency conditions could have counteracted the positive effect of movement velocity.

However, although R_{Fv} explained a comparatively small part of the overall variance, its change led to substantial differences in strength-endurance (e.g., ~13, ~20 and ~60 repetitions at $85\%P_{max}v$, with associated R_{Fv} mean values of ~2.9, ~2.1, ~1.3, respectively). Taken together, these results show that increases in velocity and decreases in force at the same $\%P_{max}v$ or $\%P_{max}$ during acyclic movements (e.g., repeated jumps or callisthenic exercises) are rather beneficial than detrimental and could lead to substantial change in maximum repetitions and cumulated work until exhaustion. Strength-endurance at the individual level seems to be almost fully dependent on *F*-*v*-*P* conditions, expressed relative to the individualized *F*-*v* and *P*-*v* relationships. More specifically, performance is determined by the position of the exercise mechanical conditions on or under the *F*-*v* and *P*-*v* relationships, this position being characterized by $\%P_{max}v$ and R_{Fv} (expressed relative to F_0 and v_0; **Fig. 3**).

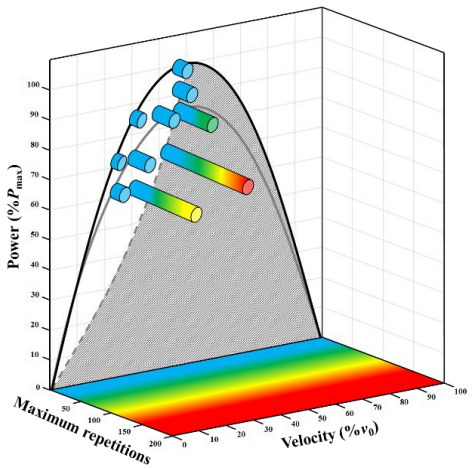

Fig. 3. Schematic 3-dimensional power-velocity-endurance relationships representing mean maximum repetitions across individuals in the 10 *F-v-P* conditions (colored horizontal cylinders)

Strength-endurance evaluation should be standardized according to the individual *F-v* and *P-v* relationships, notably *via* $\%P_{max}v$ and R_{Fv}, rather than to i) a given percentage of maximal force[20], ii) the same movement velocity across individuals[21] or iii) the same resistive force per bodyweight during all-out cycling exercises[22]. Without such standardization, inter-individual differences in strength-endurance could be mainly due to different $\%P_{max}v$ and R_{Fv} conditions among individuals and not only a marker of different physical abilities. Such "Force-velocity-Power based training" could ensure strength and conditioning to improve the strength-endurance of athletes in competition-specific $\%P_{max}v$ and R_{Fv} conditions. RSJ is a reliable, practical, and modifiable method to evaluate lower limb strength-endurance in a broad range of exercise conditions specific to field situations. The only requirements of an RSJ test are the measurements of body mass, push-off distance and continuous jump height over successive repetitions, and the use of Samozino et al's validated simple method to estimate force, velocity, and power in jumping[23-26]. Notably, there are many convenient methods of detecting the necessary variables (e.g., phone applications or other common devices, such as optical systems).

Conclusion

Strength-endurance in jumping, either characterized as the maximum repetitions or cumulated mechanical work performed until exhaustion, depends on both the velocity-specific relative power (or the power reserve) and the underlying force-velocity condition.

Strength-endurance was higher when velocity-specific relative power was lower (i.e., larger power reserve) and when the force-velocity condition to generate power was oriented toward low force-high velocity (at least until optimal velocity). The repeated squat jump is a reliable and practical method to assess strength-endurance of the lower limbs, with the possibility to easily set these mechanical conditions, by manipulating jump height, loading and rest time between jumps.

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Identifying the Power Gap Between Employer and Employees, Within the Sports Field in Romania

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Abstract

This research aims at identifying the elements of cultural specificities within the Oglinzi Târgu Neamţ camp, which concern the following: activity of the manager and of the managerial team, employees' attitude, clients' behaviour (children, students, young people, adolescents, athletes), mental, behavioural, and attitudinal conditions in the context of efforts made to ensure camp functioning.

Cultural differences were analyzed based on criteria that enable comparison. Intercultural Management calls them *cultural dimensions*. I analyzed the overlaps and interferences between these cultural dimensions, in order to highlight the most important aspects and to consider them within my research.

The research series comprises 332 subjects, of whom 34 are represented by the managerial staff of the three camps (14 persons in the Oglinzi camp, 10 persons in the Arted camp, 10 persons in the Muncel camp) and 298 are represented by clients of the three camps (171 persons in the Oglinzi camp, 77 persons in the Arted camp, 50 persons in the Muncel camp).

Results were analyzed qualitatively and quantitatively using SPSS.

Subjects were both females and males and they were divided by age categories, as follows: the personnel of the three camps into two groups – 20-40 years old (personnel with low or average experience) and 41-60 years old (personnel with high experience), while the clients into two groups: 7-12 years (preadolescents) and 13-18 years old (adolescents).

Keywords: cultural dimensions, employer and employees, intercultural, sports camp

Introduction

The identification of interrelations between cultural dimensions is the result of a mixture between the specialized field of researchers, the subsequently developed professional skills, and the newly acquired information within domains that are considered "interdisciplinary".

Intercultural Management has not "patented" any specific methodological analysis system; to this end, it has used existing methods and techniques, with applicability in management to the same extent that marketing efforts were transformed into managerial strategies of the organizational decision-making flow [1].

Methodology is the *know-how* used to reach a purpose, s research goal, in particular and in special [2]. Research methodology has a preponderantly normative character and it comprises theoretical principles (theoretical view of the discipline), data collection methods and techniques (factual and informational support), data processing methods and techniques (dimension of quantitative processing), and logical procedures of analysis and generalization (theory construction and systematization)" [3].

Methods

The methods varied by the aforementioned objectives. To study the evolution over time of an organization such as a sports camp or of its status at a certain point, we had to use research methods that include data and results provision regarding the evolution of the organization; these results lead to a change plan effective for the organization in question.

We used a series of qualitative and quantitative methods to study the organization and its characteristics, considering that identifiable facts – demonstrable from the perspective of research – constitute a proper support for elaborating intervention plans or decisions, thus avoiding an intuitive or an over oscillating polling [4]. Because purely quantitative methods are not as precise as they claim and because qualitative methods fail to provide answers to all questions raised by the research issue, the solution was to adopt a middle way, by using both types of methods. However, the advantage of quantitative research methods is that they enable the collection of data that describe reality accurately and that may constitute a basis for generalized models. Qualitative or informal methods are commonly used in the research of organizational and management field [1]. They enable the highlighting of elements of finesse, such as nonverbal communication, not included within formal methods [6]. The downside of these qualitative methods is that the results obtained are informational and they do not allow the extraction of general conclusions regarding the target-population. According to the analysis model elaborated by Geert Hofstede [5], national culture can be characterized by the five dimensions outlined below:

1. Power Distance: Large/Low;
2. Individualism/Collectivism;
3. Masculinity/Femininity;
4. Uncertainty Avoidance: Strong/Weak;
5. Long Term Orientation versus Short Term Normative Orientation.

The subjects within each researched category (administrative personnel and clients) were asked to fill in two types of questionnaires (personnel – Questionnaire ***A***, while clients – Questionnaire ***B***), in identical or similar evaluating conditions. Subsequently, results were analyzed qualitatively and quantitatively using SPSS. We present below the underlying dependent and independent variables of the research:

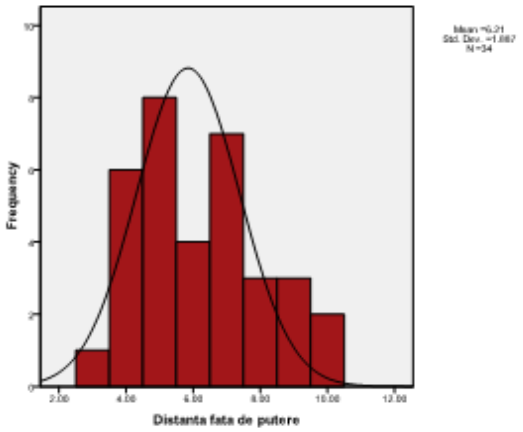
- dependent variables: Individualism/Collectivism/Power Distance/Uncertainty Avoidance/Long Term Orientation/Masculinity/Femininity.

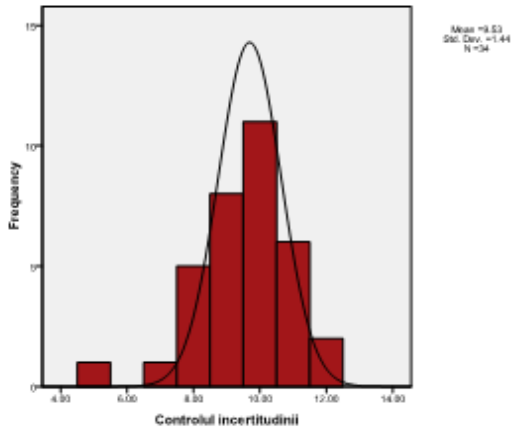
- independent variables: sports camp: Oglinzi Târgu Neamț, Arted Durău, Muncel Pașcani – Iași: status: employees, clients/sex: male, female/age of employees: 20-40, 41-60/of clients: 7-12, 13-18/birthplace of employees: Upper Moldavia, Lower Moldavia.

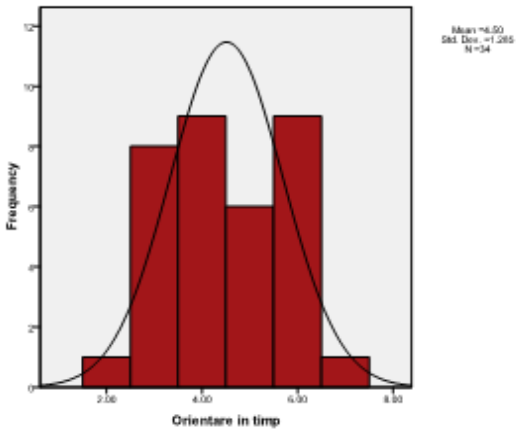
Results and discussion

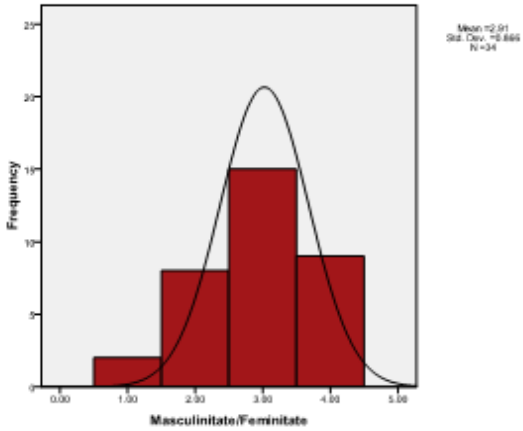
These general trends of the group of employees of the three camps are also supported by the frequencies of the scores indicated by the respondents. From the frequency graphs we will observe if the low, medium or high scores were indicated most often by the surveyed subjects, following the distribution of these scores according to the normal statistical curve.

For the dimensions: uncertainty control, distance from power, orientation in time and masculinity/femininity, the scores respect the normal distribution on the statistical curve, the scores indicated most frequently by the subjects being those around the average for each of these dimensions (figures no. 1 – distance from power, orientation in time, 2 – for the dimensions: uncertainty control, 3 – orientation in timeand 4 – masculinity/femininity).









Only concerning Individualism/Collectivism, we found a polarization of scores toward the pole represented by Collectivism, because subjects frequently recorded high scores for this dimension. Hence, it can be posited that in the three camps within our study, Collectivism and not Individualism is more likely valued and promoted by employees and management [10]. In

order to assess potential differences in the approach to cultural dimensions of the management within our study, we used ANOVA One Way. Through, ANOVA we were able to compare means for three and more sub-populations defined by the grouping variable (independent variable) [8]. This method enables the extension of the analysis made using the T Test applicable to two means, to situations where independent variables (grouping variable) present three of more categories (in our case, the three sports camps) [5]. Table 1 shows that we found significant differences between the three camps in two of the five cultural dimensions studied: Power Distance (materiality threshold $p<0.05$) and Long-Term Orientation ($p<0.01$).

Tabel 1. Comparative analysis of the cultural dimensions in the three camps (Oglinzi–Târgu Neamț, Arted Durău, and Muncel Pașcani-Iași on employee level)

		Sum of Squares	*gl*	*Squared Mean*	*F*	*Significance*
Power Distance	*Between groups*	*23.230*	*2*	*11.615*	*3.817*	*.033*
	In groups	*94.329*	*31*	*3.043*		
	Total	*117.559*	*33*			
Individualism/Collectivism	*Between groups*	*1.936*	*2*	*.968*	*.709*	*.500*
	In groups	*42.329*	*31*	*1.365*		
	Total	*44.265*	*33*			
Uncertainty Avoidance	*Between groups*	*11.613*	*2*	*5.807*	*3.166*	*.056*
	In groups	*56.857*	*31*	*1.834*		
	Total	*68.471*	*33*			
Long Term Orientation	*Between groups*	*21.086*	*2*	*10.543*	*9.781*	*.001*
	In groups	*33.414*	*31*	*1.078*		
	Total	*54.500*	*33*			
Masculinity/Femininity	*Between groups*	*3.207*	*2*	*1.603*	*2.309*	*.116*
	In groups	*21.529*	*31*	*.694*		
	Total	*24.735*	*33*			

Because only for these two dimensions significant differences were found between camps, we will analyze the different views of employees within the three camps regarding Power Distance and Long-Term Orientation (Table 2).

Another aspect on which we focused – besides highlighting the management differences within the three camps – was employees' perception of the cultural dimensions by age and sex.

By using T-Test for independent samples for each camp and for the entire employee series within all three, we found no significant differences in employees' perception of the cultural dimensions by age and sex (Tables 3-4).

Table 2. Comparative analysis of the cultural dimensions with significant differences (employees)

Camp		*Power Distance*	*Long Term Orientation*
Oglinzi-Tg. Neamt	*Mean*	*6.4286*	*3.8571*
	N	*14*	*14*
	Standard deviation	*1.82775*	*1.16732*
Arted-Durau	*Mean*	*7.1000*	*5.7000*

	N	*10*	*10*
	Standard deviation	*1.91195*	*.82327*
Muncel-Iasi	*Mean*	*5.0000*	*4.2000*
	N	*10*	*10*
	Standard deviation	*1.41421*	*1.03280*

Table 3. Grouping employees by age

	Age	*N*	***Mean***	*Std. deviation*	*Std. Error mean*
Individualism/Collectivism	*20-40*	*20*	*11.8500*	*1.22582*	*.27410*
	41-60	*14*	*11.8571*	*1.09945*	*.29384*
Power Distance	*20-40*	*20*	*6.2000*	*2.26181*	*.50576*
	41-60	*14*	*6.2143*	*1.25137*	*.33444*
Uncertainty Avoidance	*20-40*	*20*	*9.2500*	*1.55174*	*.34698*
	41-60	*14*	*9.9286*	*1.20667*	*.32250*
Long Term Orientation	*20-40*	*20*	*4.8500*	*1.38697*	*.31014*
	41-60	*14*	*4.0000*	*.96077*	*.25678*
Masculinity/Femininity	*20-40*	*20*	*2.9000*	*.85224*	*.19057*
	41-60	*14*	*2.9286*	*.91687*	*.24505*

Table 4 illustrates that no significant differences were found for any of these five cultural dimensions by age (p>0.05). Table 4 highlights that no significant differences were found for any of these five cultural dimensions by sex (p>0.05).

Table 4. Grouping employees by sex

	Sex	*N*	***Media***	*Std. deviation*	*Std mean of dev.*
Individualism/Collectivism	*Female*	*21*	*11.8571*	*1.15264*	*.25153*
	Male	*13*	*11.8462*	*1.21423*	*.33677*
Power Distance	*Female*	*21*	*6.0952*	*1.92106*	*.41921*
	Male	*13*	*6.3846*	*1.89466*	*.52548*
Uncertainty Avoidance	*Female*	*21*	*9.3333*	*1.68325*	*.36732*
	Male	*13*	*9.8462*	*.89872*	*.24926*
Long Term Orientation	*Female*	*21*	*4.4762*	*1.24976*	*.27272*
	Male	*13*	*4.5385*	*1.39137*	*.38590*
Masculinity/Femininity	*Female*	*21*	*3.0952*	*.83095*	*.18133*
	Male	*13*	*2.6154*	*.86972*	*.24122*

Conclusion

If we were to synthesize the essence of various viewpoints expressed by specialists, we would posit that the management of sports activity could be defined by "the totality of specific

processes and relations through which the resources of sports structures are organized, run, and managed both overall and on levels and competences, in order to attain goals effectively."

Considering the aforementioned definitions provided for management, we outline three main ideas below: Managers accomplish forecasting, organizing, coordinating, training, and controlling-assessing functions. Management is applied to all types of organizations, regardless of the field (economic, social, political, cultural, sports) or organization form (governmental/nongovernmental, patrimonial/non-patrimonial, public/private). Management is applied to all organization levels, from top to operational management. The purpose of management is to determine increased organizational efficacy and efficiency.

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Study Regarding the Identification of Causes and Strategies for Resolving the Conflicts Within Sports Organizations

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Abstract

Conflict is a social phenomenon that occurs when two or more individuals pursuing incompatible goals are the most vivid form of interaction between them. Over time, several approaches to conflict have been tried, but three types of approaches used by most specialist remain, namely: the traditional perspective, the human relations perspective and the interactionist perspective.

The aim

Identifying the causes of conflicts within sports organizations and itentifying the strategies chosen be athletes to resolve conflicts in the team.

Materials and methods

To conduct the study, the survey method was used by applying a questionnaire through an online platform to CSS "Viitorul" Cluj-Napoca and CSS Zalau.

Results

In order to resolve the conflicts, one of the teams' approaches was more dominant oriented towards collaboration, and the other team focuses on style oriented towards competition.

Conclusions

In order to resolve the conflicts, the coach must identify the real problem from which the conflict broke out, ensure that both parts have accepted the problem and find solutions that satisfy both parts and lead to the final resolution of the conflict.

Keywords: conflicts, handball, sports organizations, team

Introduction

Conflict is a social phenomenon, wich occurs when two or more individuals are pursuing incompatible goals are the most vivid form of interaction. Over time, wherever there have been people, there have been ideas, values, conjunctures, styles and standards that can conflict, wich leads us to think that there is not just one cause, but several: goals, purposes, habits, personalities, competition, aggresion etc. [1].

In other words, the conflict is intentionally mixed by an individual or a group in the efforts to achieve the goals of another group [2]. In the educational environment, the conflict involves a clash of interests, feelings, needs, ideas, values, opposing attitudes that are difficult to reconcile between teachers and their students, as well as the opposition between the status and role of each of the educational factor [3], [4], [5].

Over time, several approaches to conflicts have been tried, but three types of approaches used by most specialists remain, namely: the traditional perspective; perspective of human relations; interactionist perspective [2].

Successful resolution of conflict situations also requires the identification and awareness of the causes of conflicts in order to act in order to properly use the positive effects, as well as to reduce the negative consequences as much as possible [1], and in order to solve them, their causes, their characteristics must be known, but also ways to develop links between conflicts and defining aspects of communication through a conflict management, containing elements of stimulation and their extinction [6].

The aim

Identifying the causes of conflicts within sports organizations and itentifying the strategies chosen by athletes to resolve conflicts in the team.

Materials and methods

The research took place between 05.03.2020 and 16.04.2020. The players of two handball teams for juniors participated in the reasearch CSS “VIITORUL” Cluj-Napoca and CSS Zalau.

To conduct this study, 40 subjects participated, female, aged between 14-19 years. They were sent an online questionnaire to complete, with data on the personal style of students to resolve conflicts in various educational interventions.

The questionnaire is used to produce explanatory data, wich highlights the facts and the factors that determined them, using a Likter type measurement scale, wich is composed of 5 items as follows: 1-rare; 2-not very often; 3-quite often; 4-often; 5-always [7].

Întrebări	1	2	3	4	5
Discut conflictul cu colegii, cu părţile aflate în conflict, cu alţi colaboratori, pentru a demonstra avantajele poziţiei pe care o am faţă de conflict.					
Prin negociere încerc să ajung la compromisuri.					
Încerc să ţin cont de aşteptările celorlalţi.					
Caut, împreună cu ceilalţi, să investighez toate aspectele problemei pentru a găsi soluţii acceptabile de către toţi cei implicaţi în conflict.					
Sunt ferm pe poziţie atunci când trebuie să apăr aspectele problemei care mă privesc pe mine.					
Încerc să evit să fiu exclus dintr-un grup, ţinând în mine dezacordul cu ceilalţi.					
Îmi impun soluţiile la problemele ivite.					
Fac compromisuri pentru a ajunge la o înţelegere.					
Împărtăşesc informaţiile importante şi celorlalţi, pentru a putea rezolva împreună problema.					
Evit să discut diferenţele de opinie cu ceilalţi.					
Încerc să aplanez disensiunile între colegi.					
Caut să aduc în dezbatere nemulţumirile fiecăruia, pentru a le rezolva în cel mai bun mod posibil .					
Adopt o poziţie conciliantă în efortul de a debloca conflictele.					
Accept recomandările colegilor şi colaboratorilor.					
Evit conflictul, ţinând pentru mine dezacordul cu ceilalţi.					

Fig. 1. The questionnaire applied to the teams

Results

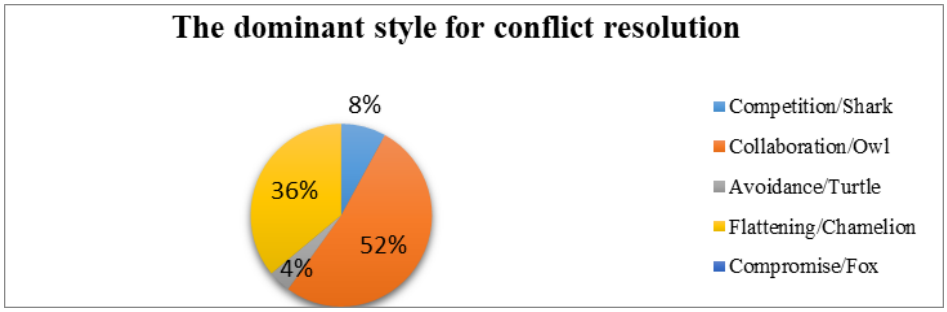
The questionnaires of two sports organizations were distributed online for each athletes from those teams.

In total there were 40 questionnaires, of wich 38 were validated. To find out the personal style of resolving conflicts, there were 5 categories of solutions, each category corresponds to a number of 3 questions:

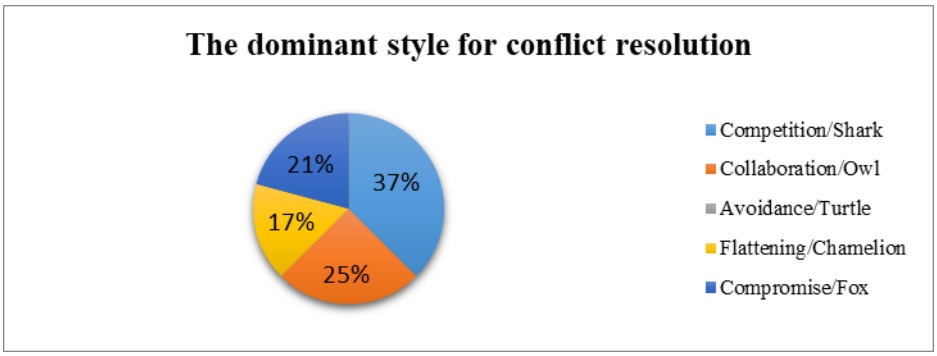
- Category no. 1 “Competition/Shark” contains the following questions:
    1. I discuss the conflict with collegues, with the parties in conflict, with other collaborators, in order to demonstrate the advantages of my position regarding the conflict;
    2. I am firmly in position when I have to defend the aspects of the problem that concern me;
    3. I impose my solutions to the problems that arise.
- Category no. 2 “Collaboration/Owl” contains the following questions:
    1. I seek, togheter with others, to investigate all aspects of the problem in order to find acceptable solutions by all those involved in the conflict.
    2. I share important information with others so that we can solve the problem together.
    3. I seek to debate everyone’s grievances in order to resolve them in the best possible way.
- Category no. 3 “Avoidance/Turtle” contains the following questions:
    1. I try to avoid being excluded from a group, keeping in disagreement with others.
    2. I avoid discussing differences of opinion with others.
    3. I avoid conflict by keeping my disagreement with others.
- Category no. 4 “Flattening/Chamelion” contains the followings questions:
    1. I try to consider the expectations of others.

2. I try yo settle dissensions between colleagues.
3. I accept the recommendations of colleagues and collaborators.

- Category no. 5 “Compromise/Fox” contains the following questions:
  1. Through negotiation I try to reach compromises.
  2. I compromise to reach an agreement.
  3. I take a conciliatory position in an effort to unblock conflicts.

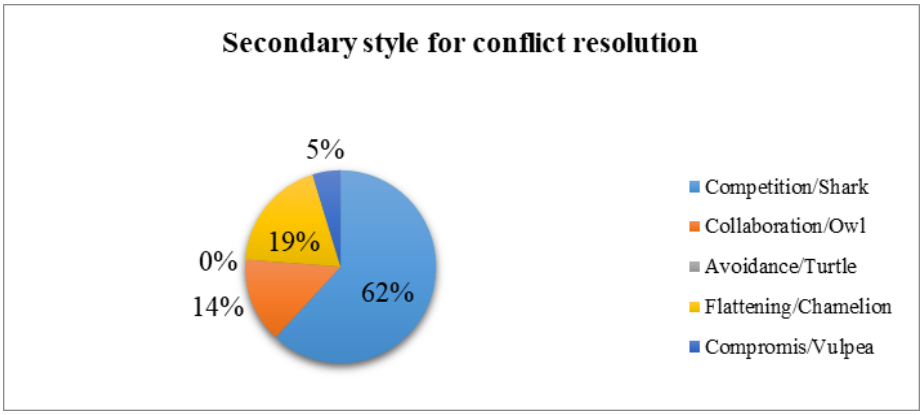


Graph. no. 1. The dominant style for CSS Viitorul Cluj

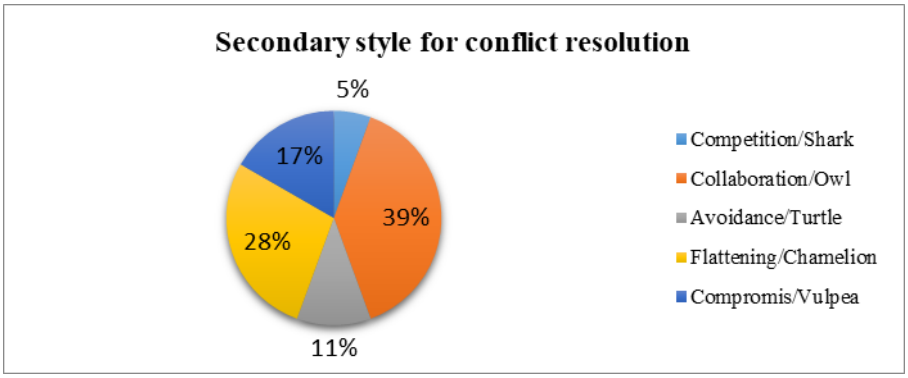


Graph. no. 2. The dominant style for CSS Zalau

According to the graphs no. 1 and no. 2, we can see that a conflict resolution style within CSS Viitorul Clus is predominantly collaborative, with a percentage of 52%, thus demonstrating that athletes try to solve the problem through negotiation, reaching a win-win agreement for both parts. The other team approaches a predominant style of conflict resolution with a competition-oriented percentage of 37%, athletes being more authoritarian and uncooperative, trying to impose their point of view in front of others by pursuing their own interest and needs, less towards interests and needs about colleagues.



Graph. no. 3. Secondary style for CSS Viitorul Cluj



Graph. no. 4. Secondary style for CSS Zalau

The graphs no. 3 and no.4 show that the secondary style approached by CSS VIITORUL Cluj for conflict resolution is with a percentaje of 62% focused on competition, athletes impose their point of view, wich leads to minimizing cooperation with their colleagues. For CSS Zalau, the secondary style is oriented towards collaboration, the athletes being more united, maximizing the imposition of interest and point of view as well as on the cooperation or satisfaction of the need of other in obtaining an agreement.

Discussions

The role wich everybody has in the organization or organizational factors is the cause of most interpersonal conflicts, these includes the following things like contradictions related to status, overlapping authority when it's not clear who is responsible for a certain thing etc. [8].

Conflicts between athletes occur when they are in competition, especially when some of them behave incorrectly, compete unfairly [9]. Conflicts between coaches and athletes are based on multiple causes, including the failure to resolve older situations, the stimulation and unewual appreciation of athletes etc. [3]

Conclusions

In conclusion we all know that regardless of the organization in wich we operate, conflicts are and will be inevitable. They are part of life because result from differences of opinion,

opposition or frustrations, but once accepted we can turn the conflict into opportunity to know ourselves but also those around us.

From the obtained results we can deduce that there are conflicts in both organizations.

After the answers of participants, we can see that the athletes from both organizations have desire to assert themselves in front of the group but also to maintain interpersonal relationships.

The most effective and least harmful style of conflict management is collaboration, a style existing in both school sports clubs, wich unlike the other, involves changing attitudes towards conflict and focusing on both the goal that created the conflict and the relationship with the other side, thus from the opponent becoming a partner.

In order to resolve conflicts, the coach must identify the real problem from wich the conflict broke out. They have ensured that both parts have accepted the problem and find solutions that satisfy both parts and lead to the final resolution of the conflict.

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Evaluating the Level of Perceived Stress on Physical Education and Sports Teachers from Timiș County, Romania, at the Beginning of the School Year, in the Context of COVID-19 Pandemic

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Abstract

Introduction

The novel coronavirus (SARS-CoV-2), part of the coronavirus family that causes illnesses from common cold to more serious diseases such as severe acute respiratory syndrome (SARS), has caused many health problems and forced the WHO to declare a worldwide pandemic. In attempt to prevent the spreading of SARS-CoV-2, institutions in every country have adopted safety measurements, which led to major changes in both behavior and routine in our lives. The educational system, amongst other, was the most affected field.

Aim

The objective of this study was to evaluate the level of perceived stress, caused by the new teaching approaches, to Physical Education and Sports teachers from Timiș County, Romania.

Materials and methods

The Perceived Stress Scale (PSS), containing 14 items, was used to measure the level of perceived stress to a group of 174 Physical Education and Sports teachers, both from urban and rural areas (88 females and 86 males, age average 38.92). Besides the PSS items, we selected another set of nine questions meant to give us more information about the subjects in our study.

Results

The results of our study show that the overall level of perceived stress is moderate, and the level of perceived stress in women (38.14±1.132) in higher than the level of perceived stress in men (32.26±1.066) ($p=0.0002$), while no difference was observed between the subjects from urban and rural areas ($p=0.41$).

Conclusions

This study shows that the level of perceived stress, caused by the new teaching approaches, to Physical Education and Sports Teachers from Timiș County, Romania, is moderate, therefore the teachers were able to adapt to new creative ways of teaching.

Keywords: COVID-19, perceived stress, Physical Education and Sports teachers

Introduction

The novel coronavirus (SARS-CoV-2), part of the coronavirus family that causes illnesses from common cold to more serious diseases such severe acute respiratory syndrome (SARS), has caused many health problems and forced the WHO to declare a worldwide pandemic [1].

In attempt to prevent the spreading of SARS-CoV-2, institutions in every country have adopted safety measurements, which led to major changes in both behavior and routine in our lives [2]. Due to the growing number of COVID-19 cases worldwide, in a short period of time, the stress level, anxiety and depression increased among global population [3].

The level of stress and anxiety was increased not only by the unknown medical implication of the disease, but also by uncertainties regarding work place and limited freedom, as a consequence of curfews and lockdowns. The majority of companies laid off their employs or kept them in technical unemployment, and in best cases, some continued their work from home [4]. The educational system, amongst other, was the most affected field and schools had to carry out distance learning, therefore teachers had to adapt their teaching almost overnight [2]. Giving the novel situation, the objective of this study was to evaluate the level of perceived stress, caused by the new teaching approaches, to Physical Education and Sports teachers from Timiș County, Romania.

Material and methods

In the present study was performed on a representative sample (confidence level of 95%, margin of error 5%) formed by 174 Physical Education and Sports teachers (88 females and 86 male, age average 38.92), from Timiș County, both from urban and rural areas. The instrument used to collect the data for this study was a questionnaire containing 25 items. The first seven items consisted in socio-demographic data such as age, gender, urban/rural areas of activity, professional experience, level of physical activity, chronical disease prevalence and the teaching methods (online teaching, hybrid teaching or traditional face-to-face teaching).

The next part of the questionnaire consisted of The Perceived Stress Scale (PSS), developed by the psychologist Cohen S. Consisting of 14 items, PSS is designed to measure the degree of perceived stress level [5]. Each of these items has a 5-points scale ranging from 0-4 (never – 0, almost never – 1, sometimes – 2, fairly often – 3, very often – 4). Based on the score obtained from all 14 items, the results will indicate the perceived stress level as low, moderate or high level of stress [5].

The last four items were designed to obtain information about the level of distress caused by social distancing at school, wearing of the mask and the teacher's confidence in performing online activities.

The questionnaire was created online, via Google Forms and was transmitted on different social media groups toward the Physical Education and Sports teachers. The data were analyzed statistically using GraphPad Prism 6.

Results and Discussions

From the results obtained in this study, we observed that the professional experience varies from 1 year to over 41 years, with an average of 13.18 years. The teaching methods we

encountered were according to the scenarios adopted by the Ministry of Education, namely traditional face-to-face learning (58.04%), hybrid (34.48%) and exclusively online (7.47%).

Among all participants, only 10.34% had chronical diseases, thus being included in the high-risk category of developing severe forms of COVID-19.

The data resulted from the second part of the questionnaire showed the score obtained from the Perceived Stress Scale, and the average of the score regarding personal characteristics are presented in Table 1.

Table 1. Mean score of Perceived Stress Scale for different variables

	Number of subjects	Mean score PSS	Median	Std. Deviation
Total	174	35.23	35.00	10.65
Female	88	38.14	39.00	10.62
Male	86	32.26	32.00	9.88
Areas				
Urban	104	34.68	34.00	11.00
Rural	70	36.04	37.00	10.13
Professional experience				
<10 years	80	37.39	39.50	10.56
>10 years	94	33.39	32.00	10.43
Teaching methods				
Face to face	101	34.98	35.00	10.82
Hybrid	60	34.68	33.00	10.60
Online	13	39.69	35.00	9.114

According to the data presented above (Table 1), the average score for PSS of the representative sample is 35.23. Therefore, the perceived stress, caused by the changes and new approaches in the educational process due to new measures adopted during COVID-19 pandemic, is at a moderate level.

However, comparing the results given by male and female participants, the data shows that even though the overall level of perceived stress is at a moderate degree, the female participants experience a higher perceived stress level than male participants (Figure 1, p=0.0002). There was no other statistically significant difference found when comparing different data. For example, no differences were observed between neither teacher from schools in urban or rural areas, or differences between teachers with different professional experiences, nor even the teaching method.

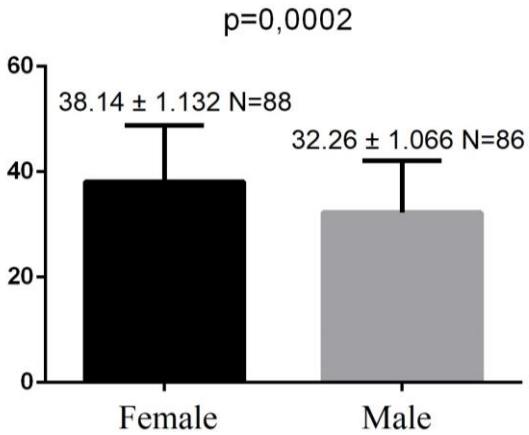

Fig. 1. Difference of PSS mean score between male and female participants

Correlating the perceived stress level by the subjects with their age, professional experience, social environment of their school (urban/rural) or the teaching methods used (face-to-face, hybrid, online), and based on these results, that showed insignificantly values for each correlation, the main conclusion is that there were no other variables conditioning the moderate perceived stress level.

The results obtained from the last four items of the questionnaire however, showed a positive reasonable correlation ($r=0.47$, $p<0.0001$) between the perceived stress level and wearing of the mask (Figure 2). Likewise, another positive reasonable correlation ($r=0.4$, $p<0.0001$) was observed also between the perceived stress level and the social distancing measures (Figure 3).

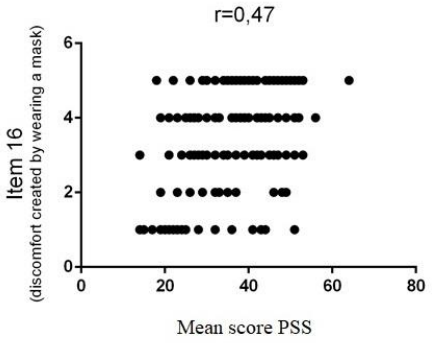

Figure 2. Correlation between item 16 and mean score PSS

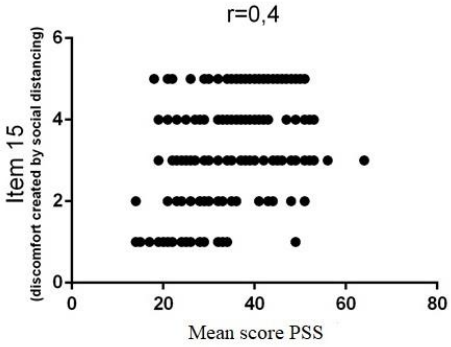

Figure 3. Correlation between item 15 and mean score PSS

On the other hand, two negative weak correlations were observed. First, an increased level of perceived stress is observed once the teacher's confidence in their ability of managing the lectures and students' interactions during online activities, decreases ($r=-0.32$, $p<0.0001$).

Secondly, a negative correlation is observed in the situations when the teacher shows a low confidence in their ability of using online resources ($r=-0.2437$, $p=0.0012$).

Therefore, given the data obtained by the last part of the questionnaire (i.e., the last four items), the most important factors causing distress were social distancing and wearing a mask, unlike the necessity of online/distance learning.

Many studies have investigated the effects of COVID-19 on stress levels among not only teachers, but also students and general population. For example, Altuntaş et al. conducted a study in April-May 2020, in Turkey, and the aim was to investigate the level of stress caused by COVID-19. Among 882 people who participated in their study, 512 (58%) were female and 370 (42%) were male). The participants were contacted via social media and were selected by four inclusion criteria: aged between 14-65 years, literate, able to understand the administration criteria and were contacted via internet. The results showed a total score of the perceived stress of 28.35±8.23 for the 882 participants. Therefore, 60.3% of the participants had moderate level of stress, and the most preferred coping strategy was the seeking of social support [6].

Another study performed by Besser et al. investigated the change in levels of perceived psychological stress and vocal symptoms among college Israeli professors. A total of 313 professors (156 men and 157 women) completed the online questionnaire, at the end of the first week of online synchronous teaching, which was considered the most stressful period of the transition. The results showed that the level of psychological stress was higher during the period of transition to online synchronous teaching and for the individuals who reported high levels of

stress during previous periods of teaching, there was a positive association between psychological stress and vocal symptoms [7].

The level of stress among students and lectures from University of Zürich was investigated during COVID-19 pandemic. From 282 lecturers about 51% were male and 47% were female, with an average age of 43.62 years and an average professional experience of 11.89 years. The results indicated that the well-being of lecturers and satisfaction with life before the novel coronavirus outbreak was higher than during the pandemic. Moreover, their satisfaction with their work at the university, before the outbreak, was significantly higher than during the pandemic. The results from the Perceived Stress Questionnaire (PSQ) from all subscales tested ("worries", "tension", and "demands") showed higher values that indicated a higher perceived stress level [8].

Another study on investigation of stress, anxiety and depression in times of COVID-19 was conducted in India, from April 3rd until April 6th 2020 (the second week of national lockdown) and a total of 403 participants (51 teachers, 31 researchers, 139 students, 34 mental health professionals, 33 doctors and nurses, 35 corporates, 80 listed as other categories) were surveyed.

The participants completed a series of online questionnaires (Family Affluence Scale, Response Accuracy Scale, Depression Anxiety Stress Scale), and the results showed that the most affected were the people who were struggling to sustain the lockdown. Therefore, the socio-economic status was negatively correlated with the level of stress, anxiety and depression. Students and healthcare professionals were found to experience stress, depression and anxiety more than other categories. On the other hand, the stress, anxiety and depression levels on mental health professionals were in normal range, demonstrating their capabilities of managing stressful situations [9].

The Perceived Stress Scale (Cohen *et al*., 1983) was also used in the study of Košir *et al*., who investigated the perceived level of stress among teachers and school counsellors in elementary and upper-secondary schools, in Slovenia. From a total of 964 participants, 874 (90.7%) were teachers and 90 (9.3%) were school counsellors. The majority of the participants (74.7%) worked in elementary schools, 25.3% worked in upper-secondary schools and 46.2% of the participants declared that they have at least one child in preschool or elementary school. The PSS was adapted to measure the perceived stress degree of the participants in the first two weeks of online teaching. The results showed that the teachers who had ICT skills had more positive attitude towards online teaching and lower perceived stress level. On the contrary, the teachers that reported having at least one child in preschool or elementary school, experienced higher levels of stress [10].

Conclusions

The present study, investigating the perceived stress level of Physical Education and Sport teachers from Timiș County, showed that all the participants experienced a moderate perceived stress level and different factors such age, professional experience, school areas (urban/rural) and teaching methods (face-to-face, hybrid, online) had no implication on the level of stress.

Although the overall PSS score is moderate, the results showed that the male participants were less stressed compared to female participants. The main factors influencing the perceived stress level were social distancing and wearing the mask, and on a smaller degree, the teacher's lack of confidence in their ability of managing online courses.

The amount of studies investigating the level of stress experienced by teachers, due to distance learning, during COVID-19 pandemic demonstrate the need of further preparation of teachers and development of training programs necessary for building the ICT skills of the teachers. Therefore, in case of another COVID-19 outbreak or even another disease outbreak, that will imply school closure and online teaching, the school professionals would have enhanced their ICT competencies.

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Study on the Practice of Combined Muscular Fitness Forms

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Abstract

In the past few years, research in the medical field has shown that less than ideal health is closely related to the lack of exercising. A growing number of people have realised that they can prevent the emergence of numerous conditions induced or favoured by inactivity, by being more active (not for a month or a year, but for the rest of their lives). Currently, the term "fitness" is considered a concept with a much more important significance, which represents a favouring element for increasing the quality of life; for this reason, translated into a physical condition, it no longer expresses its full contents. Aerobic gymnastics – along with running**,** swimming, cycling – represents a form of activity able to improve or maintain both the physical and the mental shape of the individual. The purpose of this paper is to design and apply a system of new actuating means, specific to muscular fitness, conducted with various weights, dumbbells, devices, and accessories, in order to develop a healthy, strong, aesthetic, and harmonious body, with a growing and better-defined lean mass. The study was carried out on a sample of 20 females, aged 30 to 40, to whom we applied the Ruffier test in order to assess exercise capacity.

Body mass index (BMI) was also calculated, in order to learn information on the ideal bodyweight in relation to the height and age of the subjects. The data collected through the analysis have shown that the modifications are statistically insignificant for BMI ($p=0.86$), while adaptation to specific effort reflected in a significantly better Ruffier index (9.38 ± 2.59; $p<0.0001$). The results of the study indicate a positive influence of muscular fitness for the cardiovascular system; the BMI did not suffer significant alterations among females aged 30-40 years old.

Keywords: muscular fitness, aerobic gymnastics, physical shape, quality of life

Introduction

The term "fitness" was coined by the Anglo-Saxon literature; it has also been used in Romania, where it disseminated rapidly, among both specialists and the young people, mostly in schools and faculties.

According to the dictionary (Merriam-Webster), "fitness" means the quality or state of being fit. Currently, the term "fitness" is considered a concept with a much more important significance, which represents an element favouring an increase in the quality of life and for this reason – translated into physical condition – it no longer expresses its full contents [1].

The concept of "fitness" refers an individual's physical condition allowing the unfolding of life (professional activity and leisure spending) and additional load, without the sensation of fatigue [2].

Fitness refers to shape and to contents; it means force, resistance, speed, mobility, slenderness, as well as physical health or lifestyle. Those maintained are improved, preserved, or developed with a multitude of means and exercises, not only in gyms or fitness clubs [3].

Fitness is influenced by age, gender, constitution, and lifestyle of an individual. All men and women begin their life with a certain morphological and functional potential, which determine the limits for health and fitness. The body shape, the obesity trend, the bone structure, the size and state of the heart, of the lungs, and of the visceral organs, the total number of muscles and cells in the body are set at birth. The physicians and physiologists have reached the conclusion that the human body should be subjected to muscle activity, without neglecting the possibilities of each individual, because an exaggeration may harm health [4].

The modern definition of health used by the World Health Organization (WHO) emphasizes on the fact that this is not just a state of absence of disease or disability, but it is full, physical, mental, and social wellbeing. Upon analysing this definition, a great deal of attention should be paid to the major role of disease prevention (e.g., healthy lifestyle, proper nutrition, systematic physical activity), as well as the proper rest duration. Fitness classes meet this definition and are not just physical activity alone, but they are alled lifestyle, which mastered the whole world.

There is a steadily increasing interest in both men and women in organised physical activity [5].

Diseases threatening human health are among the issues that have occupied the minds of researchers. A group of these diseases the are cardiovascular ones, claiming the lives of about 12,000,000 people annually, according to existing reports. One of the main risk factors of cardiovascular diseases is obesity (a medical condition in which body fats are unusually increased) [6].

Furthermore, studies have shown that obesity causes frailty in older adults; nonetheless, weight loss might accelerate age-related loss of muscle and bone mass and resultant sarcopenia and osteopenia [7].

Fitness classes include all kinds of exercises (performed at the gym or in the room for example Abdominals, Buttocks&Thighs (ABT), Total Body Sculpt (TBC), Stretching, Pilates, Step, etc), which are dominated by aerobic performance, designed to improve capacity and physical fitness, to reduce or maintain normal bodyweight and improve body shape. The impact of lowered physical activity on the incidence of obesity, diabetes, heart failure, many types of cancers, and the spine problems was shown. The aerobic exercise lowers total cholesterol, triacylglycerols and increases HDL – cholesterol concentration in serum. Studies also show that the reduced level of recommended physical activity is associated with the occurrence of depression [5].

Currently, combined muscular fitness trainings are considered the most effective methods for improving the general exercise capacity among adults. Involvement in such regular physical activities has already prove efficient in the attainment of significant benefits.

Scientific literature indicates that fitness combined with people's health state may represent the body's capacity of coping with daily challenges [8].

There is a consensus that regular physical activity (PA) can improve physical fitness (PF) and health and can assist in the prevention of diseases. Several studies have shown that physically

active adults are healthier and have a higher PF than inactive adults across different nations and populational groups. Physical activity is thus promoted as part of a healthy lifestyle [9].

Physical training – regardless of the presence of concurrent weight loss – provides a wide array of health benefits for individuals who are overweight and obese and have or are at risk for cardiovascular disease. A combination of aerobic exercise and resistance exercise, in addition to diet modifications, may improve cardiovascular and muscular endurance in individuals with class II and III obesity. However, conclusions must be interpreted with caution because of the heterogeneity in interventions and outcome measures among the studies and an unclear risk of bias in several studies [10].

Cardiorespiratory fitness and motor skills are significant indicators for women's physical health and development. Cardiorespiratory fitness is defined as the ability of the circulatory and respiratory systems to supply oxygen during sustained physical activity.

Low cardiorespiratory fitness levels have shown to be linked to cardiovascular disease risk factors, increased body fatness, and hypertension among women [11].

The combination of aerobic and resistance exercise could have an additional effect and further decrease the risk of cardiovascular disease (CVD) risk factors. Nevertheless, there is a vast array of populations and comorbidities included in studies on combination training, various exercise prescriptions and timing. Furthermore, many of the combined exercise training studies do not include an aerobic- or resistance-only group or are not well-controlled randomised trials [12].

Muscle fitness programs can also be used in case of pathologies, for example in the need to recover muscle strength in traumatic cases. Specialists in the field aimed at exercises that, in the first phase, aimed at readjusting the heart to effort and toning the muscles of the lower limbs and trunk. The duration of the gymnastics sessions was 60 minutes and they were performed with a frequency of 3 sessions/week [13].

Numerous studies have proven that the branch of fitness has always been a field accessed by all categories of persons and that physical training represents a safe and effective intervention for increasing tolerance to physical activity and for improving the quality of life [14].

Fitness-related methods and exercises are simple and they adjust automatically to the muscular characteristics and to the flexibility of the muscles specific to each person.

Specialists believe that exercising is not stressful; on the contrary, it is a stress-relieving factor, because it induces calmness and it is non-competitive [15].

Considering the arguments in favour of practicing combined muscular fitness trainings in order to improve motor capacity as a form of expressing an improvement in the quality of life, we have proposed to study the efficiency of a modern training design, involving new actuation means, specific to muscular fitness.

The purpose of this study was to get a better insight into the concern for muscular fitness combined trainings and to design and apply a system of new actuation means, specific to this method, involving various weights, dumbbells, devices, and accessories – all meant to obtain a healthy, strong, aesthetic, and well-balanced body, with better-defined muscles.

The paper proposes to assess the following hypothesis: we assume that the use of muscular fitness combined training routine will lead to an improvement of motor capacity as a form of expressing an improvement in the quality of life.

Starting from the aforementioned data, this study aims at determining whether there are differences in the values of the BMI and of the Ruffier Test between the tests applied in the initial evaluation and those applied in the final evaluation.

Material and methods

This research included 20 female subjects aged between 30-40 years old, who participated in personalised muscular fitness routines. The research was conducted in the period December 2019-February 2020, in a fitness centre in Iaşi; it lasted for 10 weeks. The testing involved the assessment of normal ideal bodyweight (BMI) and the application of the Ruffier Test. The latter represents a reactivity test; the effort is minor and the purpose is to determine the ventricular allure after an effort consisting in 30 squats in 45 seconds; the metronome was placed at 90 beats/minute [16]. The data processing was done with the help of Graph Pad Prism 6 software.

The software generated, following the analysis of the data series, descriptive statistics (minimum, maximum, average, standard deviation, coefficient of variation) and the results of the Student's T-test, whose significance threshold was set to 0.05.

The means used in the experiment were as follows:

Cardio exercises: plyometric exercises; skip&toe rise; jogging (in place and moving); hops; jumping-jacks; slides; stretching exercises (ballistic and hold); passive lift and hold; prolonged stretch; active personalized nutrition&fitness (active PNF); passive personalized nutrition&fitness (passive PNF), relaxion method).

- **Muscle toning exercises:** free; with weights: light dumbbells, balls of various weights, elastic bands, weight cuffs and vests, etc; self-resistance exercises with/using various equipment: benches or steppers, barbells, gym ladder; special devices for abdominal muscles, arm muscles, chest muscles, etc; with a partner.
- **Breathing and relaxing exercises:** abdominal breathing; diaphragmatic breathing; coastal-inferior (clavicular) breathing; correct (complete) breathing; psychomotor relaxation; static relaxation; dynamic relaxation (Taiji-Chuan technique) [2].

Regarding the period in which the experiment took place, the subjects performed a program with a number of 3-4 hours/week, lasting 50', performed with different weights (attached to the lower or upper limbs).

Results

The processing of the collected data materialized in obtaining the results from the tables and figures below. These features comparatively the results obtained at the tests by the female subjects within our experiment. The tables illustrate the differences in the values recorded between the initial and the final testing. It may be noticed that the value ***p*** recorded indicates that the modifications are statistically insignificant for BMI (p=0.86), while adaptation to specific effort reflected in a significantly better Ruffier index (9.38±2,59; p<0.0001). Normal BMI or BMI values are 19-25 for women and 20.5-25 kg/m for men.

Table 1. Descriptive statistics of data series

	Ruffier_I	Ruffier_F	BMI_I	BMI_F
Number of values	20	20	20	20
Minimum	7.10	5.50	13.84	14.87
Maximum	14.60	13.80	33.80	32.88
Mean	10.88	9.380	24,01	23.99
Std. Deviation	2.61	2.59	5.69	5.42
Coefficient of variation	24,05%	27.69%	23.70%	22.63%

The first Table shows the improvement of the Ruffier Test, namely a decrease from 10.88±2.61 to 9.38±2.59; this modification was accompanied by an increase in the variability coefficient (27.69%). This stands to show a positive influence of the workout routine created for and applied to the subjects.

In what concerns the BMI, it is worth noting that the data collected through the analysis show statistically insignificant differences (from 24.01±5.69 to 23.99±5.42).

Table 2. Pearson's correlations (the values of r)

	Ruffier_I	Ruffier_F	BMI_I	BMI_F
Ruffier_I		0.92	-0.37	-0.35
Ruffier_F	0.92		-0.41	-0.37
BMI_I (kg/m2)	-0.37	-0.41		0.99
BMI_F (kg/m2)	-0.35	-0.37	0.99	

Figures 1 and 2 represent graphically the modifications noticed. Upon using the t test for analysing data series, we have concluded the existence of significant differences between the initial and the final testing.

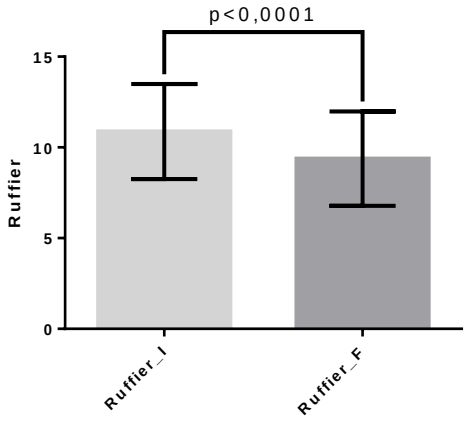

Fig. 1. Results for the Ruffier Test

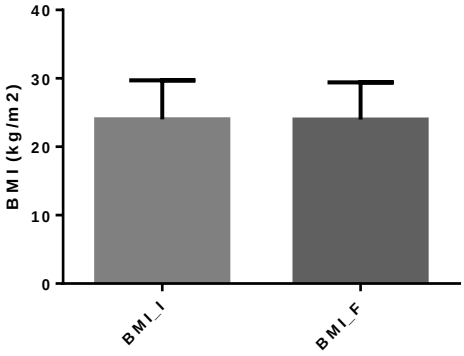

Fig. 2. BMI results

Discussions

Societal needs and the desire of improving the quality of life and of promoting a healthy lifestyle make the fitness field a pivot around which everything turns. Adults may all benefit from practicing such trainings, depending on their personal characteristics. It is recommended to use these workout routines at least three times a week.

The answer to the question "Can we improve the quality of life through muscular fitness routines?" is definitely yes. While the results for the Ruffier Test were associated positively with an improvement of health state, the BMI results have shown only slight benefits. As highlighted above, the statistical analyses of the study demonstrate positive effects of the methods used and they indicate a positive influence of muscular fitness for the cardiovascular system, BMI not recording any significant alterations among women aged 30 to 40 years old.

There are statistically significant differences between the values of the Ruffier Test between the initial and the final tests ($p<0.0001$). The modifications are statistically insignificant for BMI

(p=0.86). These findings agree with numerous other studies, which report that the health state parameters can thus improve considerably.

Compared to the data from the specialized literature, we consider that the specialized muscular fitness trainings bring an added value in the life of the people who practice them.

Conclusions

Upon the research conducted and the analysis of the recorded data, we may draw several conclusions, as follows:

The study confirms that the actuation means that we have chosen are efficient and that they had a positive influence on the cardiovascular system, which confirms the hypothesis launched.

The actuation means involving various weights, dumbbells, devices, and accessories have developed a healthy, strong, aesthetic, and well-balanced body, with better defined muscles.

Our findings suggest that the method we have used represents an efficient alternative for adult subjects and that it can represent a useful tool in diagnosing the health state for this category of persons.

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Applying the Cooper Test to Runners Who Use Different Methods of Training

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Abstract

The physical condition represents an essential factor for the runner to be able to fulfill the competitional objects for both podiums ranking and the improvement of personal time lenght.

The aim of the study consisted of the comparative analysis of 2 training programs for runners, in order to establish the benefits of cardio- vascular performance and the level of individual fitness. The study group was split in 2 subgroups: G1-Low intensity training (AIm) (5 subjects to whom low-intensity running training has been applied) and G2-High intensity training (AIM) (5 subjects to whom high-intensity running training has been applied). The subjects have been trained for two months period. During this research the subjects had 3 workouts per week. The cardiorespiratory performance was assessed through the analysis of the evolution of the maximum heart rate obtained at the Cooper test and the training level by estimating the max calculated Vo2 at 3 testing phases: the initial testing (week 1), the intermediate testing 1 (week 5) and final testing (week 9).The cardio-respiratory performance was assessed in the group and resulted the following: G1-AIm presented an improvement at the final testing from the first one as follows: (180 bpm ±2) vs (182 bpm ±2), (p=ns); Vo2max indicator (40.33±1.85 ml/kg/min) vs (42.62±1.42 ml/kg/min), ($p<0.05$). The distance was also improved (2309m±130) vs (2445m ±220), ($p<0,05$). When comparing the groups, it is shown that AIM had more important benefits than Alm on every chapter (179 bpm ±2) vs (186±2), ($p<0.05$), Vo2max indicator (48.77±2.14 ml/kg/min) vs (50.94±2.03 ml/kg/min), ($p<0.001$) and the distance (2547±120) vs (2785±179), ($p<0,001$). The AIM methods bring significant benefits in terms of running speed, distance and performance of the cardio-respiratory system and the Vo2 max indicator compared to AIm.

Continuing the study over a longer period, with a larger number of subjects is essential, in order to quantify as accurately as possible, the increase in the level of performance.

Key word: high-intensity workout, low-intensity workout, Vo2 max, FC, Cooper test

Introduction

For a runner, the phisical condition represents an essential factor to meet the competitional objectives for ranking on the podium, as well as for improving their own time. To be capable of these assets, the fundamental principles to concieve a training plan must be known. The understading of the physiological indices represents as well, a necessary condition.

Nowadays, breaking the world records at 5 km, 10 km, half-marathon and marathon events became a normality, these kinds of events taking place from one competition to another. In 2019, Eliud Kipchoge has won the title of "the best running athlete of all times". This was the first time in history when the title of the best athlete of the world was won by a marathon runner, after being the first person able to run a marathon in less than 2 hours, this record being an unofficial one [1]. By analysing the evolution of world records of marathon competitions that took place during the last century it can be observed a significant improvement of the results. In the present days, the athletes are capable of finishing a marathon competition with 40 minutes less than years ago. This evolution of performance is due to the understanding of phisiological mechanisms which interfere during efort time at an intracelular level. On the other hand, it is based on the development of methods and specific training programs, starting from the experimental data regarding the rising the potential and performance in sports established by the recent studies [2].

Among the phisiological paramethers used for the individual charaterization of the aerobe effort capacity of an athlete, it has been proven that the maximum oxygene consumption (Vo2 max) is the best indicator for describing the cardiorespiratory fitness level at a specific moment.

Improving this parameter is one of the most important items which leads to succes in endurance activities [3]. The experimental studies, involving the eficiency of different types of training concerning in raising athlete's performance through raising Vo2max, point out especially the improvements gained when a high intensity training is applied in comparison with the usage of endurance trainings and the lower intensity ones [4]. To assess the performance, the Cooper test is prefered by the research teams among the world because it is thrustworthy at results [5], even though there are not so many important proofs regarding direct compares of efficient training methods using Cooper test [6]. Thus, the aim of the study consists of comparing this training methods, the high intensity ones with low intensity ones leading to evolution of functional parameters, through analizing the Cooper test results in a 2 months training.

Material and method

The study group is composed of 10 individuals from both genders (5 males and 5 females) who performed a training program on the running track from Technical University of Timisoara and also the Green Forest area from the same city in the first three months of this year. The study group was chosen based on special criteria, as followes: individuals with a sport background, with good health and havving the availability to perform 3 training/week.

The injured individuals who required a time to recover were excluded from the experiment.

The study group rrandomly devided in 2 groups by choosing numbers. Those who choose even numbers got the the high intensity training programs and the others got the lower intensity training programs.

To testing procedure of the subjects was held on a running track of 400m which fulfills the criteria of RAF (Romanian Athlete Federation) on a 12 minutes time period at 3 different moments. A Garmin Forerunner 945 device was used in order to establish the maximum distance covered within the 12 minutes of the test. The total distance, in kilometers, was used to determine Vo2max [7]. Vo2max was calculated using the following equation:

Vo2 max = (22.351 x D)-11.288; (1) [6]

- D – represents the distance which was covered by every subject.

The study was carried out with the respect of the etical principle of research. The subjects were informed regarding the way the study will take place and every one of them gave the consent in GDPR matter.

The data was obtained with special Garmin devices for fitness and sport (Garmin Forerunner 945 watch) [8] and also its apps (https://connect.garmin.com/) [9]. The heart rate was determined using a special belt (Garmin HRM-Tri) [10]. It is prefered using this belt in order to eliminate the errors which can occur because of the lack of contact and excesive sweat. Tha Garmin Connect Apps (https://connect.garmin.com/) [9] offered the main database for the parameters. The main parameters which were followed: pace (min/km), average speed (km/h), distance (m), average heart rate (bpm), maximum heart rate (bpm), cadence (steps/min).

The time frame of the proposed training in each program is sistemic with a progresive character. Thus, the methods used in training were:

- interval method – repeted series of accelerate running on short distance (100m-800m) with short breaks (1-5 minutes)
- Tempo method – accelerate running at a specific heart rate (75%-85%) on a distance between 3-6 km
- slow running at a specific heart rate (70%) on distance between 3-6 km
- runnings on long distance with specific heart rate (70%) on distance between 7-12 km.

In Fig. 1 are depicted the training program protocols used in the present study.

	Luni	Marți	Miercuri	Joi	Vineri	Sâmbătă	Duminică	Total
Săptămâna 1 (13-19 Ian)	Cooper Test	Rest	4 km	Rest	Rest	7 km	Rest	11 km
Săptămâna 2 (20-26 Ian)	3 km	Rest	5 km	Rest	Rest	8 km	Rest	16 km
Săptămâna 3 (27-2 Feb)	5 km	Rest	5 km	Rest	Rest	9 km	Rest	19 km
Săptămâna 4 (3-9 Feb)	3 km	Rest	4 km	Rest	Rest	7 km	Rest	14 km
Săptămâna 5 (10-16 Feb)	5 km	Rest	Cooper Test	Rest	Rest	10 km	Rest	15 km
Săptămâna 6 (17- 23 Feb)	4 km	Rest	6 km	Rest	Rest	9 km	Rest	18 km
Săptămâna 7 (24 - 1 Mar)	4 km	Rest	6 km	Rest	Rest	12 km	Rest	22 km
Săptămâna 8 (2 - 8 Mar)	5 km	Rest	4 km	Rest	Rest	8 km	Rest	17 km
Săptămâna 9 (9 - 15 Mar)	6 km	Rest	Cooper Test	Rest	Rest	11 km	Rest	17 km

Low intensity program (AIm)

	Luni	Marți	Miercuri	Joi	Vineri	Sâmbătă	Duminică	Total
Săptămâna 1 (13-19 Ian)	Rest	Cooper test	Rest	6 x 100	3km	rest	Rest	3.6 km
Săptămâna 2 (20-26 Ian)	Rest	3 km	Rest	4 x 100/4 x 200	4 km	rest	Rest	8.2 km
Săptămâna 3 (27-2 Feb)	Rest	4 km	Rest	8 x 200	4 km	rest	Rest	9.6 km
Săptămâna 4 (3-9 Feb)	Rest	3 km	Rest	2 x 100/2 x 200	3 km	rest	Rest	6.6 km
Săptămâna 5 (10-16 Feb)	Rest	5 km	Rest	3 x 100/3 x 200/3 x 100	Cooper test	rest	Rest	6.2 km
Săptămâna 6 (17- 23 Feb)	Rest	4 km	Rest	2 x 400/ 2 x 200/4 x 100	5 km	rest	Rest	10.6 km
Săptămâna 7 (24 - 1 Mar)	Rest	6 km	Rest	4 x 100/ 4x 200/4 x 400	5 km	rest	Rest	13.8 km
Săptămâna 8 (2 - 8 Mar)	Rest	4m	Rest	6 x 400	3 km	rest	Rest	9.4 km
Săptămâna 9 (9 - 15 Mar)	Rest	5 km	Rest	4 x 800	5km	Cooper test	Rest	13.6 km

High Intensity program (AIM)

Fig. 1. Training programs

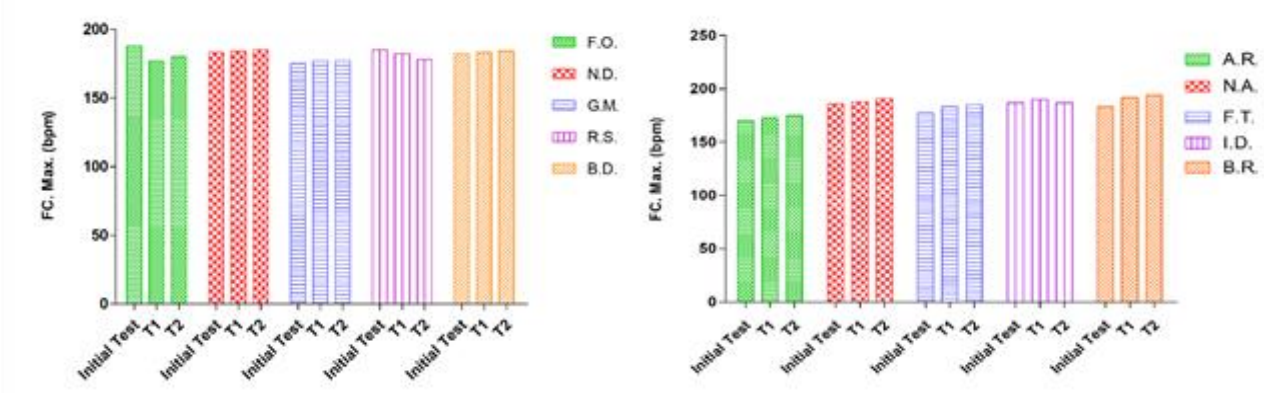
The data analysis was performed using the following softwares: Microsoft Excel and also Graphpad 5.0 The results were precentually expressed as average ± S.E.M. (Standard Error of Measurement). The quality analisys is realised using the statistical tests t-Student, One Way ANOVA and post hoc Bonferoni test. The obtained results are considered significant for values of $p<0,05$.

Results

The data analysis reveals a constant evolution of the maximal heart rate (Hrmax) for the athletes subjected to the low intensity training programme (TLI), without obtaining a significant improvement at the end of the training period, compared to the initial testing; (HR max: 180±2 bpm vs. HR max: 182±2 bpm, p=ns).

The subjects from the high intensity programme (HIP) group presented an increased HRmax during the training period (Fig. 2). At the end of the training period each of the subjects has

succeeded to significantly improve their Hrmax during the trials/testing; (Hr max: 179 bpm±3) vs Hr max: 186±2, p<0.05). This demonstrates that the subjects from the HIP group succeed in maintaining a physical effort of superior intensity throughout a longer period of time. Fig. 2 depicts the results regarding the athletes' HR max within the group.

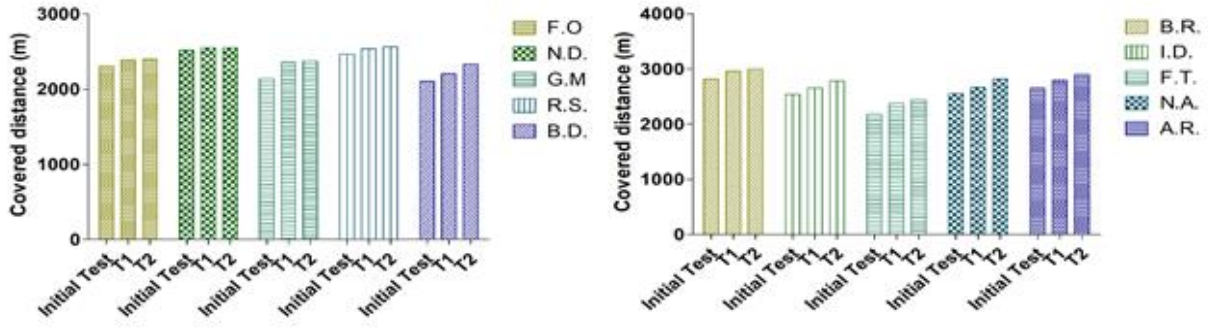


Low Intensity Training Programme High Intensity Training Programme

Fig. 2. Maximum heart rate

Regarding the covered distance during the 12 minutes of the Cooper Test, both training programmes have shown significant benefits: AIm TI 2309±130 m vs T2 2445±220 m; p<0.05 and AIM: TI 2547±120 m vs. T2: 2785±179 m, p<0,05. Each subject has improved his or her performance by covering a longer distance from one test till the next (Fig. 3).

The runners of Aim group have not registered performance increasements for the time frame T1-T2, 80% of them have kept their performance or had a non-significant improvement of their performance. The AIM programme had constant results throughout the entire intervention period. The subjects of AIM presented highly significant increase of the covered distace at T2 test in comparison to intial one (p<0,001). Also, they showed very significante performance augmeantation between the T1 and T2 test (p<0,01). Between initial test and T1 the subjectes presented an increase regarding the covered distance, even though the statistical significance was not achived (p=ns).



High Intensity Training Programme Low Intensity Training Programme

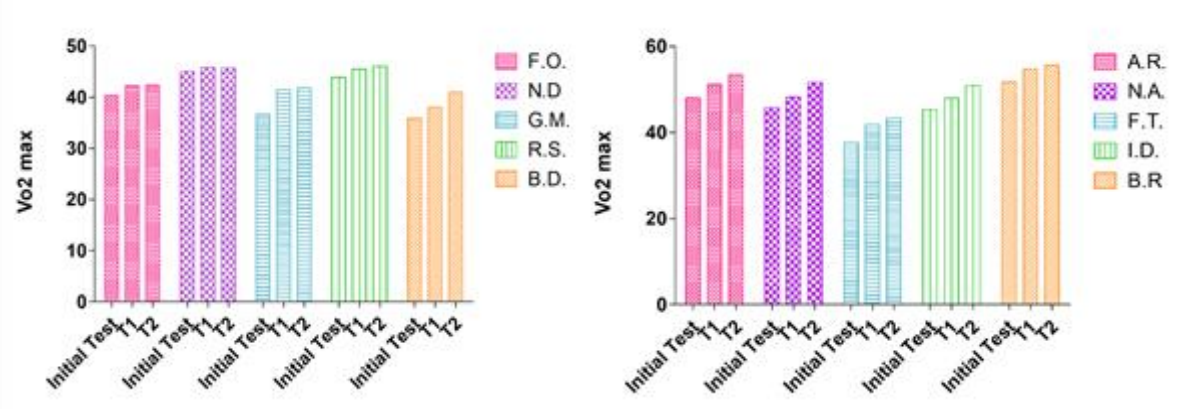
Fig. 3. Covered distance

The data analysis regarding the Vo2 max. index indicates that the subjects of the AIm group had a superior evolution presenting a higher cardio-vascular performance measured at T1

compared to initial test (T1: 42.62±1.42 ml/kg/min vs Initial test: 40.33±1.85 ml/kg/min, $p<0.05$).

These results have not been obtained in the second part of the programme from T1 to T2(T1: 42.62±1.42 ml/kg/min vs T2: 43.37±1.05 ml/kg/min, p=ns).

The subjects from AIM programme have shown a significant improvement regarding the fitness index throughout the training programme (initail test: 45.66±2.32 vs T1: 48.77±2.14 ml/kg/min and T2: 50.94±2.03 ml/kg/min, respectively, $p<0.001$). The performance augmentation was higher within the first period of the training program but it was maintained also between T1-T2 moments but with a reduced increment of the Vo2 max, ($p<0.01$).



High Intensity Training programme Vo2 max Low Intensity Training programme Vo2 max

Fig. 4. Vo2 max

Discussions

Compared to the literature our results confirm the data presented by other research groups.

Thus, regarding the improvement of the cardio-respiratory system performance, by reaching a value close to the maximum value of the heart rate during the Cooper Test, our results revealed that for the AIm group only 2 subjects have succeeded in obtaining an improvement with statistical significance regarding their HR pointed out by the modification of the maximum HR value in comparison to the subjects of the AIM group where all investigated subjects have revealed a constant improvement throughout the entire study/trial period. Similar results have been presented by Wisloff et al. in a meta-analysis regarding the improvement reached in high intensity trainings in the cardio-respiratory system. Thus, he concluded, that this type of training has real benefits for the athletes regarding their improvement of the cardio-respiratory performance [11]. Enoksen (2011) also compared the effects of low intensity trainings to those of high intensity trainings applied for professional runners/athletes. The results revealed that, in case of a training period of 10 weeks, similar to our programme, an improvement of the Vo2 max index has been obtained together with a resilience to lactate for the athletes who had been following the high intensity programme compared to those with a low intensity programme [12].

Regarding the Vo2 max index an interesting evolution of this parameter has been noticed for the AIm group. Although the subjectes have presented an improvement in the oxygen consumption, but only during the first part of the programme between the initial testing and T1, followed then by a maintaining of these valued during T2. On the contrary, the AIM group has registered a constant and significant increasement during the trial. Although they didn't reveal a similar evolution of this parameter, the subjects of both groups have shown an improvement of

the fitness index (Vo2max). This demonstrates that a constantly sustained training programme is superior in the performance outcome compared to a training without a clear/specified schedule.

Our results, as well as those of Jan Helgerud (2007), reveal that a higher eficiency in an increased performance can be obtained in the case of groups subjected to a more intense training programme [13]. The most important result is represented by the covered distance during those 12 minutes of the Cooper Test. 100% of the subjects have managed to increase their performance during the 2 testing periods. The comparative analysis of those 2 groups has revealed that the AIM group had a more significant increase of performance compared to the AIm group, the latter revealing average improvements throughout the programme (146 m) versus AIM (238 m).

The data analysis showed that for the AIm group the best obtained result lies within the inferior position of the ranking in the AIM group at the same time of trial/testing. Similar results have also been obtained by other scientists who demonstrated that implementing high intensity training programmes for runners/athletes for 3000 m can lead to a time improvement of (up to) 7% after the intervention [14].

Conclusions

Considering the presented data, the AIM methods reveal significant benefits for the movement velocity and the performance regarding the cardio-respiratory system and Vo2 max index, in comparison to AIm.

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The Gender Differences Regarding the Psychomotor Development of School Students Aged 6-8 Years

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Abstract

Aim

The aim of the research was to identify if there are gender differences regarding the psychomotor development for students aged 6-8 years (M=7.03, SD=0.721). The sample studied included 120 students (66 girls and 54 boys).

Material and methods

The level of psychomotor development was measured using the Ozeretsky-Guillmann Test. IBM SPSS 23.0 was used for data analysis.

Results

The results indicate the existence of a significant difference between girls and boys, in terms of the level of psychomotor development (z=-1.743, p=.04), girls registering higher values.

However, the size of the observed effect is small (r^2=.016).

Conclusion

The mentioned results highlight a significant, although small, difference between girls and boys aged 6 to 8 years, regarding the level of psychomotor development, with girls scoring higher. The findings represent a starting point in establishing the psychomotor profile of the students.

Keywords: psychomotor development, Ozeretsky-Guillmann Test, primary school, students, girls, boys, gender differences

Introduction

Psychomotor development aims at changing the child's cognitive, emotional, motor and social abilities, starting in the fetal and neonatal period and continuing throughout childhood and adolescence [1]. At the same time, psychomotor development also refers to the interrelationship between internal and external factors, as well as the maturation process of the central nervous system [2]. The concept of psychomotricity consists of the term "psycho", which refers to the psychological activity at the cognitive and affective level of the individual, as well as the term "motor", which refers to movement [3]. Given the juxtaposition of the two terms, psychomotricity can be defined as the ability that allows, facilitates and improves the physical, psychological and social development of children through movement [4]. At the same time, psychomotricity is a form of the child's adaptation to the external environment, through

exploratory and intellectual activities, in which the substructure of motor skills is involved, which includes the muscular reactions that determine the body movement [5].

Along with social adaptation, psychomotricity facilitates and adapts children to the educational environment [6]. In the learning process, students' psychomotor skills are an important guideline, teachers aiming to facilitate the educational and learning process and the development of a harmonious personality [7]. The fact that psychomotor skills can be educated in order to improve social and academic performance by learning motor skills and psychomotor behaviors was emphasized by Vayer in 1978 [3], who suggests that psychomotor education should be incorporated into lesson plans. In this sense, significant positive correlations were highlighted between fine psychomotor skills and writing development, as well as between eye-hand coordination, facial and gestural mobility and syllabification [2], but also between the development of gross motor skills in the first years of life and subsequent school performance. [8, 9]. The benefits of physical activity on children's cognitive abilities have been highlighted in numerous studies. For example, performance in terms of stability and flexibility of attention can be increased by 15 to 25% by exercising regularly, and reaction speed by up to 15% [10]. The period of middle childhood, ranging in age from 5/6 to 12 years, is characterized by the emergence of new developmental tasks in terms of physical, cognitive, emotional, social and cultural identity [11]. Regarding the motor development, in the mentioned interval the interaction between the genetic factors and those related to the environment plays an important role [12]. In the absence of any difficulties or disorders, both fine and gross motor skills get better towards the end of the preschool period and the beginning of the school period [11]. The impact of children's gender on the level of psychomotor development has been the subject of numerous studies, the results being controversial. Thus, the existence of a significant difference between boys and girls was highlighted, but the size of the observed effect is weak [13], the girls presenting a higher level of fine motor development [14], [15] at the age of 5-6 years [16] and 6-7 years [17], a higher degree of accuracy in handling objects [18], as well as a higher level of language skills [19].

Regarding gross motor skills, most research identifies more developed skills among girls [16], [20], [21], [22], as well as in the case of balance [15], [23], [24]. Identifying difficulties and disorders in the sphere of psychomotricity offers the opportunity of an early intervention, performed in order to correct or ameliorate the alterations, with benefits both at the subjective-individual level, and at the family and societal level [25]. At the same time, knowing the particularities related to the gender of students aged 6 to 8 allows refining the process of assessing psychomotor development, but also of the teaching and training one, considering the needs of each child who participates in physical education classes.

Objective

The aim of the research was to identify if there are gender differences regarding the psychomotor development for students aged 6-8 years, who participate in physical education classes.

Hypothesis

Based on the results obtained in previous research and the objective of the study, we launched the following hypothesis: It is assumed that there is a statistically significant difference between

the level of psychomotor development for girls and boys aged 6-8 years, participant at physical education classes.

Material and methods

The research took place in three schools from the city of Reșița, between 6 November 2017 and 5 May 2018. The sample studied was conducted on 120 students aged between 6 and 8 years who participated in physical education classes. Regarding the number of participants for each gender, 66 girls (M=7.06, SD=0.721) and 54 boys (M=7, SD=0.727) participated in the research.

Following the consent of the institutions involved and the students' legal tutors, the data were collected and analyzed using the IBM SPSS Statistics 23.0 program. The assessment of the level of psychomotor development of the students included in the study was performed using the Ozeretsky-Guillmann motor test [26], in order to outline the psychomotor profile. It assesses the motor behavior of children aged 4 to 11 years, in terms of the following components: speed, strength, deftness, endurance, dynamic hand coordination, general dynamic coordination, balance, speed and spatial orientation and it is useful in identifying motor difficulties, psychomotor retardation and in establishing the level of deficiencies.

Results

After assessing/measuring the level of psychomotor development using the Ozeretsky-Guillmann Test and the scoring of the results recorded by the participants, the following values of the central trend indicators, along with Skewness and Kurtosis indicators and the minimum and maximum scores, were obtained for the variable distribution investigated variable in each group (Table 1.).

Table 1. Descriptive analysis of the level of psychomotor development according to gender (N=120)

Group	*Mean*	*Std. dev*	*Skewness*	*Kurtosis*	*Min. value*	*Max. value*
Girls (N=66)	7,5	0,958	0,85	-.143	5	9
Boys (N=54)	7	0,916	-1,16	0,28	5,5	9,25

In order to test the hypothesis, the normality of the distribution for the psychomotor developmental variable was verified, in both groups, using the test of normality of the Kolmogorov-Smirnov Test for normality of distributions. Table 2 shows the values obtained:

Table 2. Kolmogorov-Smirnov test for the girl's group (N=66) and the boy's group (N=54)

	Kolmogorov-Smirnov		
	Statistic	df	Sig
Girls	.150	66	.001
Boys	.149	54	.004

It was found that the distribution of the psychomotor development variable does not meet the criterion of normality in either of the two groups studied ($p<.05$), which led to the choice of the nonparametric technique represented by the Mann Whitney U test for independent samples to test the launched comparative hypothesis. Tables 3 and 4 show the mean ranks of the two groups, along with the test result.

Table 3. Mean ranks for psychomotor development

Group	N	Mean rank	Sum of the ranks
1 Girls	66	65,48	4322
2 Boys	54	54,41	2938

Table 4. Mann Whitney U test result

	Psychomotor development
Mann Whitney U	1453,000
Z	-1,743
Sig	,041

The value of the coefficient z of -1,743 and that of the significance level of .041 (<.05) indicates that there is a statistically significant difference between the two groups in terms of the level of psychomotor development, the average rank corresponding to the group of girls being significantly higher than the one of the boy's group.

Discussions

The results obtained show that girls have a significantly higher level of psychomotor development than boys. Therefore, the girl participants in the studied sample tend to obtain significantly higher scores in tests related to speed, strength, deftness, endurance, dynamic hand coordination, general dynamic coordination, balance, speed and spatial orientation. However, the size of the observed effect is small. The results are consistent with those obtained in previous studies, both in terms of highlighting the significant difference in the sphere of psychomotor skills that favor girls [14], [15], [16], [17], [22], [23], as well as from the perspective of the small magnitude of the effect found [13], [16].

Possible explanations for the result obtained are related to theories that approach the difference between genders in psychomotor development. First of all, the hypothesis regarding the environmental factors involved in the appearance of the difference between the genders can provide an explanation for the noticed difference. It postulates that different exposure of girls and boys to external factors can influence the level of psychomotor development [16], through the impact of gender stereotypes on life experiences [27], but also the higher prevalence of birth complications in boys, due to their heavier weight and body size [28]. On the other hand, the theory of behavioral, emotional, and social factors may also clarify the results of the present research, given that, according to this hypothesis, boys have more difficulties in social functioning and behavior, as well as a higher risk for developmental disorders-autism, ADHD, intellectual disabilities, coordination disorders, learning disorders [16]. Finally, biological theory attributes the higher level of psychomotor development of the girls to low levels of testosterone, a hormone known to have negative effects on brain development [29].

The limits of the research are represented by its transversal character, which does not allow the interpretation of the results in terms of causality. Regarding future research, it is recommended to conduct longitudinal studies, with repeated measurements, as well as the evaluation of other components of psychomotor skills, in order to increase the accuracy and complexity of the psychomotor profile of students. Also, future studies should consider highlighting the factors that cause the difference between girls and boys in terms of the level of psychomotor development.

Conclusions

The analysis of the data obtained after evaluating the level of psychomotor development of girls and boys in the sample studied, led to highlighting a significant difference between students of different genders, girls aged 6 to 8 having a significantly higher level of the variable in question, however, the magnitude of the observed effect was small. The results presented have a high application value in outlining the psychomotor profile of children in the mentioned age range and identifying gender-specific intervention needs, in order to develop insufficient and/or poorly defined psychomotor skills, through physical exercises performed in physical education classes. Further research should concern on finding and exploring the causes that lead to differences between genders regarding the level of psychomotor development, as well as identifying the appropriate ways to improve underdeveloped skills, by analyzing the subscales of the Ozeretsky-Guillmain Test.

Conflict of interests

There are no conflicts of interest associated with the methodology or results of this study.

Acknowledgements

All authors contributed equally to this research.

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The Technical Profile of 110-M Hurdlers in the Seniors' Competitions

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Abstract

The objective of this research study was to analyse comparatively the eight best hurdlers in Romania – attending the national competitions – in what concerns biomechanical aspects, as well as to create a technical profile.

The main identification methods regarding the development of a technical pattern for hurdlers were related to pointing out negative biomechanical aspects during the competitive period, by using video technology and the comparative analysis between the finalists of national competitions. In this paper, we aim to develop a new perspective in what regards technical model, meant to assist young athletes at the beginning of their careers. Certain details cannot be noticed at first glance, reason for which we have used video technology, in order to try and provide a set of recommendations to serve as foundation for the technical profile of performance athletes. The anthropometrical data and the measurements conducted following graphic analysis provide to both coaches and athletes statistical data and records of the imperfections noted for the subjects.

In conclusion, we think that identifying the best technical profile of a professional athlete will be beneficial in modelling and building the future generations of athletes.

Keywords: health, recovery, therapy, shockwave

Introduction

Sometimes, it is more important to attend than to win a competition, but we also believe it is important how you participate, how you present yourself before the spectators and mostly before the opponents. We refer here to both the aesthetic aspect of an athlete's movements and to the execution manner, to the balance of support moment before crossing the hurdle and while jumping over the hurdle. Another essential aspect is represented by the moment hurdle clearance, given that the conditions during competitions differ by weather. Therefore, it is essential to take them into account once in the field, because an athlete needs a different tactical approach in order to obtain a better time (attainable with optimal psychomotor skills) [1].

The ability to accelerate over short distances is absolutely crucial to the success of numerous athletes participating in field- and court-based sports. [2]

The 110-m hurdles race is one of the most spectacular track and field running events.

During this race, the competitors must reach peak speed while clearing the 10 hurdles, each of them 9.14 m from one another. The space between the obstacles is used by runners for acceleration, and they usually use a 3-step rhythm, to create and maintain the main speed.

A hurdler must optimise the frequency of the steps between the hurdles. Specialists highlight that speed, resistance, and motor coordination are the most important factors in the success of a hurdles race.

Material and methods

The method used in this research is represented by the video analysis using digital cameras.

This has allowed us to interpret – at least at visual level – aspects of the movements performed by the upper and the lower limbs related to the hurdles race. Through this analysis, we wish to analyse the technical aspects of the finalist athletes at the national championships and to formulate certain conclusions. A video camera provides exposure times ranging from 1/60-1/4000s. It is worth underscoring that not all video cameras have a manual aperture adjustment function. Cameras incorporating a sport mode function should be avoided, because the exposure time associated with it is often inadequate for rapid-motion activities [4].

The purpose of this study is to compare the eight best athletes – finalists of the National Championships – and to identify a successfully technical profile in what concerns performance in hurdles races.

The hypothesis of the paper. Starting from the idea that the champion model develops permanently, we believe that the technical profile may serve as reference for building a successful young generation regarding performance track and field in Romania.

Results

In what concerns the technical analysis of the athletes – finalists of the National Championships – we will outline both positive and negative aspects and we will try to draw several conclusions.

This experiment has included 8 national-level athletes who have attended international competitions (age mean 25 years old±1.8 years old; mean height 1.81±0.04 metres; bodyweight 75 kg±4.5 kg). They have acquired a sporting experience of 8 years±1.8 years in the hurdles race, while the performance mean for hurdles is 14.66 seconds±0.20 seconds, while the best performance is 14.03 seconds.

The starting block phase concerns the time during which the sprinter is in contact with the blocks. [5]

Numerous authors have been interested in the biomechanical factors related to these two phases, in order to to explain the key factors of sprint performance [6], [7].

When analysing the start, several general aspects must be considered, as follows:

Upon hearing “READY,” the torso slightly exceeds the line of the hands resting on the ground; the hip (pelvis) falls perpendicularly on the sole of the front leg, which is important in the energic take-off forward within the starting block phase.

The images below illustrate a correct impulsion of the right leg, reaching he peak power development point. At the same time, we note calf extension compared to the thigh upon take-off within the starting block phase and an opening of the angle between these two elements,

measuring approximately 180°. The torso is on the same line as the impulsion leg, which provides an even and continuous impulsion of the generated force.

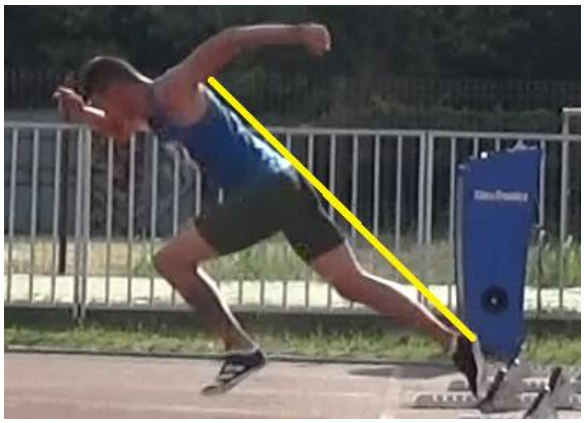

Fig. 1. The take off moment

The left arm opposing the impulsion leg is in a technically correct position; it has an important role in getting the rear leg forward as quickly as possible. The right arm is also positioned before the bent torso (the angle of the elbow joint measures around 90°).

The position of the left leg sitting forward – of the thigh, more precisely – is in a 90°-angle compared to the abdominal muscles, which favours an energic impulsion on the ground, thus entailing the development of the second step, thus providing the premise for developing the impulsion performed due to block-start.

On the other hand, we have noticed several negative aspects based on the video analysis:

Upon hearing "steady" – as shown in the image below – we have identified an incorrect position of the torso, because the shoulder line is not perpendicular on the arms and the hands, respectively. The lowering of the pelvis after hearing READY represents a risk that leads t the modification of the impulsion angles of the lower limbs.

The calf must feature a wider opening angle before stepping on the ground, while lifting the tip of the toes.

Analysis of hurdle clearance:

An important role is played by the arms (especially by the arm opposite to the front leg) because its movement must be energic and quick, in order for an athlete to resume the normal running position. In this case, the arm exceeds the regular distance and the elbow is behind the shoulder line, which determines a shoulder and torso twist toward the arm in question. As an effect of moving forward in a straight line, this twist slows down the movement speed due to the slight stopping; the athlete must make additional effort in order to resume his position on the running direction.

Unlike the other athletes – as shown by the images above – at the level of the front leg, we have noticed a slight swing of this leg outward, executed in the air, which we have evaluated through an observational analysis. Due to this one wrong move, repercussions concern the sole when the front leg gets in contact with the grounds in addition, we note a slight swing of the calf inward, which can act in two directions (both medical and technical).

Fig. 2. before the hurdle **Fig. 3.** above the hurdle **Fig. 4.** after the hurdle

Consequently, it is highly recommended to practice curtailing the loss of horizontal speed while clearing the hurdle. [8], [9].

The second technical observation evaluated in case of two of the athletes participating in this study refers to the passage of the rear leg over the hurdle, where we have identified a rather rare problem. The knee of the rear leg executes a slight rotation inward, reason for which it exceeds the sagittal line of the body, which prevents an effective step forward. In this context, the coxofemoral joint may also suffer (if the warm-up is not optimal).

Thus, in what regards the hurdlers, hip joint strength and muscles are essential for the improvement of the sprinting speed [10], [11].

Many hurdlers are prone to pulling the shoulders backward before hurdle clearance, as well as to stop briefly before the hurdle, (which is wrongfully acquired skill). This is due to incorrect running technique and to insufficiently developed abdominal and lower back muscles.

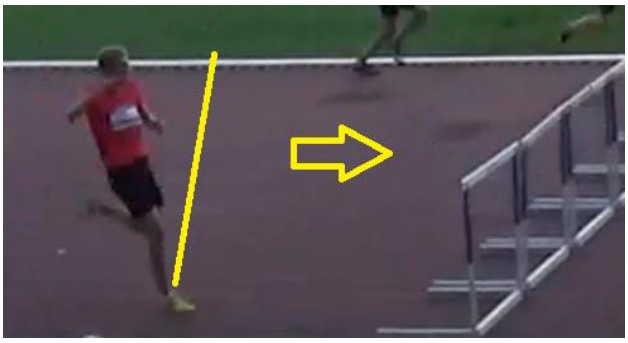

Fig. 5. last step before the hurdle

Discussions

Lopèz *et al*., have reported that with a higher ground reaction force, the hurdler obtains shorter ground contact time, which is indeed crucial in the hurdling process [12].

A lateral angle has allowed us to notice an exaggerated torso straightening right after hurdle clearance, due to the inefficiency of the rear leg, which is placed quickly but too clos to the front leg and to the hurdle. This aspect is also conditioned by the weak abdominal and lower back muscles, allowing for the shoulders to be pulled back too much, thus entailing a slight unwanted stop.

As we get a better insight into the technical analysis process, we notice that all subjects committed most errors. One of them is the curve or curl performed by the front leg upon clearing the hurdle. Two aspects cause this error:

- The hurdler's height and the size of the lower limb, implicitly.
- The wrong distance from the last step to the hurdle. Specialists state that the optimal distance indicated is 6-6 ½ soles, measured by the runners from the base of the hurdle.

Following these discussions and the objective analysis conducted, we may point out that the technical profile of a champion is by far a coveted objective for the current generation, but we are hopeful for their successors, for they may use these coordinated as a starting point.

Conclusions

The video analysis has enabled us to point out the technical issues of Romanian hurdlers in sprint-hurdles races. We are persuaded that the identification of the best technical profile for a professional athlete is beneficial in modelling and building the future generations of athletes.

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Anthropometric Indicators and Physical Tests Correlations in Football Players 14-16 Years

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Abstract

Problem statement: most scientific work in the field addresses technical and tactics components, few being focused on the subjects (for this age group), so our approach finds its place in the need to update the training programs.

The aim of this work

Is to improve and restructure existing strategies, by introducing support materials and testing devices to develop the speed of travel and explosive force in football players.

Objectives

Identifying the level of travel speed and explosive force in the lower limbs in football players (born in 2004), with the help of two physical tests and correlations with certain anthropometric indicators.

Hypothesis

Our research assumes that by introducing different specific exercises we will be able to increase the subject's athletic performance.

Research methodology

40 athletes born in 2004, 20 athletes in the control group (from the Club "Sticla Arieşul" Turda) and 20 in the experimental group (from the Football Academy "University of Cluj-Luceafarul"). For the two physical tests recorded we have used the Microgate Witty Manager System equipment; anthropometric indicators were tested with the BEURER Scale and the SOENHLE Ultrasonic Taliometer.

Results

Statistically significant differences were observed between the two groups for the speed values over the distance of 30m for non-paired samples in the first testing (T1), $p<0.0183$, but also in second testing (T2), ($p<0.05$), where a value of 0.01 was recorded (see Table 1).

Conclusions

Following statistical analyses of the results we have seen improvements in almost all the studied items, except the long jump.

Keywords: anthropometric indicators, physical tests, Witty Manager System

Introduction

In addition to football-specific technical skills, individual and team tactical knowledge and particularly adequate levels of physical fitness are important premises for success in football [1].

Typical football movements such as jumping, sprinting, shooting or rapid direction changes require a high level of physical training [2].

Resistance training as well as plyometric training or plyometric combined with sprint exercises are safe and appropriate tools for improving the physical condition of inactive young people aged 11-12 years [3] or young footballers aged 10 to 15 years [4-6]. Combining resistance training with plyometric training has become an increasingly popular training method, which has better results for increasing muscle strength compared to plyometrics or resistance training applied separately [7].

In football, resistance training combined with plyometric training was found more effectively than classic football training in young people (<15 years) football players [8] who achieved increases in speed and in the height of the counter-moving jump.

Purpose of study

The purpose in the preliminary study was to identify the initial level of motric qualities for explosive force and travel speed. The intervention plan was implemented in accordance with the annual preparation plan, the preparatory, pre-competition, competitive and effort-restoring periods. A rule was observed which required that the exercises, during the preparatory period, were carried out with several reps at a lower intensity and as they progressed to the pre-competition and competition periods, they were reduced in number of reps and higher intensity.

Objectives

To identify the level of travel speed and explosive force in the lower limbs for the studied subjects. We have started from the hypothesis that by modifying the training plan, introducing different specific exercises, we will be able to increase their sportive performance and competition results.

Research methodology

40 male subjects, born in 2004, took part in the experimental research, 20 athletes in the control group (Club “Sticla Arieşul” Turda) and 20, in the experimental group (Football Academy Luceafarul, Cluj). The tests were carried out before and after a 12-month intervention plan (2018-2019) to develop the speed and explosive force in 14-16-year-old athletes.

We have used the Microgate Witty Manager System, the Witty Timer Kit, which can be used to create personal data of athletes, to configure personalized tests and to display the obtained results. Witty hardware includes: one timer, two wireless photocells, two reflectors, four tripods,

a battery charger, a USB cable. Test 1 includes speed testing over a 30 m distance, straight sprint. The second test included a standing long jump (SLL). To measure the height and weight of athletes, we have used the BEURER scaler and Soenhle ultrasonic taliometer.

The intervention programs

It included plyometric exercises for increasing the speed, by jumps on and off the box (with vertical jump), different jump combinations like plyometrics (six boxes on a row three reps, with a one-minute break). Jumping on the box from a squat position (10 jumps/2 reps, with a one-minute break)**.** Squats with one leg raised or with a jump (20 squats/2 reps, with a one-minute break)**.** Standing jumps on one leg and sideways (30 jumps/3 reps with one-minute break, alternated with both legs and one leg). Shear jumps (ten jumps/five reps, one-minute break).

Results

For the 30m straight speed sprint in non-paired samples were observed statistically significant differences between the two groups in T1, when $p<0.0183$, but also in testing T2 where p recorded a value of 0.01 (see Tab. 1). This result is a particularly important argument in concluding our research and in the validation of the intervention plan, as increasing speed is among the main goals of our research. For paired samples, no statistically significant differences were observed between T1 and T2 in either of the groups ($p>0.05$).

Table 1. Testing the speed over the distance of 30m in the studied lots and statistical significance

Ind	Lot	Media	Es	Median	Ds	Min	Max	Statistical significance (p)	T1-T2
30m T1	I	4,69	0,0423	4,72	0,1892	4,30	5,00	0,0183	Lot I
	II	4,53	0,0518	4,55	0,2317	4,16	4,86		0,1713
30m T2	I	4,67	0,0459	4,67	0,2051	4,27	5,07	0,01	Lot II
	II	4,42	0,0779	4,53	0,3486	3,23	4,84		0,5217

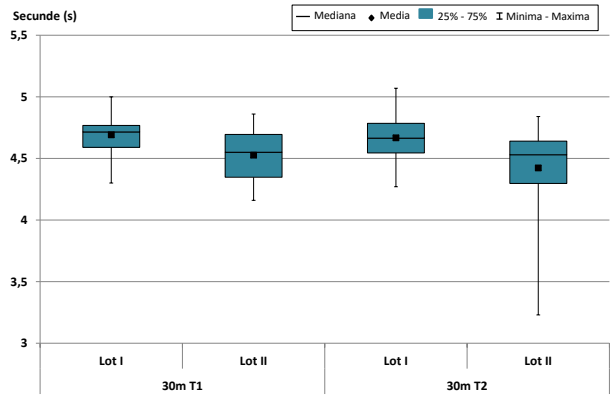

Fig. 1. 30m distance speed – sprint in a straight line for the studied lots

In Fig. 1 we can see how the speed in the experimental group (Lot II) has increased compared to the control group (Lot I) in the 30 m running test. In T2 the experimental team reached a higher score than the control group ($p<0.05$), this result being a clear record of the speed improvement following the intervention plan in the experimental group, see also Table 1.

For the standing long jump (SLL): in non-pair samples were observed no statistically significant differences between the two groups. (see Tab. 2). In paired samples were observed statistically significant differences between T1 and T2 in group I ($p<0.05$), see Fig. 2.

Table 2. Long jump in the studied lots and statistical significance

Ind	Lot	Media	Es	Med	Ds	Min	Max	Statistical significance (p)	T1-T2
SLL T1	I	2,06	0,0378	2,09	0,1689	1,75	2,32	0,2614	Lot I
	II	2,08	0,0307	2,05	0,1374	1,92	2,40		0,0417
SLL T2	I	2,06	0,0346	2,08	0,1546	1,79	2,31	0,6323	Lot II
	II	2,10	0,0313	2,08	0,1401	1,87	2,38		0,9704

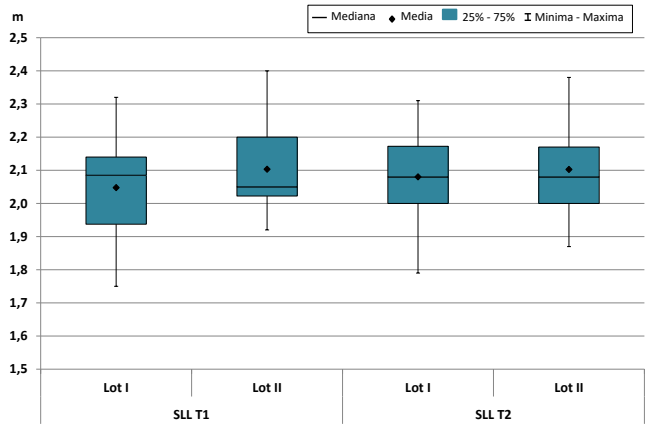

Fig. 1. Long jump for the studied lots

The results from the pilot study did not show statistically significant differences between the two testing and as can be seen above we had the same results also in the main study. The fact that there were no differences in the Long Jump, although other tests showed improvements in dynamic forces, may mean that the athletes did not use their arms properly during the long jump, or the legs, and this could have negatively affected the results.

Statistical correlation analysis between the values of anthropometric indicators and physical tests showed as follows:

For height (H), see (Table 3)

- **In group I** – a very good and same sense correlation with MC ($p<0.001$). r/rho=0.7680 and $p<0.0001$, meaning that if the height increases, the body mass will also increase;
- a good correlation and the same sense with SLL in T1 ($p<0.01$). r/rho=0.6227, and p=0.0034, concluding from this result that taller athletes will jump longer in length;
- an acceptable and same sense correlation with SLL in T2 ($p<0.05$), r/rho=0.4770 and p=0.0335; and with BMI where r/rho=0.4176 and p=0.067. (see Table 3). We can conclude from this result that taller athletes have a higher body mass index and will jump longer in length.
- **In group II** – a good and same sense correlation with MC ($p<0.001$), where r/rho=0.6987 and p=0.0008 (see Table 3), meaning that the height increases along with the body mass;
- an acceptable and same sense correlation with SLL in T1 and SLL in T2. We can conclude from this result that taller athletes will jump further in length.

For body mass (MC), see (Table 3)

- **In group I** – a very good and same sense correlation with BMI ($p<0.001$), where r/rho=0.8974 and $p<0.0001$.
- a good and same sense correlation with SLL in T1 ($p<0.01$), where r/rho=0.5659 and p=0.0093 (see Table 3), meaning that athletes with a higher body mass will be able to jump longer.
- an acceptable and same sense correlation with SLL in T2 ($p<0.05$), where r/rho=0.4595 and p=0.0415. Athletes with a higher body mass will be able to jump longer.
- **In lot II** – a good and same sense correlation with BMI ($p<0.01$), SLL in T1 ($p<0.05$) and SLL in T2 ($p <0.01$). The value of the body table is directly proportional to the body mass index and the size of the long jump on the spot.

For body mass, index (BMI**),** see (Table 3)

- **In group I** – an acceptable and same sense correlation with SLL in T1, where r/rho=0.4001 and p=0.0804 as well as SLL in T2 where r/rho=0.3521, and p=0.1278 (see table 3).
- **In lot II** – a good and meaning correlation with SLL in T1 ($p<0.05$), where r/rho=0.5485 and p=0.0123; and SLL in T2 ($p<0.01$), where r/rho=0.5686, and p=0.0089 (see Table 3), meaning that athletes with a higher body mass index will be able to jump longer from standing.

Table 3. Correlations between anthropometric indicator values and physical tests

Items		Lot I			Lot II		
		r/rho	Colton	P	r/rho	Colton	P
Height	Mc	0,7680	****	< 0.0001	0,6987	***	0,0008
	Bmi	0,4176	**	0,067	0,0212	*	0,9265
	30m T1	-0,3765	**	0,1018	-0,1278	*	0,5901
	30m T2	-0,3370	**	0,1462	0,1155	*	0,6214
	SLL T1	0,6227	***	0,0034	0,3224	**	0,1643
	SLL T2	0,4770	**	0,0335	0,4045	**	0,0768
Mc	Bmi	0,8974	****	<0.0001	0,6551	***	0,0022
	30m T1	-0,0822	*	0,7304	-0,0459	*	0,8462
	30m T2	-0,1347	*	0,5712	0,0867	*	0,7143
	SLL T1	0,5659	***	0,0093	0,5645	***	0,0106
	SLL T2	0,4595	**	0,0415	0,6694	***	0,0016
Bmi	30m T1	0,1048	*	0,6601	0,1301	*	0,5845
	30m T2	0,0203	*	0,9323	0,1974	*	0,3998
	SLL T1	0,4001	**	0,0804	0,5485	***	0,0123
	SLL T2	0,3521	**	0,1278	0,5686	***	0,0089

Legend

H – Height; MC – Body mass; BMI – Body Mass Inde x30m – Sprint in a straight line;
SLL – Long jump from standing; T1 – initial test; T2 – final test; r=Bravais-Pearson correlation coefficient; rho=Nonparametric Spearman Rank Correlation Test

Conclusions

In the physical test (30m – straight sprint) there were considerable increases in the scores achieved (p=0.01 in the final test), in T2 the experimental team reached a higher score than the

control group ($p<0.05$), and this result is an important argument for our research conclusions and confirming the intervention plan, since increasing speed is among the main goals of our research.

The results and information obtained from our research can help us in creating a professional profile of athletes, thus coaches having the chance to improve the professional training programs of football players. Knowledge of strengths, as well as the differences in psycho-motor characteristics, help both to develop a training plan focused on the problems or lacks and to develop customized training plans for each athlete needs.

Discussions

Maximum speed is often achieved by reaching peak power output and high-rated force [9].

Despite the usefulness of this approach, SSI (Seamless Sequential Integration) was originally intended for track and field and beginner athletes [10] which usually accelerate over distances of approximately 35-60m [11] and 30-50m [12] in the competition, respectively football players, who spend the vast majority of the match covering shorter distances of about 9-15m [13-15]. The importance and selective influence of the maximum ability to accelerate the speed of direction change, linear sprint, sprint moment was tested on football players [9].

Although we were satisfied with the way the research was carried out and the results, we could say that we met some limitations in terms of annual plan construction and the implementation of the intervention plan, as it had to fit into the competition program and the annual sports training plan of the football team from the experimental group.

On the other hand, the age of the subjects was also a potential risk element in achieving the goals, as we did not work with adult athletes, and the age group in our research (14-16 years) has its own characteristics when it comes to perseverance, ambition, resilience or emotional stability.

However, we believe that during our research we have been able to cope well with these challenges.

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Age Related Morphologic and Metabolic Adaptations on Prolonged Exercise

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Abstract

The research is based on an experimental case study, carried out over a period of 45 days under the conditions of a prolonged daily effort (10 to 12 hours paddling – moderate intensity 50-60% MHR). The study monitored some somatic parameters – body mass, subcutaneous tissue thickness, BMI, body diameters, visceral adipose tissue. It started from the idea that the body of the older subject will adapt faster, but also from the fact that each individual has a specific metabolism. Although there are similar studies, no common denominator has been reached regarding the ability of each individual to adapt, nor are the processes that trigger the adaptation of changing processes of anabolism and catabolism effectively known. The evaluations carried out throughout the study revealed that the adaptation process has stages common to the two subjects as well as different evolutions. The different dynamics of the monitored parameters is based on the different capacity of the organism to adapt to the endurance effort in people over a certain age.

Keywords: body mass, BMI, skinfolds

Introduction

Metabolism represents the multitude of physical and chemical processes in the body, through which substances are produced, maintained or destroyed and through which energy is made available to cells. In other words, metabolism is the sum of the biochemical processes that take place in the tissues and consists of anabolism and catabolism [1], [2].

The most visible form of adaptation of the body to the training program is the modification of the body composition, respectively the proportion between the adipose tissue and the low mass [3].

Following a medium intensity effort, fat deposits are reduced due to the use of fatty acids as an energy resource, and muscle mass is increased through the mechanisms presented above.

The main factor that determines the most intense effect on the rate of metabolism is physical exertion.

Other determinants are body size and composition. A larger body means more cells that need to be kept in operation, which means more energy. On the other hand, to move a body harder, it requires the involvement of more muscle fibers, so more energy consumed. Body composition is also an important factor, because muscle tissue is a very active metabolic tissue, here most of the metabolic processes popularly called "burns", while adipose tissue is almost metabolically inert

tissue. This is how a more muscular body will "burn" more fat during physical exertion, than one with reduced muscle mass.

Starting from the previous idea, we can say that men who have more developed muscle mass will have a higher metabolic rate. So, muscle size is a factor to consider.

Age is an important element that influences metabolism. After 30 years, the rate of metabolism begins to gradually decrease. According to the studies, the regular exercise of the physical exercises contributes essentially to the maintenance of the muscle mass, so indirectly it helps to maintain an optimal metabolism.

Regarding long-term efforts, it must be said that glycogen reserves are not enough and that is why we call on the body's largest energy reserve, fats. As the effort is extended, the burning of free fatty acids becomes very important, as they can cover 80-90% of the energy needs of the muscles.

The analysis of the specialized literature shows that the endurance effort is sustained at higher levels by the elderly, who have been practicing physical activity for a long time. This aspect is also confirmed by the superior results obtained in all endurance cycling sports samples by athletes over the age of 30, especially in the running tests [2].

Material and methods

The two subjects, M-53 years and I-27 years, with relatively identical somatic constitutions (mesomorphic), with the same concerns during the period 15-25 years, crossed for 45 days, with double kayak, several rivers, canals and rivers (upstream and downstream) and covered 3320 km.

The subjects made the same effort because rowing in a tandem kayak involves synchronizing the movements. We say relatively because, under natural conditions, the force applied by each in the blow cannot be directly evaluated. It should also be noted that the older subject has a greater experience in sports, even when traveling with a kayak.

The thickness of the skin folds - the evolution of the size of the envelopes in the abdomen in the anterior and lateral parts, as well as in the arm in the triceps muscle area was recorded.

Circumferences of some segments, which evaluate the distribution of adipose tissue, have been proposed as a superior BMI in the assessment of obesity.

Body mass index as well as visceral fat level were calculated using the Omron BF 306 device based on biomagnetic impedance and Ph level. It was used after evaluating the weight for a more accurate calculation.

Results and discussions

In terms of body weight, always appreciated with the same scale, for both subjects, a large difference can be observed ($P<0.001$). As shown in figure 1, during the study, it evolved, in a first phase, under a similar graph in the first 10 days, after which in the subject M there is a maintenance of the weight with small variations (± 1.6), and in the end it can be observed even a slight increase. In subject I the body weight registered a downward trend from the initial to the final testing, maintaining a relatively constant graph.

Tested features	Subject M				Subject I				
	$\overline{X}$	STDEV	MIN	MAX	$\overline{X}$	STDEV	MIN	MAX	Ttest
Weight (kg)	73.2	±1.6	72	77	78.2	±4.3	72	84	0.003
Abdominal skinfold (mm)	14.3	±4.3	10	23	15	±5.7	8	24	0.49
Iliac skinfold (mm)	14.6	±3.9	10	23	13.9	±5	10	24	0.24
Triceps skinfold (mm)	12.9	±1.3	11	15	19	±4.6	7	19	0.4
Abdominal diameter (cm)	82	±1.8	80	84	86	±2.5	79	91	0.002
Arm diameter (cm)	31	±1.4	28	33	31	±0.9	28	31	0.46
Hip diameter(cm)	55	±2.5	53	58	54	±1.8	51	56	0.04
BMI (%)	25.2	±0.6	25	27	24.1	±1.3	22	25	0.006
Visceral fat	15.3	±2.8	12	22	13.9	±3.9	9	21	0.045

Fig. 1. Test results recorded in subjects M and I

From the analysis of figure 2, regarding the evolution of BMI we can find that both subjects fall in the category of overweight with 25.2, ± 0.6 subject M and 24.1, ± 1.3 subject I. We consider that the assessment of BMI only the ratio between height and weight represents a disadvantage for the studies that have practicing sports subjects. It is known that muscle mass, specific to athletes in the category of strength sports, heavy athletics, etc., weighs more compared to the volume occupied by fat [4]. Therefore, the two subjects, former combat sports practitioners, although theoretically they fall into the overweight category, are normoponderous persons. As expected after the evolution of body weight, BMI of the two subjects had a different dynamic throughout the study. Thus, the older subject registers a plateau and the subject I a continuous decrease.

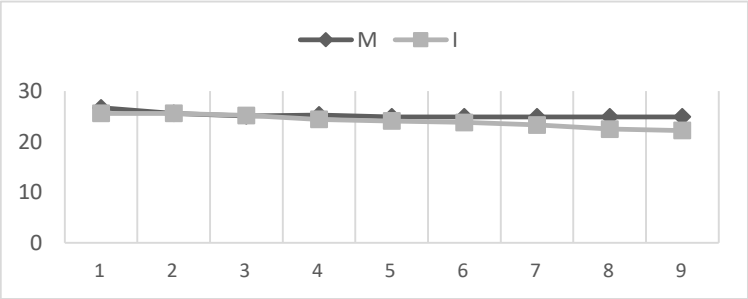

Fig. 2. Body mass index evolution

The evolution of the circumferences highlights the specific activity of each segment correlated with the evolution of the weight. Thus, it is observed, in subject M, an initial decrease of the circumference of the abdomen followed by a maintenance of 84MAX-80MIN, whereas in the subject I circumferentially it was registered in a downward trend throughout the study 91MAX-79MIN. The circumference at the thighs shows fluctuations in both subjects, with insignificant increases and decreases, relatively proportional.

As expected, the arm muscles constantly and permanently involved in movement recorded an increase in circumference in both subjects, with a growth rate accentuated in the first stage, followed by a maintenance. The maintenance of the circumference was based on a constant effort, perhaps with a higher level in the first part because the crew was moving upstream and the musculature was adapted to the specific activity. [6]

The thickness of the envelopes at the abdominal level in subject M shows a constant decrease (14.3mm±4.3), although some variations are observed with respect to subject I (15mm±5.7). We could attribute these variations on account of human error, given that the evaluations were performed with each other. However, there was a steady decrease in the thickness of the adipose tissue layer in the anterior area of the abdomen in both subjects.

The adipose tissue in the arm area shows a similar evolution to the tissue in the abdomen for subject I and with slight variations in subject M.

From the analysis of the thickness of the adipose tissue at the triceps level, there is a rather low variation in the subject M where it falls between 15-13 mm, while the diameter has increased, while in subject I the variation is considerably larger (19 and 7 mm).

An alternate evolution is recorded at the level of the internal fat tissue, as shown in figure 3.

After a uniform decrease in both subjects, slight variations begin to occur, but a constant decrease is the uniform decrease, which eventually results in a slight increase in subject M.

Given that the level of adipose tissue in the internal organs has been appreciated. with an electronic device that considers the Ph level we could attribute the slight variations to this element which can be easily modified.

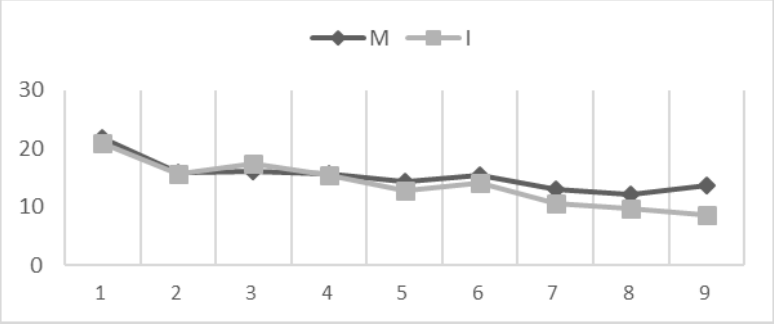

Fig. 3. The evolution of the internal fat level

From the correlation of the data obtained at we could attribute the weight gain of the subject M based on the toning of the musculature, aspect found and from the evaluation of the circumference of the segments. Of course, the toning of the muscles is also recorded in the subject I but with a certain gap. The time difference in which the toning effect appeared is given by the specificity of the morphological type and the capacity of the organism to adapt to the effort [6]. While subject M is a medium mesomorphic type, subject I has influences from the endomorphic type.

Conclusions

The evolution of the monitored parameters had a similar evolution in the first part of the study, ie a decrease of the quantitative indicators because the prolonged effort required a high energy consumption. In other words, we can say that the process of catabolism has exceeded the result of anabolism. Although the effort was constant for both subjects, and the consumption of food and nutritional supplements was also identical, a different evolution of the somatic indicators followed was observed. Other studies attribute this evolution on account of the adaptive particularities of organisms and especially of individuals over a certain age.

Although the body mass index shows the relationship between muscle tissue and adipose tissue, in our study situation the reality is distorted because the decrease of one parameter

overlapped with the increase of another. Thus, the thickness of the envelopes and visceral tissue decreased and the muscles were toned. In this sense, we can say that BMI monitoring (BMI) is only valid when applying a diet for weight loss.

Another conclusion from the study is that the thickness of the layer of adipose tissue decreases preferentially in different percentages depending on the areas. Thus, there is a sharp decrease in the area of the abdomen (both anterior and lateral) compared to the posterior area of the arm.

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Effect of Romanian Heracleum Sphondylium Product, in Acute and Intense Physical Stress

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Abstract

Background

Romanian Heracleum sphondylium (RHS), is traditionally used for human ailments.

Methods

30 healthy men were enrolled in 3 groups: control (C=10), placebo (P=10), HSP (HS=10).

P/HSP were administered for 21 days before an intense exercise. Analyzed parameters: heart rate (HR), *malondialdehyde (MDA)*, glycemia (G). Evaluation: before P/HSP administration (T1), 20min before (T2), 20min (T3) and 4hours (T4) after stress.

Results

Compared to T1, parameters were significantly increased: HR, at T2 (for C/P/HS) and T3 (for C/P); for MDA and G at T3 (for C/P/HS) and T4 (for C/P). Parameters were significantly increased for C/P compared to HS: for HR (T2/T3); for MDA and G (T3/T4). The highest impact of Romanian Heracleum sphondylium, was on HR at T2, MDA/G at T3.

Conclusions

1) Compared to C and P, HSP significantly reduced the effect of stress on the parameters.
2) HSP was more efficient immediately before and immediately after the stress.
3) HSP was more efficient on HR, before stress, and on MDA, after the stress.
4) We sugest RSH product may be useful in acute intense physical stress modulation, but further research is needed.

Keywords: Heracleum sphondylium, heart rate, malondialdehyde, glycemia, stress

Introduction

The Apiaceae family contains over 300 genera and 3000 species [1]. Of these, one of the largest genera is the genus Heracleum L. contains over 120 species, found mainly in Europe [2, 3] and Asia: China [4], Turkey [5]. Heracleum plants have important actions, due to the rich composition, of which 94 compounds were isolated [6]. Some Heracleum species have hypoglycemic effects [7], biological [8] and immunostimulatory [9] properties, antioxidant and antimicrobial potential [10]. Heracleum sphondylium is a plant found in Europe [11]. Its leaves resemble the bear's paw, so the popular Romanian name of the plant is *Ursuleț* or *Bear Branch* [12]. Various studies have analyzed its composition [11, 13]. Different parts of the plant have proven effects: the aerial parts, to treat high blood pressure [14]; flowers and leaves have antioxidant effects [15]. It is used in traditional medicine [16] for the treatment of hypertension, sterility, epilepsy, digestive diseases, renal failure and as an antifungal agent [14, 17]. Ethanol extract and aqueous H. sphondylium extract showed antimicrobial activity [18]. Heracleum sphondylium L. has antihypertensive action [14].

Objectives

We propose the evaluation of Romanian Heracleum sphondylium product (HSP) in acute stress induced by intense and short-term physical effort, on sedentary subjects, by investigation of functional (heart rate, HR), oxidative (malondialdehyde, MDA) and metabolic (glycemia, G) parameters.

Material and methods

Research protocol

a) Period and place of the research

Study have been carried out in October 2018, in the 122 Medical Cabinet in Cluj-Napoca.

b) Subjects and groups

30 healthy men were voluntarily enrolled in 3 groups: control (C=10), without treatment; who received placebo (P=10); who received HSP (HS=10). Study participants were aged between 21-33 years. We chose the highest age group for HSP administration, considering that this could be the one the most exposed to stress. Thus, the selected groups had the following age ranges: for C, 21,4 (Standard deviation, SD=1.02); for P, 24,1 (SD=1.103); for HS, 30,2 (SD=3.06).

c) Tests applied

1) Study design. All participants followed a 12-min heating muscle, on a Monark Ergomedic 839E cycle ergometer, adjusted to 40 watts, and after a 10 min break, they followed the proper stress, realized on the same ergonomic bike: an intense and short-term physical effort. The effort test was carried out at a rate of pedaling 60 rotations/min, starting with a power of 30 watts, followed by a gradual increase of power until the advent of fatigue feeling. Administered products were: placebo; HSP, produced by a Dacia Plant Romanian company [19, 20]. P/HSP were administered for 21 days before the physical stress, 3 tablets per day at 7.00-13.00-19.00 hours.

2) The indicators determination program was the same for C, P, HS, beeing carried out as follows: time 1=T1 – before P, HSP administration; time 2=T2 – 20min before physical stress; time 3=T3 – 20min after physical stress; time 4=T4 – 4h after physical stress.

3) *Explorations.* The analyzed parameters were: *heart rate (HR)* – evaluated on the cyclogergometer; *malondialdehyde (MDA)* – using liquid chromatography method [21]; *glycemia (G)* – evaluated with a portable glucometer.

d) *Statistical processing.* The results obtained were analysed using SPSS 19.0. statistical package. For continuous data examination, Student's T-test has been used. The differences were considered significant at a $p<0,05$.

Results

A. Intra-group analysis (Table 1).

Table 1. Comparison of parameter values for C, P and HSP between: T2-T3 (for HR) and T3-T4 (for MDA, G)

Parameter	Time	T1	T2	T3	T4	p value
HR-C	Mean	65.5	149.5	144.4	101.3	T2-T3
	SD	3.00832	15.8887	15.3441	14.82599	0.24867
MDA-C	Mean	0.505	0.502	1.837	1.661	T3-T4
	SD	0.1636	0.16969	0.36799	0.3234	0.14769
G-C	Mean	71	71	140.6	138.2	T3-T4
	SD	2.89828	3.63318	4.2	4.4	0.1259
HR-P	Mean	70.8	142.7	133.1	84.7	T2-T3
	SD	4.99599	11.127	7.1617	12.7047	0.02154
MDA-P	Mean	0.404	0.433	1.724	1.632	T3-T4
	SD	0.14122	0.13402	0.39439	0.40174	0.31494
G-P	Mean	71.7	71.9	140.2	138	T3-T4
	SD	1.34536	2.21133	26.76	5.01996	0.18599
HR-HSP	Mean	67.5	122.4	107.8	68.7	T2-T3
	SD	5.81807	6.93108	15.4971	4.14849	0.00944
MDA-HSP	Mean	0.439	0.464	1.331	1.093	T3-T4
	SD	0.16885	0.16936	0.27959	0.29719	0.049
G-HSP	Mean	71.6	71.5	121.5	116.1	T3-T4
	SD	2.93939	2.57876	2.33452	3.884585	0.00109

Dynamics of HR values were similar for all groups. The differences between T2-T3 were: not significant for C ($p=0.24867$) and significant for P ($p=0.02154$) and HSP ($p=0.00944$).

Dynamics of MDA values were similar for all groups. The differences between T3-T4 were: not significant for C ($p=0.14769$) and P ($p=0.31494$) and significant for HSP ($p=0.049$).

Dynamics of G values were similar for all groups. The differences between T3-T4 were: not significant for C ($p=0.1259$) and P ($p=0.18599$) and significant for HSP ($p=0.00109$). significant for HSP ($p=0.00109$).

B. Inter-group analysis (Table 2).

Parameters values were significantly increased for C and P, compared to HSP (Table 2; Fig. 2): a) *For HR*: 1) at T2: C-HSP ($p=00009$); P-HSP ($p<0001$); 2) at T3: C-HSP ($p=0.00004$); P-HSP ($p=.00015$), 3) at T4: C-HSP ($p<0.00001$); P-HSP ($p=.00104$). b) *For MDA*: 1) at T3: C-HSP ($p=0.00206$); P-HSP ($p=.01266$); 2) at T4: C-HSP ($p=.00059$); P-HSP ($p=.00229$). c) *For G*: 1) at T3: C-HSP ($p<.00001$); P-HSP ($p<.00001$); 2) at T4: C-HSP ($p<.00001$); P-HSP ($p<.00001$)

Table 2. Analysis of parameter values, for each of the times, compared to HSP

Time	T1		T2		T3		T4	
Group comparison	C-HSP	P-HSP	C-HSP	P-HSP	C-HSP	P-HSP	C-HSP	P-HSP
HR – p-value	.1858	.1065	.00009	.0001	.00004	.00015	.00001	.00104
MDA – p-value	.2053	.3195	.32007	.33593	.00206	.01266	.00059	.00229
G – p-value	.33399	.46354	.37012	.36401	<.00001	<.00001	<.00001	<.00001

C. Analysis related to T1

a) ***Intra-group analysis related to T1***. *For C*, the biggest differences were for: HR at T2/T1 (2.28), MDA at T3/T1 (3.63), G at T3/T1 (1.99). *For P*, the biggest differences were for: HR at T2/T1 (2.02), MDA at T3/T1 (4.26), G at T3/T1 (1.94). *For HSP*, the biggest differences were for: HR at T2/T1 (1.82), MDA at T3/T1 (3.03), G at T3/T1 (1.69).

b) ***Inter-group analysis related to T1***. *For HR*: the biggest differences were for: C at T2/T1 (2.28); the smallest differences were for: HSP at T4/T1 (1.02). *For MDA*: the biggest differences were for: P at T3/T1 (4.26); the smallest differences were for: C at T2/T1 (1.02).

For G: the biggest differences were for: C at T3/T1 (1.99); the smallest differences were for: HSP at T2/T1 (0.99).

Discussion

1) Specifications

This article is a continuation of previous research of the authors, regarding the atpic of heart rate [22], oxidative stress [23] and glycemia [24] assessments in stress and physical stress, as well as for the modulation of physical stress [25].

2) Analysis for the results of the present study

Through the present study it was carried out a comparative analysis of the impact of HSP, in intense acute and short-term physical effort, on sedentary persons. For all groups, the highest times differences were, in decreasing order, for: a) MDA, at T3/T1: C=3.63, P=4.26, HSP=3.63; b) HR, at T2/T1: C=2.28, P=2.02, HSP=1.82; c) G1, at T3/T1: C=1.99, P=1.94, HSP=1.69.

Differences between C and P were reduced for all parameters, at all times, the most important being at T3, between C-MDA and P-MDA. It is noteworthy that the stress-effort impact was the most intense on C and P, and the lowest on HSP. The impact of stress was the most intense on MDA, and the lowest on G. Under the influence of HSP, the stress effect was greatly reduced for all three parameters: a) HR (T2/T1) – HSP=1.82, vs. C=2.28 and P=2.02; b) MDA (T3/T2) – HSP=3.03, vs. C=3.63 and P=4.26; c) G (T3/T2) – HSP=1.69, vs. C=1.99 and P=1.94. Thus, it is found that HSP provides an important antistress protection, proven by the influence on HR, as well as an antioxidative effect, proven by the influence on MDA, and a hypoglycemic effect, proven by the influence on G.

3) Heracleum. A Pubmed chronological evidence

Heracleum species are widely used in folklore medicine for the treatment of many disorders [6]. On the other hand, moderate regular training seems beneficial for oxidative stress and health; acute exercise leads to increased oxidative stress [26]. Heracleum species have different actions [6]: Heracleum afghanicum seeds have sedative effects [27], and Heracleum sphondylium is vasorelaxant [14]. The genus Heracleum has proven antioxidant actions [6], due to the flavonoids and phenolic acids of the plant composition [15]: for Heracleum pastinacifolium and Heracleum persicum, the phenolic content plays an antioxidant rol [28]; Heracleum persicum contains furanocoumarine, which plays an important role in oxidative stress [29]. Heracleum

inhibited glucose uptake [7]. Studies have shown that different species of Heracleum have important effects on blood sugar: antidiabetic actions [30], through the action of a natural α-glucosidase inhibitor [31].

The results obtained in our study, on HR, MDA and G, by using HSP, are consistent with data from recent studies related at the changes of this parameters, under the action of stress, sport and Heracleum species. This study also confirms the modulating effect of Heracleum species on HR, oxidative stress and glycemia. The difference from the quoted studies is that our study has shown the effectiveness of *Heracleum sphondylium* administration, in acute and intense physical stress induced by an in intense acute and short-term physical effort on sedentary persons.

Conclusions

1) Compared at C and P, HSP significantly reduced the effect of stress on the parameters.
2) HSP was more efficient immediately before and immediately after the stress.
3) HSP was more efficient on HR, before the stress, and on MDA, after the stress.
4) We sugest RHSP may be useful in acute intense physical stress modulation, but further research is needed.

Conflicts of interest

Nothing at declare.

Acknowledgement

We would like at thank Doctor Alexandrina Fărăgău, for kindly hosting this study.

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Increasing Cardiovascular Endurance Through Physical Education Lessons During a School Year

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Abstract

Introduction

Nowadays, a major priority remains promoting physical activity among youth. Physical fitness and physical activity are important factors in maintaining not only the quality of life, but also enhancing health and promoting the holistic development of children. Unfortunately, for some children and adolescents, the only vigorous physical activity at which they are exposed is during physical education lessons in school.

Aim

Therefore, given the importance of endurance in everyday life and also the fact that for some youngsters, the only physical activities they are involved in are the ones held in school, the aim of this study was to verify in which manner endurance can be improved through physical education lessons in school.

Materials and methods

The present study was developed during the school year of 2018-2019, at a high school from Turda, a city in Cluj County. At this study participated 58 students from 11th grade (20 girls, age average of 17.5 and 38 boys, age average of 17.47). The intervention program regarding endurance increase took place during 30 Physical Education lessons, and the following three methods were used: running while increasing work distance but keeping the same tempo, running while decreasing work distance but increasing the tempo and running with intervals. In order to make a correct analysis over the intervention program, at the beginning of the study, an initial evaluation of the students was made. Therefore, an endurance running of 800 meters for girls and 1000 meters for boys.

Results

The values observed by the girls, at the initial and final testing, were 274.9 seconds and 218.8, respectively. Therefore, by comparing these two values, an improvement of 56.1 seconds, can be observed, and the statistical analysis confirms that is statistically significant ($p<0.0001$). Same situation was observed for the initial and final testing of the boys. Hence, a statistically significant progress ($p<0.0001$) was registered from the 278.7 second recorded at the initial testing, to 221.7 second, recorded at the final testing.

Conclusions

The results obtained in this study showed that the methods used in the intervention program are efficient, hence the statistically significant improvements in cardiovascular endurance for both boys and girls.

Keywords: cardiovascular endurance, physical education lessons, school, students

Introduction

Nowadays, a major priority remains promoting physical activity among youth. Physical fitness and physical activity are important factors in maintaining not only the quality of life, but also enhancing health and promoting the holistic development of children [1].

Unfortunately, for some children and adolescents, the only vigorous physical activity at which they are exposed is during physical education lessons in school [2]. Therefore, we must acknowledge the importance of exposing children to physical activities that promote a healthy and active lifestyle [3].

Many of school-based fitness programs rely on endurance, muscular strength and flexibility.

The aerobic endurance for example reflects the well-being of the cardiovascular and pulmonary system. Aerobic endurance or maximum oxygen consumption, can be measured by a field test of endurance, for example running 1-3 km. Studies have shown that during childhood, the aerobic capacity, although doubles both in girls and boys, girl seem to possess a lower capacity. Males aerobic capacity improves during adolescent times, up to ages of 17-18, while in females, the aerobic capacity reaches plateau around age of 14 [4].

Endurance training can be defined as an exercise program, well structured, that must be sustained for a sufficient period of time and at a sufficient level in order to produce an improvement [5].

Therefore, given the importance of endurance in everyday life and also the fact that for some youngsters, the only physical activities they are involved in are the ones held in school, the aim of this study was to verify in which manner endurance can be improved through physical education lessons in school.

Materials and methods

The present study was developed during the school year of 2018-2019, at a high school from Turda, a city in Cluj County. At this study participated 58 students from 11^{th} grade (20 girls, age average of 17.5 and 38 boys, age average of 17.47), from two different classes (one class was noted as "11^{th} grade A" and "11^{th} grade B", each of the class counting 10 girls and 19 boys).

The inclusion criterion in this study was the requirement that the only physical activity of the students in this study should be the lessons held in school. The students that had other physical activities, outside the school lessons, participated at the same program, but their results were not registered. Therefore, by excluding these students, two equal groups were formed.

The intervention program regarding endurance increase took place during 30 Physical Education lessons, and the following three methods were used: running while increasing work distance but keeping the same tempo, running while decreasing work distance but increasing the tempo and running with intervals.

In order to make a correct analysis over the intervention program, at the beginning of the study, an initial evaluation of the students was made. Therefore, an endurance running of 800

meters for girls and 1000 meters for boys. The distance was selected considering the school curriculum that indicates the level of physical preparation of 11th grade. Students. At the end of the intervention program, a final testing was made, respecting the same procedure as the initial evaluation.

Beside the endurance running method, the subjects were tested for heart rate values at the beginning of the program and at the end of the intervention program, as well. For this method, the following protocol was respected: the measurements, made by the Physical Education teacher, were made on each of the students, every two days, at the exactly same hour, and the results were given as an average between these three recordings.

The heart rate was measured for 30 seconds (the value was multiplied by 2 to obtain the heart rate on a minute) at the radial artery, after the students were in physical rest for 5 minutes. At the end of the intervention program, the same testing protocol was applied.

Results and discussions

The results obtained were summarized in tables and analyzed using GraphPad Prism 6.

Therefore, in Table 1 the values recorded for initial and final endurance tests can be observed.

Table 1. The results obtained from the initial and final endurance testing

	Number of subjects	Age (mean)	Endurence test (Initial testing)			Endurence test (Final testing)		
			seconds (mean)	Std. Deviation	Minimum/Maximum (seconds)	seconds (mean)	Std. Deviation	Minimum/Maximum (seconds)
Girls (all subjects)	**20**	**17.5**	**274.9**	**8.341**	**263/289**	**218.8**	**10.35**	**202/240**
11th Grade A - Girl	10	17.4	277.3	9.262	263/289	212.6	8.475	202/230
11th Grade B - Girl	10	17.6	272.5	6.948	264/286	224.9	8,386	214/240
Boys (all subjects)	**38**	**17.47**	**278.7**	**15.75**	**238/310**	**221.7**	**12.25**	**200/248**
11th Grade A - Boys	19	17.37	280.3	12.38	261/302	215.3	8.788	200/229
11th Grade B - Boys	19	17.58	277.2	18.74	238/310	228.1	12.04	205/248

As it can be observed above, the values observed by the girls, at the initial and final testing, were 274.9 seconds and 218.8, respectively. Therefore, by comparing these two values, an improvement of 56.1 seconds, can be observed (Figure 1), and the statistical analysis confirms that is statistically significant ($p<0.0001$).

Same situation was observed for the initial and final testing of the boys. Hence, a statistically significant progress ($p<0.0001$, Figure 2) was registered from the 278.7 second recorded at the initial testing, to 221.7 second, recorded at the final testing.

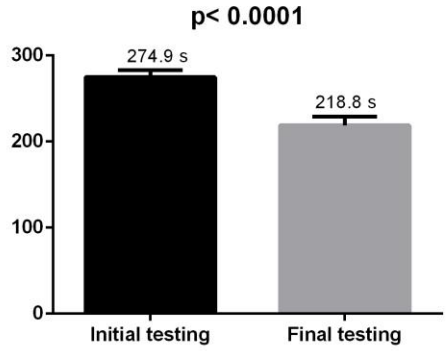

Fig. 1 Comparative analysis of the results obtained at the initial and final testing for the endurence test (GIRLS)

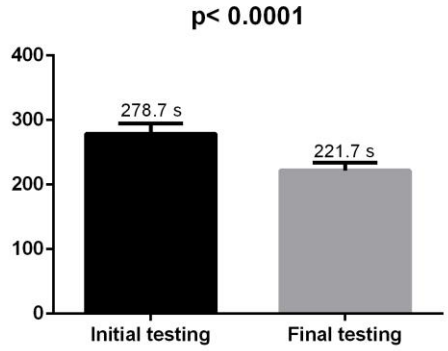

Fig. 2 Comparative analysis of the results obtained at the initial and final testing for the endurence test (BOYS)

The heart rate values, recorded at the initial and final testing, are presented below, in Table 2.

Table 2. The results obtained from the initial and final heart rate testing

	Number of subjects	Age (mean)	Heart rate (Initial testing)			Heart rate (Final testing)		
			heart beats per minute (mean)	Std. Deviation	Minimum/Maximum (seconds)	heart beats per minute (mean)	Std. Deviation	Minimum/Maximum (seconds)
Girls (all subjects)	**20**	**17.5**	**82.55**	**2.929**	**78/88**	**79.1**	**3.432**	**72/84**
11th Grade A - Girl	10	17.4	82.7	3.199	78/88	77.3	3.268	72/82
11th Grade B - Girl	10	17.6	82.4	2.797	78/86	80.9	2.644	77/84
Boys (all subjects)	**38**	**17.47**	**79.42**	**4.648**	**72/88**	**76.92**	**4.05**	**70/84**
11th Grade A - Boys	19	17.37	80.11	5.269	72/88	77.79	4.467	70/84
11th Grade B - Boys	19	17.58	78.74	3.956	72/88	76.05	3.488	70/84

Following the intervention program, carried out during one school year, improvements of the heart rate during endurance activities were also observed. Therefore, considering the girls, a statistically significant decrease of the heart rate was observed, from 82.55 beats per minute, to 79.1 beats per minute ($p<0.0001$, Figure 3). A similar situation was observed considering the boys, were we recorded a decrease from the initial value of 79,42 beats per minute to 76.92 beat per minute ($p<0.0001$, Figure 4), recorded at the final testing.

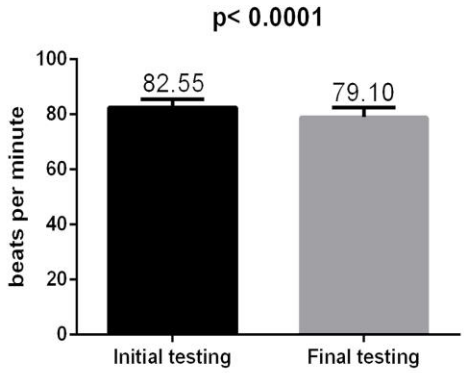

Fig. 3 Comparative analysis of the results obtained at the initial and final testing for Heart rate (GIRLS)

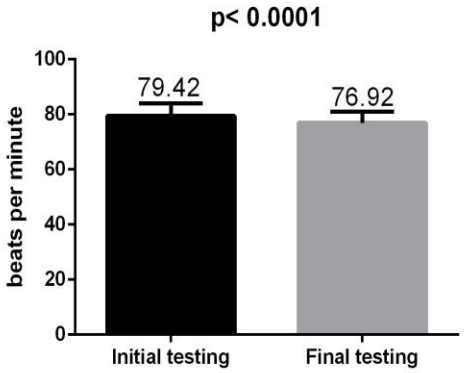

Fig. 4 Comparative analysis of the results obtained at the initial and final testing for Heart rate (BOYS)

The need for physical activity, especially for children, must be acknowledge and efforts must be made to support these kinds of practices. The early development of the children must occur as good as possible and physical activity maintains and increases the physical and mental health of the children [6, 7, 8].

Published studies, similar to our research, show that cardiovascular endurance can be improved during school lessons of physical education. For example, the study of Vega *et al*., evaluated the effects of a circuit training program, combined with a program designed to maintain the muscular and cardiovascular endurance of children between 11 and 12 years.

They divided 72 children into two groups, an experimental one (n=35) and a control group (n=37). The developed program lasted eight weeks and include an eight stations circuit (15/45 to 35/25 second of work/rest) and endurance tests (abdominal, upper-limbs and cardiovascular endurance). These parameters were measured at the beginning and at the end of the program.

The results showed that cardiovascular endurance increased significantly in the experimental group ($p<0.05$), and for the control group, the values remained unchanged ($p>0.05$). The results obtained from the circuit training demonstrated that the program was effective in increasing and maintaining both cardiovascular and muscular endurance among subjects [9].

The study published by Partavi, that investigated the effect that a 7-week rope-jump has on endurance and speed of middle school males, showed promising results. Twenty-eight participants (age 11.87±0.33-year, weight 40.30±9.72, height 1.49±0.08 m) were divided into two groups, rope-jump group (n=14) and control group (n=14). After seven weeks of training, the cardiovascular endurance and agility improved by 10.33% and 3.17%, respectively, compared to control group. The authors findings suggest that even a short program, of only seven weeks can give encouraging results and improvements of cardiovascular endurance and agility [10].

Another study, published by Faigenbaum et al. shows the efficiency of an after-school resistance training program, focused on improving physical fitness of middle school boys.

Twenty-two boys participated at the program that lasted 9 weeks and involved training session twice a week. All the subject was tested, at the beginning and at the end of the program, based on the following parameters: 10-repetition maximum bench press, flexibility, percentage of body fat, medicine ball toss, vertical jump and the progressive aerobic cardiovascular endurance run (PACER). The results showed statistically significant improvements on the vertical jump (5%), flexibility (10%), medicine ball toss (12%), bench press (15%), squat (19%) and PACER (36%) [11].

The study of Pasek *et al*., involving 220 students from fifth and sixth grades, over a period of two years, suggested that physical education lessons held outdoor increase considerably the aerobic endurance of children [12].

Conclusions

The results obtained in this study showed that the methods used in the intervention program are efficient, hence the statistically significant improvements in cardiovascular endurance for both boys and girls.

There is no doubt that physical education is an important tool that need to be better validated in order to improve the educational process. Physical education teachers must design innovative training programs that can help students remain fit and maintain at optimal level the muscular and cardiovascular endurance.

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Innovative Dimensions of Contemporary Forms of Aerobic Fitness: Analysis of Aerobic Interval Training on Young Adult (17-18 Years)

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Abstract

The study aimed to investigate the effectiveness of an interval training program that falls within the area of cardiorespiratory effort. Our goal was to test whether interval cardiorespiratory fitness sessions can produce effects similar to a classic long-distance but shorter-term cardiorespiratory endurance program. The experimental program was addressed to a group of people aged between adolescence and young adult and aimed both to optimize body weight according to BMI standards of normal weight and to significantly improve aerobic exercise capacity. The value of t Critical one-tail of the final values of BMI ($p<0.05$) shows us that the difference between the two groups is significant and the hypothesis can be confirmed. However, this result is not supported by the calculated t value (t-Stat = -1,952 so t-Stat<t critical, which shows that the hypothesis of the program's efficiency on the evolution of BMI is not fully verified. It is encouraging that the average of the final values of BMI is lower in EG (experiment group) than in CG (control group), placing these results in an average position of normoponderality (20,282) as opposed to framing near the threshold of overweight in CG (24,261). The calculation of the final values of the YO-YO test for the last shuttle demonstrated that the results obtained after the application of our program of sub-maximal moderate aerobic effort intervals, even if it registered a positive evolution, improving the aerobic effort capacity, did not obtain results with a statistically relevant level.

Using this type of aerobic fitness program can be an alternative to the classic cardio-respiratory endurance programs that include long distance running by obtaining similar results but consuming a much shorter time. These analyses give us confidence in the potential efficiency of the tested method on the evolution BMI and aerobic exercise capacity on young untrained adults, but there is a need to refine the working design and conduct new research.

Keywords: aerobic capacity; interval training; cardio respiratory effort; moderate-submaximal intensity

Introduction

The fitness industry has always been a competitive environment, where specialists within the field and within related fields have collaborated in a race against the clock for designing new workout programs, devices, and installations, alternative forms for counselling and coordinating the activity. Many "revolutionary" ideas have been launched on the market, but a small number of them have also benefitted from the generous appreciation of the public and the commercial success followed by the promotors. Among the components of the fitness program industry, the

top of the recent trends comprises interval training. The study of the aspects generated by this method is the result of a mix between the researcher's specialized field, the professional skills developed later and using new ones obtained in areas considered "interdisciplinarity" [1].

The dynamic of the practice – supported by theoretical and methodical research – has imposed two main categories of the interval training method [2]: a category is called aerobic high-intensity interval training (A-HIIT), while the other category represents the same type of training, comprising the resistance of a weight (bodyweight, weights, bars, various devices, etc), in one word, R-HIIT. Both of them involve an alternation of intense effort periods with brief partial relief intervals. A-HIIT comprises a portfolio of means through which we identify the various types of running, cycling, moderate- and high-intensity aerobic gymnastics routines, exercises using various pieces of equipment (stationary bike, treadmill, elliptical bike, etc). By contrast, R-HIIT uses calisthenic exercises, plyometric exercises, CrossFit exercises, trainings with portable weights, with progressive resistance items, and various installations or devices with neuromuscular load, all of them following a threshold or anaerobic intensity regimen.

Whereas both types of HIIT programs are popular in the fitness industry, current research focuses on R-HIIT-related issues.

Consequently, this paper provides a current standpoint regarding the issue of aerobic interval training protocols, thus delimiting the reasons for accessing such a method, its characteristics, and types of benefits.

The recent recommendations by specialists concerning physical activity include either 150 min/week of moderate exercising [3], or 75 min/week of intense PA (physical activity) [4].

Studies have shown that PA has been used successfully in the prophylaxis of over 35 chronic diseases [5], while systematic participation in a moderate – or high-intensity PA provides higher confidence concerning lower mortality rates, regardless of gender and age, compared to the absence of it [6].

Material and method

Hypothesis

H_1 of the aerobic exercise capacity among young adults without any motor experience.

H_2 Exercise interval training within the limits of aerobic effort may influence positively the regulation of bodyweight, based on the BMI values.

Subjects. Duration

The research was conducted in the period September-November 2019, within a fitness centre in the city of Iași; it took nine weeks.

In order to validate our subjects, to obtain a high homogeneity degree for the subjects within the research, and to obtain a high degree of confidence between the independent variables and the results obtained, we have created an Inclusion and an Exclusion protocol according to the recommendations within *SAGE* [7].

The subjects were selected based on the advertisements on social media (Facebook, Instagram), leaflets disseminated in the high schools of Iaşi with the assistance of PE teachers, as well as in several public spaces within the city. Using the RANDBETWEEN function (the formula = INDEX (D4:D30, RANDBETWEEN (n, n_i)) in Microsoft® Excel® 2019 MSO (16.0.13029.20232) 32-bit, 28 subjects were chosen randomly. They were divided into two groups – EG (experiment group) and CG (control group) – following the same random

algorithm, namely n=14 subjects in each group. In order to avoid potential inconsistences in the participation of volunteers or potential dropouts, we have selected 14 volunteers in each group.

We have recorded the data from all participants; the analysis of the final data concerned only the first 10 subjects in each group, who recorded the highest number of participations, but no less than 80% from the total number of working sessions conducted.

Research Design

The research was carried out based on four phases:

Phase I: selecting the subjects, identifying the specific exercises, developing the methodical design, and planning the specific contents throughout the actual period of implementation concerning the proposed design;

Phase II: getting the subjects in the EG (experiment group) used to the workout routine, to the selected exercises, as well as to the assessment protocols. At the end of this phase, the initial evaluations were conducted. They comprised as follows:

- Assessing individual bodyweight according to standardised BMI tables for the age group 17-18 years old [8];
- Applying the YO-YO ETL1 test [9], also known as Standard test or Eurofit [10], in order to evaluate the individual capacity of sustaining an aerobic effort with variable intensity. Unlike other versions of the aerobic exercise capacity evaluation, this version does not require much body load, thus being ideal for persons without much training, such as the subjects within present research. This test was chosen because the evaluation protocol features a high degree of similarity with the method of interval training with aerobic load. The final score for LLS (Last Level Shuttle) in the YO-YO ETL1 test is obtained by recording the last level of effort that could be performed (on a scale from 1-20, according to the specific protocol) and the number of shuttles performed at that level. E.g.: the level/stage reached for LLS = 12, with a number of shuttles made according to the protocol = 6. Final score of LLS = 12.6

Phase III: applying the methodical working design to the EG for nine weeks.

Phase IV: final testing in both groups; statistical analysis and result interpretation; formulating the conclusions and highlighting methodical recommendations.

Results

Our results agree with a series of researches that have studied diverse high-intensity training protocols, thus demonstrating the positive effects of this method, upon both the aerobic and the anaerobic exercise capacity, given a much shorter timeframe for exercising [11, 12].

After the final testing of the BMI (see Table 1), we have noticed a considerable decrease, towards the limit of normal weight, in the values recorded in the experiment group (EG). This stands to denote a positive influence of the workout routine created and applied in this group in what concerns the weight-related dynamic.

Analysing the evolution of BMI for control group (CG) we identified four subjects who presented at the initial evaluation a value of the BMI included in the “overweight” category.

After the final testing, we have recorded an increase in the BMI values, with the same four values included in the overweight category.

In the EG, we have noticed a positive dynamic, with a reduction of BMI values (close to the average range of normal weight). Furthermore, all four subjects from EG who were included initially in the category of borderline overweight have obtained in the final evaluation normal weight values. This difference in favour of the methodical design applied in the EG can be explained in terms of both higher efficiency and of higher attractiveness of the working design – an aspect that was able to generate a higher level of motivation and active participation in the program proposed, unlike the subjects in the CG.

Table 1. The comparison of the BMI final results

BMI Analysis of final results	*EG*	*CG*
Mean	20.282	24.261
Variance	10.99391	30.5497
Observations	10	10
Hypothesized Mean Difference	0	
Df	15	
t Stat	-1.95219	
P(T<=t) one-tail	0.03492	
t Critical one-tail	1.75305	
P(T<=t) two-tail	0.06984	
t Critical two-tail	2.13145	

The final values of BMI for Df = 15, we have obtained a table value $t_{one\text{-}tail}$ = 1.753 for p=0.0349 (p<0.05). this consolidates the statistical correlation, (a confidence degree of 95%).

It may be stated that the difference between the final values of the BMI in the two group is significant, thus confirming the hypothesis 2. The use of interval training with moderate continuous intensity may influence significantly he dynamic of the BMI.

Table 2 shows that between the two evaluation moments there is a difference in the data row mean of 1.136 in favour of the final score (see the Research design – Phase II paragraph) – a relatively important difference marking an average increase in the final LLS score by 11.38%.

The values of the dispersions are low, which suggests a concentration of data around the central value. The unidimensional critical probability for df=18 shows a value of 0.036, lower than the determined significance threshold. The unidimensional value calculated (p<0.05) is significantly lower than the T table value (-1.91139<1.734064), which is inconsistent with H_1.

This may represent a result to be more likely correlated with certain variables out of our control. In what concerns bilateral critical probability for p=0.07, it is higher than the determined significance threshold, each entails a slightly insignificant difference. Bilateral critical probability is also higher than the one calculated (2.100>-1.911), which is again inconsistent with H_1.

Table 2. Last level shuttle LLS – experiment group (EG)

LLS analyses (EG)	*Intial evaluation*	*Final evaluation*
Mean	9.981	11.117
Variance	1.743388	1.788912
Observations	10	10
Hypothesized Mean Difference	0	
df	18	
t Stat	-1.91139	
P(T<=t) one-tail	0.036005	
t Critical one-tail	1.734064	
P(T<=t) two-tail	0.07201	
t Critical two-tail	2.100922	

Following the final testing and the recording of the score obtained for the LLS, we have noticed a dynamic synchronised with the evolution of the BMI. Hence, the mean of individual final scores of the EG is 0.512 higher than in the CG. The evolution of the LLS score mean differences between the initial end the final evaluation has also recorded an advantage of 0.996 in favour of the EG. This shows that the subjects in the EG have managed to reach a better level of the aerobic exercise capacity, manifested through a higher volume of the total distance covered, of high-intensity effort duration, and of the moving speed during the effort.

Statistical analyses demonstrate that the results obtained upon applying the aerobic interval training – although having recorded a positive evolution, thus improving the aerobic exercise capacity – have failed to reach a significant statistical level. The results, in our case, may be due to random factors more than to the workout routine used. This may be explained by the fact that the subjects were selected from among persons without any motor experience and with low exercise capacity. Therefore, the adjustment to the volume and mostly to the intensity of the effort proposed was not a positive one. A readjustment of the exercise parameters in the sense of a continuous adaptations to the momentary individual availabilities may present a measure able to improve the results obtained for the methodical design proposed.

Upon analysing the data from the CG – which followed a classic average-duration cardiorespiratory endurance routine – we have noticed a relatively small difference of the means calculated in the two moments of the evaluation. In the final testing (Table 3), we have obtained a small difference of 0.14, namely an increase in the exercise capacity by 1.33%.

Upon comparing the percentage increase of 11.38% recorded by the EG data, it may be stated that there is a relatively great difference.

Table 3. Last Level Shuttle LLS – control group (CG)

LLS analyses (CG)	*Initial evaluation*	*Final evaluation*
Mean	10.462	10.602
Variance	3.900218	3.254684
Observations	10	10
Hypothesized Mean Difference	0	
df	18	
t Stat	-0.16551	
P(T<=t) one-tail	0.435193	
t Critical one-tail	1.734064	
P(T<=t) two-tail	0.870387	
t Critical two-tail	2.100922	

Statistical data show a result exceeding the determined significance threshold (0.43>0.05), an aspect failing to provide a high confidence degree of the results obtained. As for the CG, the t-value calculated is also lower than the critical value (-0.16551<1.734064). This does not support the quality of the program applied. It is the same situation encountered in case of subjects performing interval training. The bilateral critical probability calculation shows for a significance threshold of 0.05 a t-value calculated lower than the table value (-0.16551<2.100922). This also supports a low quality of the workout routine in the subjects of the CG, thus invalidating the program chosen.

The unsatisfactory statistical results in the CG may denote a lack of motivation or active implication of the subjects throughout the program. This may be explained by the monotony of average or long endurance workout routine, which does not fit the dynamic behaviour of young 17-18-year olds. Of course, this remains a more profound research direction for scientific validation.

Whereas the statistical analysis has not shown a high degree of confidence in the actuation system used in both groups, a comparison of the LLS score in the final evaluation provides an optimistic touch (see Table 4).

Table 4. Comparative analysis of the final score for the LLS

LLS final score	*EG*	*CG*
Mean	11.117	10.602
Variance	1.788912	3.254684
Observations	10	10
Hypothesized Mean Difference	0	
df	17	
t Stat	0.725165	
P(T<=t) one-tail	0.239107	
t Critical one-tail	1.739607	
P(T<=t) two-tail	0.478215	
t Critical two-tail	2.109816	

The difference of the final mean score for the LLS is 0.515 in favour of the EG. This difference shows a result improved by 4.62% for the values of the EG. For a significance threshold ($p>0.05$), we have obtained a t value calculated lower than the critical table threshold ($0.72<2.10$) which fails to support a significant difference between the results of the two groups.

Discussions

The interval training method enjoys wide appreciation among fitness lovers. This is due to the multitude of benefits, to the dynamic features and to the attractiveness of the routines, as well as to the short duration [13, 14, 15].

Our effort – motivated by this reality – focused on analysing the effects of a different interval training design: performing a type of interval training within the peak limits of the aerobic threshold and applied to a group of untrained young adults. This represents a novelty of the fitness industry landscape. Most offers include interval training programs with high and maximal load and a neuromuscular working regimen. Fitness clubs rarely include cardiorespiratory interval training routines. This may also justify the relatively high dropout rates from persons who fail to cope with a workout based on intense load, pertaining to threshold or anaerobic effort regimen.

The analysis of the final BMI data for the two groups shows unidimensional critical probability with a calculated value lower than the table value ($0.03<0.05$); the significant difference may confirm hypothesis H_2. However, this result is not supported by the t value calculated (t-Stat=-1.952, so t-Stat<t-critical), which shows that the hypothesis of the efficiency of the program on the BMI evolution is not entirely validated. The encouraging aspect is that the mean of the final BMI values is lower in the EG compared to the CG, which includes the results in a mean position of normal weight (20.282), unlike the inclusion near the overweight threshold, in case of the CG (24.261). These analyses offer us confidence concerning the effectiveness of aerobic interval training with moderate continuous intensity concerning a positive influence of the dynamics of the BMI. In order to demonstrate it through a high confidence degree, the working design should be refined and new research should be conducted.

Thus, upon calculating the final values for the YO-YO ETL1 test concerning the last effort level, we have not found a significant difference ($p=0.47$, so $p>0.05$) between the two groups.

However, the higher evolution of the BMI in the EG – corroborated with a progress, even modest – provides us with an optimistic view for the future.

Conclusions

Whereas the statistical processing of the data obtained fails to provide a higher degree of appreciation for aerobic interval training, we believe that this method represents an efficient alternative for a certain category of subjects who cannot access routines with maximal intensity or exclusive/dominant neuromuscular load. Furthermore, it provides a positive horizon concerning the management of bodyweight, too. These statements are also supported by other studies that have approached similar topics [16, 17].

A continuation of this study by using a calibrated research in what concerns the management of effort parameters, the specific exercises, and the methodical design used represents a reasonable choice. It has the potential of leading to significant findings, which may contribute to a support for this method as a safe and effective alternative of accessing fitness programs in case

of young adults, either at the beginning of an active life, or among those who cannot cope with intense interval training, involving neuromuscular load.

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Changes in the Values of the Explosive Force of the Lower Limbs in Rugby Tag Players (U12)

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Abstract

The need to apply specific training programs in the training of the representative team of the school, is a point of interest among teachers of physical education and sports. The application of customized training programs according to the individual needs of athletes, indicates a qualitative increase in the training process and also in sports performance.

The aim of this paper is to appreciate the way in which the muscular adaptation of rugby tag players to a specific training program takes place.

The study aimed at monitoring 16 subjects (8 girls and 8 boys), aged 11-12 years, during 3 effective months of work (September 2019-December 2019).

The evaluation of the explosive force was performed by means of the standing long jump, as well as the Sargent test. Following the statistical analysis of the data obtained after testing the researched parameters, there were statistically significant differences ($p<0.05$), both for the standing long jump and for the Sargent test. Thus, the training program proposed and implemented led to an increase in the explosive force of the lower limbs.

Keywords: rugby tag, standing long jump, Sargent test, children, training

Introduction

The need to apply specific training programs in the training of the representative team of the school, is a point of interest among teachers of physical education and sports. The application of customized training programs according to the individual needs of athletes, indicates a qualitative increase in the training process and also in sports performance.

Physical education and sports are included in everyday life in order to accelerate those psychological and physical abilities that could influence the performance, no matter the domain [11]. Athletic activity is the only way to systematically and continuously develop sporting values and the desire to compete induced in the physical education lesson where students receive a knowledge system that forms a true theory of competition [1].

Some specialists in the field noted that a rationally organized training process contributes to the harmonious development of the motor qualities of young people and encourages them to engage in sports, in particular, rugby [3].

In the recent period, rugby has evolved considerably worldwide and nationwide [19]. In our country, rugby tag was introduced in the school curriculum in 2017 as a compulsory sport at the gymnasium level.

Rugby players must have certain intensely developed physiological skills like strength, power, speed, agility and aerobic power, due to the competitive and spectacular nature of the game [16].

The originality and specificity of the game of rugby lies in the fact that it offers the widest opportunities to express the attributes of human, physical, mental, intellectual and moral qualities in a stimulating and deeply dynamic legislation [7].

Of all the forms of practicing this sport, rugby-tag is the most accessible, as it is a contactless sport that can be safely practiced during physical education classes, after class or on weekends in a recreational environment [17].

Essentially, rugby is a sport for all sizes and shapes, but, at the same time, it is a sport of individual ascriptions and skills [18].

Rugby tag was introduced on 15 lessons of physical education in 2018, and some authors proved that the speed-force work was developed by means of playing tactical combinations, in which pupils of 12-13 years must quickly and accurately transfer rugby ball to each other [4].

During jumping, the foot acts as a compatible mechanism and as a rigid lever being the main means of interaction of the body with the ground [14]. In jumps, the ankle joint is vital for maintaining posture and movement [15].

Some specialists considered that the standing long jump is the most valid field-based muscular fitness test compared with isokinetic strength exercises [2]. Other research shows that this assessment tool is useful in schools and educational circles, being a test applied to all age categories [13]. Due to its simple and time-efficient implementation that does not require any equipment, it is routinely used by coaches of several sports for talent selection and prediction of potential [6].

Regarding the assessment of jump height, some authors claim that the Sargent jump test is a valid and reproducible instrument for measuring the explosive strength in homogeneous groups [9]. The ability to jump vertically is appreciated by some authors as a measure of muscle strength and by others as a measure of coordinate activity of lower limbs [24].

Methodology

The aim of this paper is to appreciate the way in which the muscular adaptation of rugby tag players to a specific training program takes place.

We believe that by applying a program adapted to the particularities of rugby tag players, age level U12, an improvement of the explosive force of the lower limbs will be obtained.

The study aimed at monitoring 16 subjects (8 girls and 8 boys), aged 11-12 years, during 3 effective months of work (September 2019-December 2019). The trainings took place twice a week and lasted 90 minutes.

In the first training, after the warm up adapted to the specifics of the rugby game, were introduced the circuits for the development of muscle strength, and in the second training session of the week, the circuits were replaced with games for development the muscular strength specific to the game of rugby.

The evaluation of the explosive force was performed by means of the standing long jump, as well as the Sargent test.

For standing long jump test, each subject stood on the starting line with their legs parallel and feet shoulder-width apart. Children were instructed to bend the knees (the depth of the flexion was self-selected) and bring the arms behind the body. Then, with a powerful drive they extended their legs, moved the arms forward and jumped as far as possible. Children performed

two jumps with about 2 min rest in between, and the best trial was recorded [20], and the jump length was measured from the line to the heels. [25]

Vertical jump height for Sargent test was calculated as the distance from the highest point reached during standing and the highest point reached during the vertical jump. Vertical jump height was measured to the nearest 0.1 cm with the average value obtained from two trials used as the vertical jump score [12].

The collected data were centralized and then analyzed using Graph Pad Prism 6 software.

Following the statistical processing, the descriptive values of the data series were generated, which included the minimum and maximum values, the mean, the standard deviation and the coefficient of variability. For testing the hypothesis, we compared, using the Student's t-test, initial results with the final ones for each sample. The degree of significance of the Student's t-test is $p<0.05$.

Results

Following the statistical analysis of the data obtained after testing the researched parameters, there were statistically significant differences ($p<0.05$), both for the standing long jump and for the Sargent test.

According to Table 1, our results suggest that both groups of boys and girls are homogeneous by a statistical point of view, due to the values of the coefficient of variation.

Table 1. Standing long jump and Sargent test- statistical results

	Standing long jump				Sargent test			
	B I	B F	G I	G F	B I	B F	G I	G F
Minimum	150,0	160,0	148,0	160,0	28,00	30,00	28,00	32,00
Maximum	190,0	200,0	187,0	200,0	45,00	48,00	40,00	45,00
Mean	175,3	184,3	167,9	175,9	37,14	39,71	35,13	38,25
Std. Deviation	16,09	14,84	12,30	12,67	6,440	6,291	4,486	4,621
Coefficient of variation	9,18%	8,05%	7,33%	7,20%	17,34%	15,84%	12,77%	12,08%

At standing long jump, at the assessment of the girls, Fig. 1. shows that the mean gets a progress of 8 cm from the initial value 167,9 cm to the final value 175,9 cm. According to Fig. 2., the boys obtained a progress of 9 cm. We can notice that the maxim value at the final assessment of the two groups is the same, 200 cm.

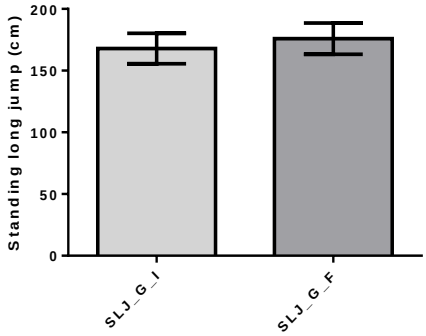

Fig. 1. Standing long jump- girls' results

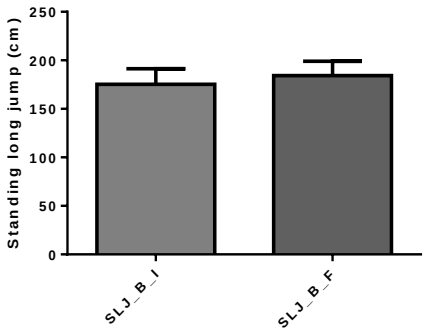

Fig. 2. Standing long jump-boys' results

Regarding the Sargent test, according to the two figures (Fig. 3. and Fig. 4.), the progress of the girls is 3,12 cm, and of the boys is 2,57 cm. We can see that boys perform better than girls, both in the initial and in the final evaluation.

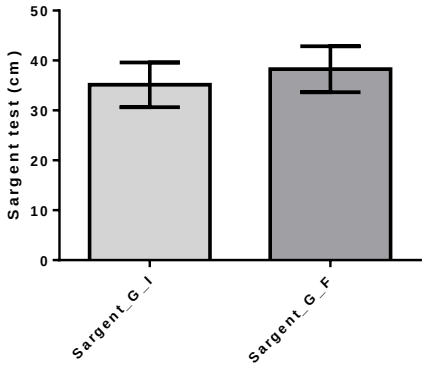

Fig. 3. Sargent test-girls' results

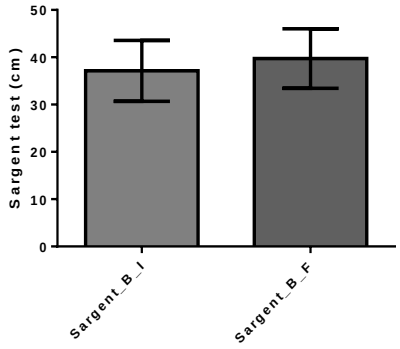

Fig. 4. Sargent test-boys' results

Discussion

In 2019, in Western Australia, 3293 subjects were tested, and the results of this showed that during adolescence the activation in a sports club helps to improve motor skills and contributes to the formation of an active and healthy lifestyle [10]. Comparing with our study, where the mean of the initial results of the two groups is 171.6 cm, in this study the mean of the results is 164.5 cm, at standing long jump assessment.

A study from 2019 from China says that BMI is in correlation with development of motor skills, including long jump and high jump [5].

In 2015 in Norway, 100 athletes were tested with Sargent Test and standing long jump, and we can say that female and male athletes achieved the same performance in jumping events, up to the age of 12 [23]. In this study, long jump is improved at boys with 35 cm and with 36 cm at girls, and at the Sargent test, the boys progressed with 11 cm and the girls with 10 cm.

Also, we can compare our results with a study conducted in 2017 in Kosovo where 195 boys and 159 girls were investigated [22]. At standing long jump assessment, mean of boys is 175.6 cm and mean of girls is 130.2 cm, and comparing with our results, boys' performances are equal and our girls' performance are better with 37.7 cm. Regarding the Sargent test, boys' performances are lower with 1.46 cm, and our girls' performance are better with 5.83 cm.

Another research realised in 2006 suggest that when performing vertical jump, those individuals who perform dynamic stretching will perform better than those who perform static stretching [21].

In 2013, the standing long jump performances were significantly different between boys and girls, with all age groups at a 0.01 significance level. The boys performed better than the girls in each age group. The mean difference increased as the age increased, depicting a prominent variance in muscular strength between boys and girls at age 12 [8].

In a study realised in 2012, the 2-way ANOVA of standing long jump performance revealed only a marginally significant difference ($p=0.09$) of standing long jump between boys and girls at the age of 12 [20].

Conclusions

The results show that at the both assessments, standing long jump and Sargent test, all the subjects have made progress. Thus, the training program proposed and implemented led to an increase in the explosive force of the lower limbs.

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Study on Flexibility Testing in Middle School Students

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Abstract

Introduction

The positive influence of physical activities on mental and physical development of children has long been a paradigm in the world of sports pedagogues that requires an adaptation of pedagogical methods to all educational disciplines. By targeting the child's motor skills that involve their development, it can improve and complete the functional structure of tissues, stimulate overall growth and development and lead to a perfect cooperation and integration of organic components. Motor evolution is closely intertwined with other fields of education and development, such as social and emotional, but also in terms of music and language.

Purpose

Improving the physical education process at the gymnasium level both in terms of training and assessment.

Hypothesis

It is assumed that using two methods for evaluating flexibility in the previous plan we obtain more accurate information about the level of education/development of this skill. Flexibility is a genetically conditioned skill; it is perfectible and regresses with age.

Material and methods

Joint mobility is measured in degrees, knowing that the movements of the musculoskeletal system make different angles between them, but considering also the soft parts of the body we used two other tests, namely "Stand and reach test" and "Sit and reach test". Our sample of 202 students, 84 girls and 118 boys from Middle School nr. 21 Timișoara, aged between 11-14 years led us to obtain more accurate information about the level of flexibility's development. The study took place between October and December/March. We applied a pretest and a posttest and the data were recorded and statistically processed.

Results and conclusions

The data were recorded for each class, separately boys-girls and the diagrams highlighted the progress or regression. The collected data undoubtedly demonstrate the increase in flexibility of all groups, both boys and girls.

Keywords: Paradigm, flexibility, middle school, test

Introduction Section

Flexibility, understood as suppleness, mobility and elasticity, may be defined as the capacity of the human body to perform motor acts with a large degree of amplitude [1], [2], [3], [4]. It is also the motor skill considered to be at the border between conditional and coordination skills which refer both to the joints and to their capability to move, limited by the shape of the joint surfaces, as well as to elasticity, as the fundamental physiological property of muscle fibres to return to their length after a contraction or passive stretch [5], [6].

This capability is genetically conditioned, it is little perfectible and it regresses with age [4].

Unfortunately, it's a capability which is not of great interest although it is part of the general well-being. Increasing flexibility has beneficial effects on the quality of life and functional independence [7]. School age is the period when students make great progress in terms of flexibility, it is the age when the development of motor qualities may start, being called the age of the first performances.

We have approached this topic starting from the following premises: the development of motor qualities is a fundamental objective of physical education in school; the increase of physical education teaching efficiency in middle school and the creation of a physical education model at the level of each middle school grade; the lack of specific content for the development of the school curricula in force [8], [9], [10].

Purpose and hypothesis

The improvement of the training–educational-evaluative process in physical education at the middle school level.

It is assumed that, by using two methods for retrospectively assessing flexibility, more accurate information can be obtained on the level of education/development of this capability.

Material and methods

The experiment was conducted on a sample of 202 students from Middle School no. 21 Timisoara, aged between 11 and 14 years. According to gender, the 202 subjects are divided into 84 girls and 118 boys. Out of the 202 subjects, 57 are in the 5th grade, 56 in the 6th grade, 47 in the 7th grade, and 42 in the 8th grade (see Fig. 1.)

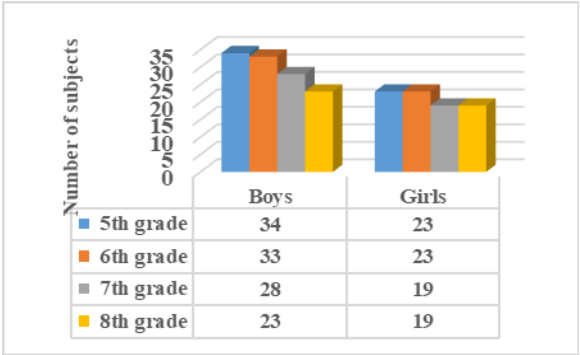

Fig. 1. Chart showing the composition of the research sample

The 202 subjects were tested for flexibility at the level of the lumbar spine using two tests: the "Stand and reach test" and "Sit and reach Test" indicated by the school curricula in force [11], [12]. Two assessments were performed, one at the beginning of the study, the pre-test (T_i) and one at the end, the post-test (T_f). A motor content adapted according to the research objectives was applied between the two assessments. The used methods and means were adapted to the middle school level.

Results and discussions

After the application of the two tests (P1 – "Stand and reach test" for testing mobility in the standing position, P2 – "Sit and reach Test" for testing mobility in the sitting position), data were recorded and statistically processed. Data recording was performed for each grade level, for boys and girls, separately. The calculated statistical indices were: the arithmetic mean ($\bar{x}$), standard deviation ($\sigma\pm$), coefficient of variation (CV%), and "T" test [12], [13] [14].

All the collected data were included in table 1, 2, 3, 4 and the statistical analysis of them resulted into the following findings:

Table 1. Mean values for initial and final Stand and Reach Test

Nr. crt	Grade	Gender (number)	Stand and reach Test (T1-cm.)		
			Initial Test	Final Test	Difference (cm.)
1	5th grade	Boys (34)	2.26±**2.31**	4.14±**1.95**	1.88
		Girls (23)	4.65±**3.08**	6.91±**3.86**	2.26
2	6th grade	Boys (33)	2.63±**3.57**	6.24±**2.73**	3.61
		Girls (23)	4.43±**4.47**	7.04±**4.10**	2.57
3	7th grade	Boys (28)	0.46±**2.49**	3.67±**1.62**	3.21
		Girls (19)	1.57±**2.47**	4.15±**2.30**	2.58
4	8th grade	Boys (23)	0.13±**2.15**	3.13±**1.80**	3.00
		Girls (19)	2,26±**3.33**	5.00±**2.50**	2.74

Table 2. Mean values for initial and final Sit and Reach Test

Nr. crt	Grade	Gender (number)	Sit and reach Test (T2 -cm.)		
			Initial Test	Final Test	Difference (cm.)
1	5th grade	Boys (34)	4.17±**2.47**	6.38±**2.46**	2.21
		Girls (23)	7.04±**4.16**	9.52±**3.95**	2.48
2	6th grade	Boys (33)	4.96±**4.17**	8.48±**3.71**	3.52
		Girls (23)	6.47±**4.29**	9.78±**4.55**	3.31
3	7th grade	Boys (28)	2.71±**3.04**	5.85±**2.04**	3.14
		Girls (19)	4.94±**4.14**	7.36±**3.31**	2.31
4	8th grade	Boys (23)	1.78±**2.35**	5.08±**1.99**	3.30
		Girls (19)	4.63±**3.31**	7.52±**2.98**	2.89

The 34 subjects in the 5th grade obtained in test 1, a difference of 1.88 cm. and in test 2, a difference of 2.21 cm. The difference between the means is significant, both in test 1, ($p=0.000683$; $p<0.05$), with a probability of 95%, and in test 2, ($p=0.000559$, $p<0.05$).

The 23 girls in the 5th grade had in test 1, a difference of 2.26 cm. and in test 2, a difference of 2.48 cm. The difference between the means is significant, both in test 1, ($p=0.037658$; $p<0.05$), with a probability of 95%, and in test 2, ($p=0.049079$; $p<0.05$).

The 33 subjects in the 6th grade obtained in test 1, a difference of 3.61cm. and in test 2, a difference of 3.52 cm. The difference between the means is significant, both in test 1, (p=2.58894E-05; p<0.05), with a probability of 95%, and in test 2 (p=0.000704; p<0.05).

The 23 girls in the 6th grade obtained in test 1, a difference of 2.57 cm and in test 2 a difference of 3.31 cm. The difference between the means is significant, but borderline in test 1, (p=0.049847; p<0.05), and significant in 2, (p=0.017232; p<0.05).

At the 7th grade level much, lower values are recorded in T_i, although in T_f they will be significantly higher.

Thus, the 28 boys obtained a difference of 3.21cm and in test 2 the same subjects obtained a difference 3.14 cm. The difference between the means is significant, both in test 1, (p=7.40529E-07; p<0.05) with a probability of 95%, and in test 2, (p=4.33942E-05; p<0.05).

The 19 girls from the 7th grade had a more significant decrease in the values of flexibility compared to 5th and 6th grade students. Thus, in test 1, the difference being of 2.58 cm. and in test 2 the same subjects obtained a difference of 2.31 cm. The difference between the means is significant, in test 1, (p=0.002599; p<0.05), and insignificant in test 2, (p=0.060872; p>0.05).

The results obtained for the 8th grade is the following: the 23 boys obtained in test 1, a difference of 3 cm. and in test 2, a difference of 3.30 cm. The difference between the means is significant, both in test 1, (p=2.16271E-06; p<0.05), with a probability of 95%, and in test 2, (p=9.198E-06; p<0.05).

The mean values of the 19 girls in the 8th grade is higher than those obtained by the boys of the same age and they are as follows: in test 1, the difference is of 2.74 cm. and in test 2 the same subjects obtained a difference of 2.89 cm. The difference between the means is significant, both in test 1 (p=0.008978; p<0.05) and in test 2, (p=0.009113; p<0.05).

Table 3. Mean values for initial test, comparatively, Stand and Reach/Sit and Reach

Nr. crt	Grade	Gender	Test 1	Test 2	Difference
			Initial Test		
1	**5th grade**	Boys (34)	2.26±**2.31**	4.17±**2.47**	1.91
		Girls (23)	4.65±**3.08**	7.04±**4.16**	2.39
2	**6th grade**	Boys (33)	2.63±**3.57**	4.96±**4.17**	2.33
		Girls (23)	4.43±**4.47**	6.47±**4.29**	2.04
3	**7th grade**	Boys (28)	0.46±**2.49**	2.71±**3.04**	2.25
		Girls (19)	1.57±**2.47**	4.94±**4.14**	3.37
4	**8th grade**	Boys (23)	0.13±**2.15**	1.78±**2.35**	1.65
		Girls (19)	2,26±**3.33**	4.63±**3.31**	2.37

The results of the two tests were also compared in table 3 and 4 as following: in T_i the 34 subjects in the 5th grade obtained a difference of 1.91 cm.; in T_f the 34 subjects obtained a difference 2.24 cm. The difference between the means is significant both in T_i (p=0.001895; p<0.05), with a probability of 95%, and in T_f (p= 0.000123; p<0.05).

In T_i the 23 girls in the 5th grade obtained a difference of 2.39 cm.; and in T_f the 23 girls obtained a difference of 2.61 cm. The difference between the means is significant, both in T_i (p=0.035976; p<0.05), with a probability of 95%, and in T_f, (p=0.032182; p<0.05). Fig. 2 presents in a comparative way the data obtained for the group of boys in the pre-test, for test 1 and test 2.

Table 4. Mean values for final test, comparatively, Stand and Reach/Sit and Reach

Nr. crt	Grade	Gender	Test 1	Test2	Difference
			Final test		
1	**5th grade**	Boys (34)	4.14±**1.95**	6.38±**2.46**	2.24
		Girls (23)	6.91±**3.86**	9.52±**3.95**	2.61
2	**6th grade**	Boys (33)	6.24±**2.73**	8.48±**3.71**	2.24
		Girls (23)	7.04±**4.10**	9.78±**4.55**	2.74
3	**7th grade**	Boys (28)	3.67±**1.62**	5.85±**2.04**	2.18
		Girls (19)	4.15±**2.30**	7.36±**3.31**	3.21
4	**8th grade**	Boys (23)	3.13±**1.80**	5.08±**1.99**	1.95
		Girls (19)	5.00±**2.50**	7.52±**2.98**	2.52

The results of the two tests were also compared as following: in T_i the 33 subjects in the 6th grade obtained a difference of 2.33 cm.; in T_f the 33 subjects obtained a difference of 2.24 cm.

The difference between the means is significant, both in T_i ($p=0.019226$; $p<0.05$), with a probability of 95%, and in T_f ($p=0.007663$; $p<0.05$).

In T_i the 23 girls obtained a difference of 2.04 cm.; in T_f, the 23 girls 6th grade obtained a difference of 2.74 cm. The difference between the means is insignificant in T_i ($p=0.129131$; $p>0.05$), and in T_f it is borderline, ($p=0.041948$; $p<0.05$).

Comparatively, the two tests present the following values: in T_i the 28 subjects in 7th grade obtained a difference of 2.25 cm.; in T_f the same subjects obtained a difference of 2.18 cm.

The difference between the means is significant, both in T_i ($p=0.00447$; $p<0.05$), with a probability of 95%, and in T_f ($p=6.54671E-05$; $p<0.05$).

In T_i the 19 fetes in 7th grade obtained a difference of 3.37 cm.; in T_f the same girls obtained a difference of 3.21 cm. The difference between the means is significant, both in T_i ($p=0.005446$; $p<0.05$), and in T_f ($p=0.001766$; $p<0.05$).

Comparatively, the two tests present the following values: in T_i, the 23 subjects in 8th grade obtained a difference of 1.65 cm.; in T_f the same subjects obtained a difference being of 1.95 cm.

The difference between the means is significant, both in T_i ($p=0.007366$; $p<0.05$), with a probability of 95%, and in T_f ($p=0.001396$; $p<0.050$).

Comparatively, the two tests present the following values: in T_i the 19 girls obtained a difference of 2.37 cm.; in T_f the 19 girls obtained a difference of 2.52 cm. The difference between the means is significant, both in T_i ($p=0.039469$; $p<0.05$), with a probability of 95%, and in T_f ($p=0.009725$; $p<0.05$).

By also examining the values obtained for the coefficient of variation (CV) we have found that all samples studied are not homogenous and present an excessive data scattering.

Comparing the data of our experiment with data from other studies and research carried out on the same topic [15], [16] [17], we can state that the subjects tested by us present a relatively low level of flexibility, which means that more attention should be paid to this capability at the middle school level. The data in the accessed studies are of reference for ages between 16 and 19 years, and our subjects are students aged between 11 and 14, therefore they should present higher values.

Conclusions

After having applied the two tests for assessing flexibility: “Stand and reach Test” and “Sit and reach Test”, performed in two phases, i.e., the pre-test and post-test, we recorded the data and performed a statistical analysis thereof. The results have revealed the following aspects:

- regarding the progress achieved, expressed by the difference between T_i and T_f, both in test 1 and in test 2, the smallest progress was recorded in the group of boys in the 5th grade (1.88cm and 2.21 cm), and the greatest progress in both tests was achieved by the boys in the 6th grade, i.e., 93.61 cm and 3.52 cm.;
- regarding the difference between the two tests, when comparing T_i/T_f – the values of test 1 are smaller than the values of test 2;
- the application of the "T-test" allows us to state that the results are significant, therefore the hypothesis is validated.
- Although the hypothesis is validated, our data are not satisfactory, if we compare them with the data obtained in other studies.
- The study proves that joint mobility and muscle elasticity can be educated and are perfectible, provided that systematic action is taken and that the effects of a good flexibility of all joints in the body are acknowledged.

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Bullying in Schools. How Physical Education Classes Reduce it

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Abstract

The main purpose of this study can be divided in two parts. The first one is to assess the bullying situation from the gymnasium students' point of view in order to have a better perspective about their experiences, the implication of teachers and parents to find the best solutions for helping them, and also how frequent bullying situations appear in their life. In the second part, we are trying to observe if the physical education classes can reduce these behaviors because it is well known that physical activities have a cohesion implication in the social life of people, this giving the opportunity to the group to work together and at the same time to improve the manner in which everyone can deport oneself.

Some of the objectives of the study are to find the target group, to apply a questionnaire that has items who can gives us the information about the bullying situation, and also to see from the children point of view if physical education classes can bring a general positive interaction with one another through its unitary character.

This article is seen as a starting point for a much ampler research in order to notice if physical education classes can reduce the bullying situation in schools, especially in gymnasium level.

Keywords: bullying, physical education, children, cohesion

Introduction

Bullying situation is constantly causing more and more problems, due to the differences between social classes that has the tendency to induce to the young generations a wrong perspective about the people around them.

As Smith (2015) states, bullying in considered to be an aggressive behavior with an imbalance of power between the bully and the one who is being bullied. The interest of many researches, such as Schneider (2012) and Hugues (2017), especially in the last years, has increased massively one of these reasons being the appearance of cyberbullying this leading to high risk of being bullied amongst different groups. Some suffer from bullying and the ones who profane de bulling are often socially skilled and can obtain short-term benefits form this type of behavior.

As Wolke (2011) highlights, family environment, school class, entourage can influence for sure the degree of involvement. As Kristensen (2003) affirms coping strategies were made against bulling in the past years with some results of success and Benatov (2019) by accumulating evidence strongly suggests that bullying victimization poses a major risk for children's and adolescents' socioemotional development.

Olweus (1993) sees bullying as a systematic abuse of power being defined as an intentional aggressive behavior that implies harmdoing by peers that carries it out, behavior that can lead to

further problems, in which we can include the impossibility of the person to join a social group in on short and even long term.

Bullying can take different form. If we are to speak about direct bullying, here we can include physical and verbal acts of aggressivity such as hitting, name calling, and stealing personal belongings. In the case of indirect bullying we can address to social exclusion, for example "you are not invited", "you can't play with us", and also rumor spreading (Wolke, 2000). Children often can be the victims of bullying and also can be the one who take part in this process as (Haynie, 2001), and this can be triggered by certain factors such as family education, family background.

As (Wolke, 2015) affirms, it has been highlighted that the conditions that nourish an increased prevalence of this behavior and the appearance of hierarchies in classrooms, in family environment, or even in the nations case, can increase the bullying stability of bullying victimization over time.

We can agree to the affirmation of Olthof (2011), through which is stated that bullying is being found in all societies, no matter the country or continent, not even the social blanket and can include modern societies as well as ancient civilizations. It is considered to be an evolutionary adaptation that can give a certain person or a group to obtain a higher social status and dominate the ones around them as well as to be able to access resources, to secure the hierarchy in order to be sure of the survival factor, reduce stress and allow to get in touch with more opportunities. It is said that bullies are quite the strategic type and as Hawley (2008) states they achieve this by promoting acts of aggressiveness and a prosocial behavior to be able to heighten a power position, by making the bullied dependents by their inability to respond back or to withdraw from the situation. Woods (2009) also affirms that these bullies tend to be popular, to have a good social condition and an increased emotional understanding/maturity.

Also, Wolke (2001) has shown that bullies do not have a conduct disorder. Furthermore, bullies are being found in all groups, no matter the ethnicity and economical status. On the other side Camodeca (2003) highlights that victims tend to choose to withdrawn from conflicts, to be unassertive, emotionally sensitive, and poor social and emotional understanding.

It is well known that physical exercises can offer the possibility for a group or for people generally speaking to integrate and also to create bonds that can last outside the courts. The implication of the physical education classes is being correlated with the reductions of the bullying process in this article by gathering information from the opinion of the children questioned in order to be able to see if really there is a reduction in these aggressive behaviors by practicing regularly these activities during PE classes.

Physical activities in school environment can help children create a better communication channel, activities such as rugby tag an activity that children enjoy and as Oprean (2019) stated is an activity that can be practiced in modest conditions, on any surfaces and does not require special skills of some kind. Activities such as these can enroll students to come to school more frequently, and avoid abandonment that represents a serious situation and needs to be taken in consideration, as Puni (2012) affirmed. The health state can be improved by avoiding to develop pathological conditions and such as Lucaci (2018) stated, it should be highl ined that besides physical and visceral problems, people suffering from obesity may experience certain psychological symptoms such as depression, this could be the case even in the of children.

Purpose and objective

The purpose of the study is on one side to assess the situation created by bullying in different schools in Romania, and also to see if the physical education classes can reduce them by creating a safe environment for children no matter their background.

A first objective of this article is to assess the bullying situation in schools, especially in the gymnasium area, the purpose of this objective being the possibility of having an overview on this type of behavior.

As another objective that can be highlighted in this research, is to identify the children that may be inclined to have the traits of a bully by taking in consideration factors as family background and entourage, factors that can influence one's way of acting.

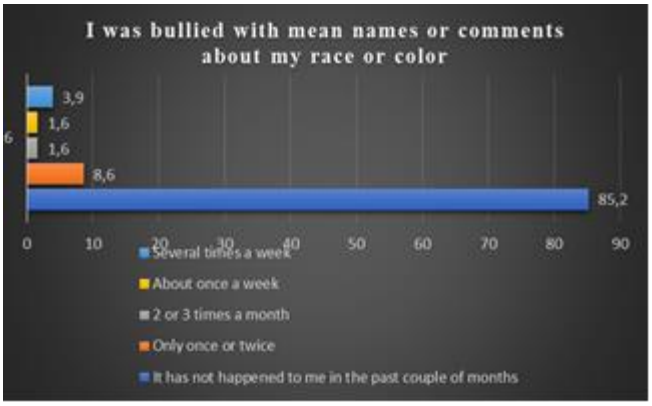
The third objective is to observe is there is a correlation between bullying and physical education classes, in the way that physical activities may help reducing these kinds of comportments.

Material and method

In this research it has been use the Olweus (1996) questionnaire, that had been applied in the first semester of the former school year, data being interpreted to a number of 128 gymnasium children from three schools, two of them in Iași and the third one in Bucharest, in order to assess the bullying situation. There were also used items in a second questionnaire, that contained aggregate items that were interpreted by percentage with the aim of knowing from the children's point of view if physical education classes can reduce these types of behaviors.

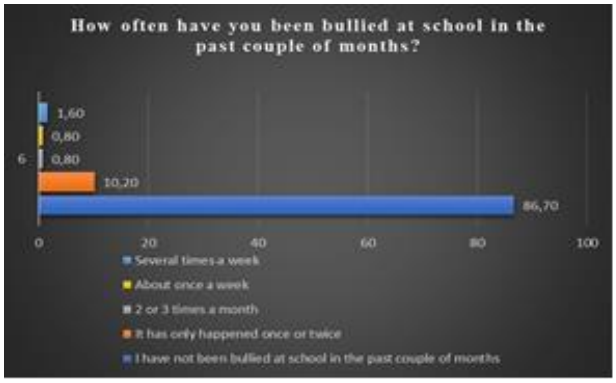
Results

The homogeneity of the assessed group and as it can be seen, from the 128 children, 47,7 are girls, and 52,3 are boys, also the age ranging from 11 to 14 years of age the average being of 12,8, and the standard deviation of 0,72 years old for the wholesome group.



Graphic 1. The prevalence of the bullying situation

Graphic 2. Bullying situations



Graphic 3. Other bullying aspects

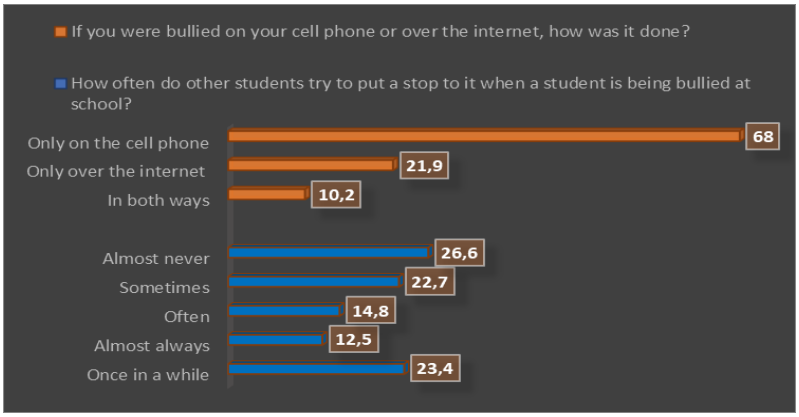
Graphic 4. Negative actions of the bully

Graphic number two highlights the prevalence of the bullying behavior in the past months, in the case of this question, the students replied that 86,7% of them have not been bullied, 10.2% stated that it only happened once or twice, 0,8% affirmed that it happened 2 or 3 times a month, 0,8 said that this happened approximately once a week and 1,6% suffered from bullying multiple times a week.

Graphic number 3 shows more specifically the bullies did to them, from stealing personal things to the extent of excluding them from their group of friends or ignored them completely and the results were as it follows: 81,3% stated that it never happened in the past months, 15,6% only one or three times, 0,8% said that it happened two or three times a month, also 0,8% suffered from this type of behavior approximately once a week, and 1,6 percent suffered from bullying multiple times a week.

Graphic number four, shows the responses of children when asked if they were harassed or victimized with nicknames or comments about their family or physical aspect, the answers being in this proportion: 85,2% – never happened in the past months, 8,6% – only once or twice in the past months, 3,9% – two or three times a month, 0,8% – once a week, 1,6% – multiple times a week.

Graphic number five wanted to highlight exactly what the bullies did to them, the responses being addressed also for personal belongings such as money, and also the behavior of the bully if he/she destroyed other personal belongings.



Graphic 5. Online bullying/The implication of others

Most of them stated that this never happened to them in the past months. It was also addressed the cyber bullying situation in the case of these gymnasium students, the responses being in the

following percentages: 68% said that it only happened on the cellphone, 21,9% said that the bullying appeared only on the internet, and 10,2% said that it happened both ways. This shows us that not only during the classes these situations can happen, many of them being influenced by the online area.

When questioned about the intervention of other students when these kinds of situation happened, the responses were as presented in the graphic that 26,6% of almost never intervened when a colleague was being bullied, 23,4% said that others wanted to help from time to time, 22,7% – sometimes, 14,8% – often, 12,5% – almost always. We can see that the highest percentage, unfortunately, shows that almost never other students try to intervene when they see another colleague being bullied, the main reason being the fact that they are afraid that this kind of situation can happen to them if they try to help.

Discussion

In the modern day it is of a high importance to understand all the situations that the young ones are going through in order to choose the best means and methods for helping them in rough situations. As stated before, bullying is a real-life problem of our today's society, problem that needs to be taken care of promptly and efficiently when situations require it.

Researchers such as Nickerson (2017), Smith (2004), Baldry (2007) the latter stating that evaluations conducted internationally are optimistic, but stronger research designs needed in order to have a better perspective of the bullying situation.

One limitation of this research compared with others about this topic is the fact that they had a great number of subjects, but as stated before this is a pilot study on which data will be added after evaluating a greater number of subjects.

Conclusions

As the results from the graphics can show, from the 128 children there was a percentage of them that have suffered from bullying in the school or outside it through the online means that students nowadays benefit. The bullying situation, in our perspective, is an important aspect that needs to be taking care of in order for our future generations to live in a healthy environment that can contribute to their optimal growth and psychological development in this modern society.

When asked about if they feel that the physical education classes can reduce the bullying situation, 80% of them answered positively because they feel that activities during these classes require implication from all the participants, communication, constantly aiding each other, and foremost no one is being treated differently.

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The Benefits of Chess Practice on Students – A Meta-Analysis

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Abstract

In recent years, the educational routine has led to the recording of results below expectations, so finding new complementary innovative teaching methods is a common topic for researchers in this field. The game of chess requires the training of several cognitive skills that are used in the learning process, and the effects of specific training have been observed and analyzed in depth.

The aim of the study is to observe the benefits of practicing chess on students. This paper is a meta-analysis focused on three decisive cognitive processes in children's intellectual development, namely: attention, memory and thinking. Five studies were selected for each cognitive ability. The results indicate a significant improvement in attention and thinking, and in the case of memory, only the specific one was improved.

Further research is needed to clarify the issue of "far transfer" from one field to another.

Keywords: chess, cognitive abilities, students, education

Introduction

Chess is in its depth an activity based on strategy, representing two sides in which pieces play various roles, from leaders, to simple tools used to achieve a planned goal. In this clash of ideas, in principle with equal chances, a more efficient player, better prepared and more resistant to the psychological pressure during the game, will win. A game involves a chain of actions, strategy and tactics, which affect the state of mind. They create an experience based on the principle of causality that aims to enrich the ability to adapt to the new, thus providing the opportunity to choose the right move in the future.

Chess requires cognitive skills and knowledge of sophisticated problem-solving algorithms, thus providing a good opportunity to study the mechanisms underlying cognitive expertise.

Attention is a "psychophysiological process of focus, delimitation and selective enhancement of mental and psycho-behavioral functions and activities related to the environment, providing them with the necessary ability to adapt and understand new conditions [1]". Attention can be classified as follows: voluntary, involuntary and post-voluntary. Voluntary attention is intentional, involves deliberate effort and is consciously self-regulated. Involuntary attention is spontaneous, unintentional and is caused by a strong stimulus. Post-voluntary attention can be defined as a complex of operative structures that function automatically in the observation and management of the activity; a system made up of skills to be attentive.

Memory is a general function of the psyche, which offers the possibility of storing, sorting, and then using previously accumulated information [2]. It can be described as a mental image of past experiences, where the constituent elements have been assigned meaning, purpose or form.

Memorization takes place in three stages: encoding, storage and updating (retrieval) [2].

Encoding is the transformation of sensations into the type of code or representation that memory will store; storage refers to the stocking of encrypted information, and updating is the process by which information is retrieved from memory and used in the new context.

Thinking [3] is the culmination of processing and assimilating information about both the internal and external environment. A thinking model has a structure based on ideas with which we assimilate the empirically received information and we manage to form representations of objects from the environment. The role of thinking in practicing chess is obvious, practically, the game is a mental struggle between two opponents, and the weapons are the notions previously assimilated. Their operationalization is present both in the training sessions prior to the competition and during the matches. Chance occurs only when impulsivity and too much desire to win take the place of thinking.

The purpose and the objective of the research

The purpose of the research is to observe the benefits of practicing chess on students.

The objective of this paper is to identify and analyze the studies on chess in order to establish the right design for further researches.

Material and method

We selected the studies that included the keyword chess in the title. We also excluded those made before 2000. The next selection criteria were the design of the studies; all meta-analyzes were eliminated, and the accepted ones had as research method the experiment. Only studies aimed at observing the influence of chess on cognitive abilities, namely: attention, memory and thinking, were considered eligible. The studies that met the above criteria were listed in the table below.

Table 1. Studies analyzing chess instruction

Study	Objectiv	Testing method	Chess intevention	Subjects	Country
Aciego [4] 2012	Attention	WISC-R	1 weekly training-1 scholar year	170 subjects aged 6-16	Spain
Anderson [5] 2004	Attention	D2 Test of Attentive abilities	The subjects were already affiliated with a professional club	126 subjects from the secondary school	USA
Gliga [6] 2015	Attention	Kraepelin Test	1 weekly training-10 weeks	38 subjects from pimary cycle, 20 boys, 18 girls.	Romania
Miranda [7] 2019	Attention	Observing illegal moves on a chess board	The subjects were already affiliated with a professional club	30 subjects from VI-grade	Spain
Velea [8] 2019	Attention	Kraepelin, Bourdon-Anfimov and Toulouse-Pieron Tests	1 weekly training-6 months	34 subjects from pimary cycle	Romania
Duan [9] 2014	Memory	Resting-state functional connectivity and graph theoretical analyses	The subjects were already affiliated with a professional club	40 subjects, 20 chess players and 20 non-players	China

Ebenezer [10] 2019	Memory	WISC-IV India- The Digit Span Subtest and Letter-Number Sequencing Subtest	1 weekly training- 1 scholar year	178 subjects aged 9-15	India
Fattahi [11] 2015	Memory	Dichotic auditory-verbal memory test	The subjects were already affiliated with a professional club	60 subjects, 30 chess players and 30 non-players	Iran
Lane [12] 2017	Memory	Test of memory for chess positions and a test of fluid intelligence	The subjects were already affiliated with a professional club	79 subjects	USA
Villafaina [13] 2019	Memory	Electroencephalogram (EEG)	The subjects were already affiliated with a professional club	14 male subjects	Spain
Connors [14] 2011	Thinking	Think-aloud procedure for two chess positions	The subjects were already affiliated with a professional club	22 subjects	Australia
Eberhard [15] 2003	Thinking	Naglieri Nonverbal Ability Test (NNAT) level F	1 weekly training- 1 semester	153 subjects aged 13-14	USA
Mirzakhanyan [16] 2016	Thinking	„Egoskop" Test	1 weekly training- 1 scholar year	85 subjects aged 8-10	Armenia
Sigirtmac [17] 2016	Thinking	Gazi Early Childhood Development Assessment Tool Test	1 weekly training- 7 months	87 subjects	Turkey
van Harreveld [18] 2007	Thinking	Analysis of the quality of chess games under time pressure	The subjects were already affiliated with a professional club	300 subjects	Netherlands

Results

Each study presented above recorded favorable values in the experimental group (chess players) or, if chess players already affiliated to a sports club were tested, the reporting of standardized results was positive. These were statistically verified to validate their relevance.

It can also be observed that the geographical area in which the tests were applied is extremely vast, thus giving credibility to the meta-analysis. In the table, there are 4 studies in which only the number of subjects is mentioned; the only additional detail provided is the chess coefficient (ELO) which does not influence the research.

It should be noted that most studies advocate the introduction of chess in school as an innovative method of teaching.

Discussions

In the third study [6] they correlated focused attention and memory with school performance.

The results have improved drastically in chess group for many of the tests applied. Besides the better grades obtained in math they also registered an upgrade at Romanian language and this is consistent with previous studies made before 2000 [19], [20], [21]. Velea [8] followed the path

of Gliga and decided to test focused attention but she used 3 different tests in order to verify to results. The same positive conclusion was reached.

Anderson [4] was interested to find out if there is a connection between age, gender, giftedness, chess-activity and attention. Although his main goal was different, he registered the same positive results when attention skills of secondary school students were tested.

Aciego [4] and Miranda [7] used custom tests to check if chess practice aids social-emotional enrichment by improving attention. The correlation was statistically relevant and once again the same conclusion was reached, chess develops children's attentive skills.

When it comes to studying how memory can be trained there are plenty researches made outside this domain [22], [23], [24]. The results were not good and the accepted theories state that only specific memory can be improved. Thanks to Gobet's work [25], [26], [27], [28] the foundation was laid and the researches presented in table 1 were possible. Duan [9], Fattahi [11], Lane [12] and Villafaina [13] tested chess players that were already affiliated to a club and this has a clear drawback because the factors that helped them develop a good memory can be multiple and a link between chess practice and memory can be contested. Even so, all of them showed that chess players can recall better and faster than normal people. The most intriguing finding was made by Villafaina [13] by discovering that during a chess game, different cortical areas were accessed depending on the phase of the game and the amount of time. During lighting games more, theta power was registered which is related with chunks retrieval and during slow games chess players rely on their working memory. Ebenezer [10] used an adapted version of WISC test to check if chess practice improves memory but, as is the case with the other 4 researches, the direct link can be contested.

Sigirtmac [17] used a standardized test (GECDAT) to check if chess influence the mind development at early childhood. The results in thinking fluency and elaboration abilities showed that what they use, in an abstract form, at the chess board transfers to other domains.

Connors [14] and van Harreveld [18] used specific chess tests on subjects that were already affiliated to a chess club and the results showed that even under severely time pressure the decisions that they made were not worse. This resistance to disturbing factors is extremely useful because it can be transferred to daily tasks. Eberhard [15] and Mirzakhanyan [16] used standardized tests and their studies were using the experimental researching method with pre- and post-test. In [16] were registered interesting results in quick reactions and the delayed ones were not hazardous. Eberhard chose economically disadvantaged students to observe how they react to chess instruction. Because of their condition, integration in any group is a problem and the effects are negative. Chess provides an ideal environment where everybody has equal chances. The studied concluded that education through chess can be an alternative teaching method to disbalanced classes no matter what caused the problematic situation in the first place.

Each study presented can be the starting point for future researches. The cognitive abilities influenced by the practice of chess have a particular character, and the tests used have a general one, thus more specific tests are required and the research design should be changed.

A clear analysis of chess games/competitions is needed to properly understand how this game trains the skills mentioned above.

Conclusions

Analyzing the researches presented above we can state that chess do help the development of cognitive skills. This statement was reached by all authors but the most convincing results were

registered for children who were in primary school. This correlation appeared probably because the chess training happened during a period where most of the cognitive abilities are trained (a presumption which is yet to be tested). Another important aspect is the worldwide area where the studies were made. The educational systems around the world differ entirely and because of that we can safely assume that the benefits of practicing chess, presented in the aforementioned studies, are real.

In order to get a clearer view on this topic the life of a chess player should be studied in depth, which means: club training, practice, tournaments, individual training and a chess game. Every single aspect offers enough hints about which cognitive abilities correlates with chess.

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Vibratory Stimulus Focused on Fall Forward of the "Anterior Postural Type"

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Abstract

Introduction

Many postural problems derive from excessive fascial tension, which creates muscle, tendon and osteo-articular problems. By rebalancing the fascia, multiple postural-functional problems can be resolved [1]. The mechano-sonorous vibration is nothing more than a mechanical vibration, which uses pressure-depressor air cones to stike the skin and send a stimulus to the central nervous system [2], through the deformation of the high threshold mechanical receptors (Pacini corpuscles), according to the "all or nothing" technique, using the Wave Meccanica Quadra.

Aims

The aim of the study was to identify if the anteriorized posture can be influenced by saction on the abdominal peritoneal component because here there are strong tensions, which can accentuate the attitude described above [3].

Method

Children between the ages of 6 and 12 were included, without any previous pathology and with an anteriorized postural attitude. Evaluation were performed with baropodometric examination and instrumental examination of the lateral/lateral Barrè vertical. For the stimulation of postural receptors (Pacini corpuscles), the EVM instrument from Endomedica was used, which emits mechanical sound waves, focused in two specific points, lateral to the navel. After 15 minutes of vibrations at 250hz, the subjects were re-examined with the same tests.

Results

Of the 18 patients examined, we immediately notice that, after the application of the mechanical sound vibrations, there was a change/variation in posture. Almost all subjects had an improvement in the positioning of the head, more on the same axis, except for a case in which the priority component (made with subsequent tests) was found to be type cranial and temporo-mandibular joint deviation.

Conclusions

We can conclude that a superficial fascial abdominal relaxation, by means of mechanical-sound vibrations, leads to a sensitive postural variation and a greater momentary rebalancing of the patient.

Keywords: anteriorized posture, mechano-sonorous vibration, tension on abdominal peritoneal components

Introduction

The Mechano-Sound Vibration is nothing more than a Mechanical Vibration that uses pressure-depressor air cones to strike the skin and send a central stimulus causing the deformation of the high-threshold mechanical receptors (Pacini's corpuscles). These percussions are produced by pressure-depressor air cones which in our system follow the "all or nothing" technique thanks to the Wave used, a Quadra Mechanical Wave.The vibrations, in fact, even if of small amplitude, are read by the muscle and skin nerve receptors and sent to the central nervous system, activating a physiological mechanism to improve cognitive and proprioceptive functions, even weeks after the treatment. This vibratory energy is not invasive and is easy to apply.

The EVM of the ENDOMENICA company (device we used), works by rapidly alternating air pressure and depression going from 20 to 300 Hz. The pressure phase impresses a slight force on the fabric going deep. The depression phase "sucks" the fabric forcing it suddenly upwards: in this way it creates an alternation between the compressed fabric and the expanded (or raised) fabric. The vibratory stimulus "closes" the spinal gate to the pain stimulus, allowing the control of the rapid pain response mediated by the lack of endorphin.

Mechanism of action of focal vibration:

At the level of the spinal cord, physiologically, when the mechano-sound stimulus is applied to a relaxed muscle, this causes tonic contractions on it that can be recorded through electromyography. This reaction is called the Tonic Vibration Reflex (TVR), perceived as a reflex of autogenous inhibition. Simultaneously it causes relaxation of the antagonist muscle.

At the cortical level, in the peripheral nervous system, the focal vibration causes the afferent neuromuscular spindles to vibrate in a ratio of one to one, increasing the proprioceptive input to the central nervous system (CNS). All proprioceptive and exteroceptive information is considered important for motor control and performance.

Imaging studies show that the activity caused by stimulation in response to tendon vibration occurs not only in the somatosensory cortex but also in the premotor cortex and in the supplementary and cingulate motor areas.

At the fascial level, the vibratory stimulus of EVM is able to act on mechanoreceptors, Golgi organs and neuromuscular spindles. A fascia is a connective tissue structure that covers muscles, muscle groups, blood vessels and nerves, joining some structures while allowing others to gently slide over each other. Various types of fascia are made up of distinct layers, depending on their functions and their anatomical location: superficial, deep and subserosal (or visceral) bands extend uninterruptedly from the head to the tips of the toes. Many postural problems derive from excessive fascial tensions that create muscular, tendon and osteo-articular problems. By rebalancing the fascia, multiple postural-functional problems can be solved.

In particular, in this research we tried to stimulate the anterior peritoneal wall.

The peritoneum is a thin and almost transparent mesothelial serous membrane, which is located in the abdomen and forms the lining of the abdominal cavity and part of the pelvic cavity (parietal peritoneum), it also covers most of the viscera contained within it (peritoneum visceral), while fixing them to the walls of the cavity (ligaments of the viscera). The term peritoneum derives from the Greek περί (perì) which means around and τονείος (tonéios) which means covered, which in turn comes from the verb τείνω (téinō), to cover: in fact, the peritoneum is the organ that covers the organs of the abdomen and abdominal wall.

The peritoneum is the largest of all serous membranes and, due to its arrangement, also the most complex. This complexity derives above all from the fact that instead of covering a single organ with a relatively uniform surface, as happens to the pleurae that cover the lungs or to the pericardium that covers the heart, of which it is the abdominal equivalent, the peritoneum envelops several organs, arranged and oriented in the most varied ways and also having rather irregular shapes. The visceral peritoneum, in accordance with this irregularity, also forms large folds between the organs; a striking example is the great omentum, which extends like an apron over the intestinal mass, starting from the great curvature of the stomach. The peritoneum consists of a superficial layer of mesothelial cells supported by thin layers of extraperitoneal connective tissue, which in some regions is particularly rich in adipose lobules, such as in correspondence with the kidney, the inguinal region, some duplications of the peritoneum and of the external surface of the large intestine; it seems that these accumulations of fat perform a function of protection and support of the organs. The peritoneum performs the function not only of lining and supporting the abdominal viscera, but also of "conduit" for the blood and lymphatic vessels and for the nerves of the abdominal region. The peritoneum is a thin and almost transparent mesothelial serous membrane, which is located in the abdomen and forms the lining of the abdominal cavity and part of the pelvic cavity (parietal peritoneum), and also covers most of the viscera contained within it (peritoneum visceral), while fixing them to the walls of the cavity (ligaments of the viscera).

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An initial assessment will be performed which will determine the "anterior postural type" group.

The treatment lasted 15 minutes with mechanical sound vibrations focused on specific points of the anterior chain (Band of the Visceral Lodge) of the individuals. At the end of the treatment, the evaluations were performed again and compared with the previous ones. The study was carried out with the support of a pediatric doctor and a physiotherapist at the Sinergia Benessere private practice in Rome.

Material and methods

Inclusion criteria were: pediatric age (6-12), anteriorized posture (or anteriorized postural imbalances), healthy subjects.

Exclusion criteria: age group above or below 6-12 years old, neutral or posterior posture, unhealthy subjects.

For evaluation we analyzed the patients through Barrè L/L tests and with the POSTURE SCREEN software; listening test according to J.P. Barral's method; analysis with baropodometric platform.

The device used for the delivery of vibratory energy is the EVM of the Endomedica company, chosen for its specific features of functionality and non-invasiveness. Frequency chosen 250Hz.

Procedure

The 18 individuals, included in the experiment, were subjected to 15 minutes of mechanical sound vibrations at 250 Hz, (frequency chosen to remain at a superficial level in the stimulation), placing the electrodes on the sides of the navel, to create a relaxation of the anterior peritoneal fascia, due to the stimulation of the receptors. After 15 minutes they were tested again to see possible variations.

Discussion and conclusion

Of the 18 patients examined, it was immediately noted that after the application of mechanical sound vibrations, there was a change/variation in posture.

Almost all of them had an improvement in the positioning of the head, more in axis, as it can be observed in the Fig. 1, except for one case, in which the priority component (made with subsequent tests) was of the cranial type and of the A.T.M., as it can be observed in Fig. 2. below. Using the listening method for evaluation in this case, the subject also went forward, but stopped shortly after, unlike the other listening, which all reached the visceral sub-diaphragmatic part.

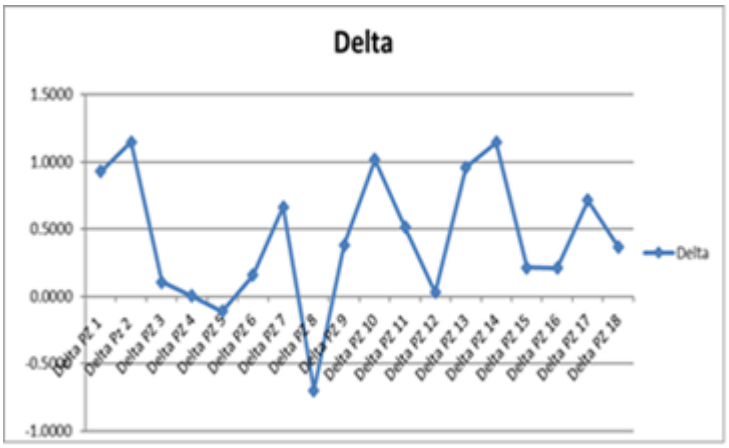

Fig. 1. Delta of the average of the 4 points for each patient

Delta PZ 1	0,9275
Delta Pz 2	1,1475
Delta PZ 3	0,1050
Delta PZ 4	0,0025
Delta PZ 5	-0,1125
Delta PZ 6	0,1550
Delta PZ 7	0,6625
Delta PZ 8	-0,7000
Delta PZ 9	0,3825
Delta PZ 10	1,0150
Delta PZ 11	0,5125
Delta PZ 12	0,0275
Delta PZ 13	0,9575
Delta PZ 14	1,1425
Delta PZ 15	0,2125
Delta PZ 16	0,2100
Delta PZ 17	0,7150
Delta PZ 18	0,3675
Delta Average	0,3865

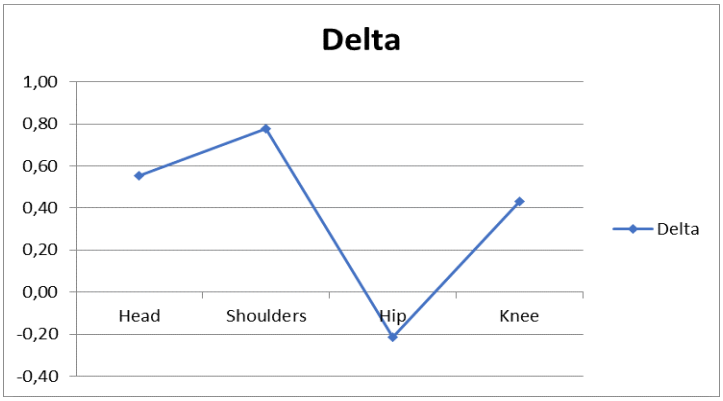

Fig. 2. The 4 Delta points represented in the patient in whom the exception was registered

	Delta
Head	0,52
Shoulders	0,47
Hip	-0,35
Knee	0,50
Average	0,29

Therefore, we can conclude that a superficial fascial abdominal relaxation, by means of mechanical-sound vibrations, leads to a sensitive postural variation and a greater momentary rebalancing of the patient.

Ultimately, each subject has had a postural change, that is, a new postural organization after the stimulation.

Another noteworthy fact was to verify that overall, the improvements occurred for 3 out of 4 parameters. In particular, head, shoulders and knees. While the hip parameter had a general worsening.

This could make us think of a compensatory adaptation of the new tonic-postural situation by the Hips, since the area of discharge is greater than the ascending and descending forces of our body.

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Study of Posture Deficiencies and Muscle Imbalance in Patients with Migraines

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Abstract

Introduction

Migraines are associated with posture deficiencies. However, there are no relevant studies that would demonstrate the link between them.

Objectives

This study aims to assess posture deficiencies and muscle imbalance in migraine patients compared to the control group.

Material and method

56 people participated in this study. 28 diagnosed with migraine (experimental group) and 28 volunteers (control group). They were all subjected to the same evaluations. Only the experimental group was treated with posture correction, physiotherapy and manual trigger point therapy to balance the cervical-thoracic muscles.

Results

In people who complained of migraines, frontal deviation was observed. Migraines appeared on the opposite side of the convexity of the thoracic curvature.

Conclusion

The study revealed the link that may exist between migraines accused by some people and frontal deviation of the spine. Other studies are to be conducted to bring more information about the link between migraine and posture deviation.

Keywords: posture, migraine, myofascial dysfunction, physical therapy

Introduction

In the practice, the physiotherapist often encounters headaches of various types, including migraines. Patients with “headaches” are referred to a physiotherapist by a neurologist when other causes of neurological origin have been ruled out. Emotional stress and poor posture need to be deprived as a whole, and the purpose of this study is to assess posture deficiencies and muscle imbalance in patients with migraines.

Migraine is a disease with genetic transmission, very common (prevalence 15-20% in the population), with a considerable socio-economic impact, recorded mainly in the most productive

period of life – between 25 and 55 years. (National Clinical Protocol "Migraine" PCN 284, Republic of Moldova) [6].

Migraines are often described as intense headaches experienced as a severe pain on one side of the head. In addition to pain, patients with migraines may also develop an associated set of symptoms, such as an increased sensitivity to noise and light, without nausea and vomiting. [5]

There are three main types of migraines: migraine without aura, migraine with aura and silent migraines. Those who suffer from migraine with aura experience a series of symptoms that indicate the appearance of a migraine. The aura represents those neurological symptoms that appear 10-60 minutes before the headache, frequently expressed by visual phenomena that appear in both eyes – black, gray spots, tremor of the image, flashes, colored lines, and by sensitive phenomena – needles, stings, numbness that first appears on the fingers and then extends to the entire arm and face. [5, 6] Aura migraines are not the purpose of this study.

The most common is migraine without aura. Only 10% of affected people have migraine with aura and 20% have both types. Rarely does the aura appear only without a headache, especially in the elderly.

It is believed that a poor posture can be a trigger for migraines. Although migraines are usually seen as a central pathway dysfunction, the associated symptoms can be considered peripheral, as peripheral nociceptive stimuli are linked to the onset of a migraine episode. [2]

Due to the contradictory nature, more research may be needed to fully establish the relationship between posture deficiencies and migraines.

Diagnostic

The diagnosis of migraine can often be a process of ruling out other types of headaches and neurological causes. A patient diagnosed with migraine reports intense, unilateral pain. The migraine attack is characterized by the presence of pain symptoms:

- lasting 4-72 hours (no treatment or ineffective, incorrect treatment);
- unilateral temporal-frontal localization;
- pulsating character;
- moderate or severe intensity;
- association with nausea/vomiting and/or phonophobia, photophobia;
- aggravation of routine physical activity;
- pain in the eyeball;
- apathy. [3]

Aggravating factors include sustained postures (usually sitting), certain neck movements, and emotional stress; although, these responses are often present with other forms of headache. [2]

Physical evaluation to identify posture deficiencies that correlate with migraine symptoms is another important piece in the diagnostic process. Often, patients may have headaches that come from several sources. Most commonly, migraine pain is accompanied by tension-type headache.

For this reason, it is necessary to make a differential diagnosis. This can be done by manually testing and studying the patient's history (Table 1).

Table 1. Essential information for history. [1]

A. Age, Occupation
B. Current behavior of symptom
1. Location of symptoms (record on body chart
2. lntensity of symptoms (visual analog scale)
3. Character and quality of headache
4. Constant versus intermittent?
5. Duration of episodes or exacerbations
6. Frequency of episodes or exacerbations
7. Aggravating and easing factors
8. Variations with time of day
9. Night pain, effect on sleep
10. Medications and their effect

C. Previous history
1. Date of onset
2. Predisposing factors, injuries
3. Progress since ons
4. Previous treatment including drugs, injections, surgery, manipulation, etc.
5. Frequency and duration of recurrences if episodic

D. General health

Methods

Between July 1 and December 1, 2019, 56 patients, with a mean age of 22 to 50 years, who participated in this study were evaluated. Of these, 17 – men and 39 – women. The groups were divided into 28 patients diagnosed with migraine, who were subsequently treated with posture correction physiotherapy and manual trigger point therapy to balance the cervical-thoracic muscles (Experimental Group); 28 volunteers who were evaluated by the same methods, but did not have a migraine diagnosis (Control Group).

Posture was assessed in orthostatism by the visual method and using the Posture Screen program (Fig. 1, Fig. 2). By analysis of the sholders, the level of the 8th rib, pelvis, functional length difference of the lower limbs, deviations of the spine and inclinations in the frontal and sagittal plane of the neck/head. We also studied the incidence of headaches on the left or right side according to the directions of pathological curves in the frontal plane of the spine.

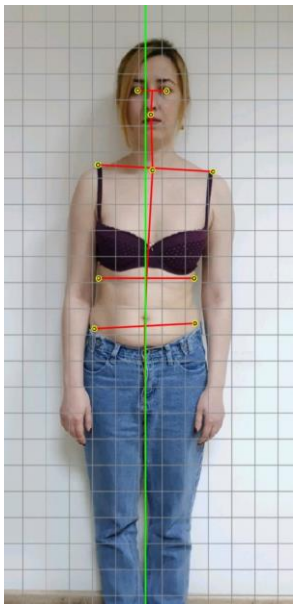

Fig. 1. Front View

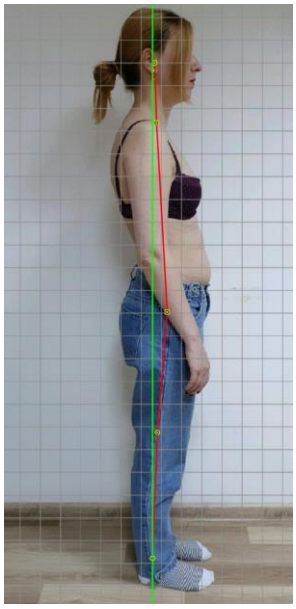

Fig. 2. Side View

Tabel 2. Body posture assesment

	Front View Deviations	Side View Deviations (degrees)
Head	3 degrees right	normal
Shoulders	4,36 degrees left	3,25 cm forward
Ribcage	2.5 cm	-
Hips	3,55 degrees right	2,9 cm forward
Knees	-	2,1 cm forward

Inclusion and exclusion criteria

The patients with migraines were selected consecutively from the database of the "KinetoTerra" Medical Recovery Center, in the city of Chisinau, Republic of Moldova, where they also received outpatient recovery treatment. Migraine was diagnosed by neurologists according to the criteria established by the National Clinical Protocol "Migraine", PCN – 284. [5] Patients with a stable clinical condition for at least three months were included, with a frequency of 3-15 days per month with migraine. Patients were evaluated for the presence of posture deficiencies: scoliotic attitudes, kyphosis, etc. Volunteers who had not been previously diagnosed with signs or symptoms of migraine and posture deficiencies in the last 12 months were accepted into the control group. The persons in the control group were selected so that their weight, height and age coincided with the parameters of the experimental group.

Exclusion criteria: any other type of headache (except for episodic tension headaches less than three attacks per year), any other chronic pain, major diagnosed postural deficiencies (scoliosis/anatomical differences in limb length, severe kyphosis) amputated limbs, hemiplegia, acute pain at the time of evaluation, recent surgery, recent trauma involving clinical sequelae (cerebral trauma, bone fractures, whiplash), chronic migraines with aura.

Treatment

Trigger points soft tissue Manual Therapy.

The therapy was performed from the first day, bilaterally, daily, having as objectives:

- inactivation of trigger points: sternocleidomastoid, upper trapezius (key points), levator scapulae, pterygoid masseter, temporal (satellite points).

These trigger points most often have as reference area the regions of the head, specific to migraine pain. [2] Activation of these points can have several causes and can be caused by a number of factors (postural, nutritional, psycho-emotional, etc. [3] Basically, we can say that migraine pain is activated directly by the trigger points mentioned above. The perpetuating factors, however, are those that maintain the state of migraine.

- reduction of myofascial pain syndrome;
- restoring bilateral muscle balance and rebalancing the agonist-antagonist balance (ex. rhomboids-pectorals)

In addition to the direct manual treatment of headaches, there is an acute and immediate need to identify and correct perpetuators.

After a certain number of manual sessions (6-12 sessions) in combination with passive and active analytical stretching exercises of the muscles involved, the patients benefited from individual physiotherapy sessions to correct the posture. Elements from Schroth and RPG (Global Postural Reeducation) therapies were used. At the same time, an attempt was made to establish the links between headaches, posture deficiencies, nutrition, psycho-emotional state and the activities of the patient's daily life.

Results and discussions

In the experimental group, 21 people showed obvious posture deficiencies: scoliotic attitudes, pelvic asymmetry, ATM dysfunction (usually unilateral), facial asymmetry and a muscular imbalance manifested by increased sternocleidomastoid muscle tone, upper trapezius, levator scapulae, spinal erector, on the same side with the presence of migraine symptoms; 5 people presented postural asymmetry at the cervical-thoracic level, kyphosis and anterior-lateral inclination of the neck, also manifested by muscle imbalance in the given area. In the first 26 participants, the presence of migraine symptoms was observed *on the opposite side of the thoracic curvature* in the frontal plane. In 2 people, no links were found between migraine pain and the type of posture deficiency.

Conclusion

The results demonstrated the presence of posture deficiencies in patients with migraines, compared to the control group in which only 12 people showed obvious postural deviations, but which created various compensatory mechanisms that manifested by painful myofascial syndrome in other parts of the body. At the same time, some differences were observed in the activities of daily living (ergonomics at work, sports activities, etc.), nutrition and the psycho-emotional factor.

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Comparative Study Regarding Very Early Mobilization and Early Mobilization in Patients After Stroke

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Abstract

Introduction

Every year, more than 13 million people suffer a stroke. Rehabilitation of stroke survivors can begin in the first 24 hours with very early mobilization (VEM) or after 24 hours with early mobilization (EM). Based on the fact that there are two different periods of intervention, the comparison between the two approaches is plausible in order to find the most effective option.

Aims

This study's aim is to compare VEM vs EM in order to find the proper rehabilitation approach regarding stroke patients in the first 3 months after stroke.

Methods

The most recent statistics data about stroke were searched with the main goal to identify and select the VEM and EM trials in the medical databases.

Results

Following the searches in the medical databases and respecting the inclusion criteria, 21 articles remained into discussion, of which 10 studies address VEM and 11 studies bring into question EM, in the case of patients with stroke.

Conclusions

The results suggest that EM could be the best rehabilitation method when approaching stroke patients and VEM does not seem to be a reliable method. More studies are required in order to reveal more information about these two intervention methods, especially on the proper intensity of the exercises during the rehabilitation period.

Keywords: stroke, early mobilization, very early mobilization, neuromotor rehabilitation

Introduction

According to World Health Organization, 13 million people suffer a stroke every year, and 38 thousand suffer a stroke every day. One third of these cases result in neuromotor deficiencies for the rest of the life [1]. Stroke is an acute episode of focal dysfunction of the brain, retina or the

spinal cord, which lasts more than 24 hours or, regardless of the duration, if the imaging or autopsy indicate focal infarction or relevant focal hemorrhage in relation to the specific symptoms. The earlier the intervention, the higher chances of favorable outcomes. "Time is brain!" [2]. The human brain recovers from stroke in 3 main ways: adaptation, regeneration, neuroplasticity. Neuroplasticity, generally defined as a recovery process in which the neuronal network is "reconnecting its wires", is considered to be the main recovery process of the brain. In order to properly "reconnect", the physiotherapist's intervention should be concentrated on tasks and specific goals [3]. In the scientific literature there are two different approaching methods: Very Early Mobilization (VEM), the intervention takes place in the first 24 hours after stroke onset and Early Mobilization (EM), the intervention takes place after the first 24 hours after stroke onset [4].

Aims

This study's aim is to compare VEM vs EM in order to find the proper rehabilitation approach regarding stroke patients in the first 3 months after stroke.

Methods

The most recent statistics data about stroke were searched with the main goal to identify and select the VEM and EM trials in the databases of PubMed, Research Gate, Microsoft Academic, PhysioPedia, LibGen, New England Journal. of Medicine (NEJM), The Journal of the American Medical Association (JAMA), Institute of Health Metrics and Evaluation (IHME), World Health Organization (WHO). The inclusion criteria in our study were: original articles, full-text, randomized studies conducted in the period 2008-2020 that addressed the early recovery of patients who suffered a stroke. Keywords such as "early rehabilitation" were used; "Very early stroke rehabilitation"; "Stroke rehabilitation RCT"; "Post stroke intervention" etc.

Results

100 potentially relevant studies were found, out of which 20 review studies were excluded along with another 59 irrelevant trial studies. 21 relevant studies remained. The entire selection process can be observed in the figure below (Fig. 1.)

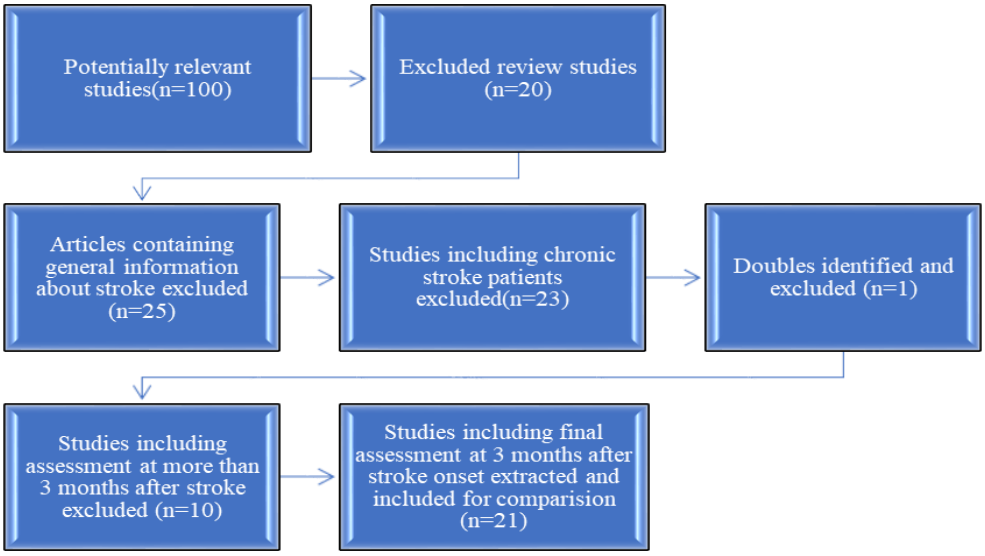

Fig. 1. The selection process of the articles

Discussion

The mobilizations after stroke onset have a very important role regarding neuromotor rehabilitation of stroke patients. There is a significant difference between VEM and EM, this fact can be observed at the final assessment after the treatment.

Out of the 10 studies which analyzed VEM 3 months after stroke onset [4], [5], [7], [9], [15], [16], [19], [21], [23], [24], 3 suggest the potential positive effects of VEM [7], [16], [19], the other 7 indicating the negative outcomes of VEM in stroke patients. This means that 2752 patients were analyzed in these studies. The studies show that the time spent in the hospital was reduced when treating the patients with VEM in order to reduce the immobility complications and the initiation of walking was faster [16], in comparison with one study [21] which say that functional status worsened and the dependency status increased. However, one large trial study [5] contradicts the conclusions of the study mentioned above [16] regarding the walking initiation time, the number of the patients in the large trial study being 2104 and in the study regarding walking initiation time [16] being 32. Only 3 studies [7], [16], [19] concluded that VEM could have positive effects on stroke patients after 3 months after stroke onset (the cumulated number of patients of these studies is 189). Immobility complications seem to be rare in these 3 studies, the VEM patients walk earlier than the standard group patients [16] and the functional status is increased [7]. With a cumulated number approximatively 13 times higher, 2563, the other studies indicate the negative impact of VEM regarding the evolution of stroke patients. In most studies the exercises were performed in out of bed environment with a standard rehabilitation program. Even though the number is relatively small, the value of p in these studies is 0,009 – [19], 0,05 – [16] and 0,001 – [7]. In one study [9] the original Constraint-Induced Movement Therapy (CIMT) was used and it cannot be clearly concluded regarding the relation of CIMT and VEM. However, it should be considered that the combination between VEM and CIMT could result in negative outcomes.

The negative impact of intense VEM is highlighted by 4 studies [24], [4], [5], [15].

Therefore, we believe that it is indicated that more studies regarding the proper dose in VEM treatment should be initiated in order to find more information about the use of VEM in neuromotor rehabilitation. The dosage in VEM treatment is quite vague. It is known that intense VEM (long and frequent periods of time) does not have positive outcomes in stroke patients [4], [15], [24]. The constant observation of post-stroke patients is imperative, thereby, automated monitoring (AM) [16] is an important auxiliary factor for reaching the peak of efficiency of the rehabilitation period.

At the final assessment, 3 months after stroke onset, the number of patients having negative outcomes is eloquent: 2563 ($p<0,05$), in contrast with those 189 patients ($p<0,05$) which had favorable outcomes 3 months after stroke onset. This evidence shows that using VEM treatment at 3 months after stroke onset could have a negative impact on stroke patients.

In terms of EM, one single study [14] indicates negative outcomes of the stroke patients with unfavorable prognosis, using Electromyography-NeuroMuscular Stimulation Therapy (EMG-NMS). The patients in the following studies had favorable outcomes regarding the functional status, the rate of mortality was reduced, the time spent in the hospital was also reduced and the quality of life improved at 3 months after stroke onset [2], [12], [8], [14], [26], [25], [17], [6].

Therefore, a total number of 1506 of patients (the studies had a p value lower than 0,05) were assessed at 3 months after stroke onset and after EM treatment. Only 101 patients ($p<0,05$) – the patients with unfavorable prognosis from one study [14] had negative outcomes after the EM and EMG-NMS therapies combined. In the same study, it was concluded that EM combined with modified CIMT could result in functional improvement of the upper limb at post-stroke patients with favorable prognosis ($n=58$) at 3 months after stroke onset; therefore, this combination seems to be superior to the standard CIMT method.

2 studies [14], [26], suggest the fact that EM with modified CIMT could bring functional improvement 3 months after stroke. In one study [20] the medical team also used auxiliary therapies combined with EM and concluded that this combination brought improvements of the functional status and quality of life in stroke patients.

Regarding the comparison between VEM and EM, the balance tends to lean towards the use of EM in the rehabilitation process after stroke onset. 1506 patients were assessed after EM treatment and 2752 patients were assessed after VEM treatment at 3 months after stroke onset. 189 patients in the VEM treatment had favorable outcomes, and 2563 had unfavorable outcomes.

In both cases the p value was under 0,05. 1405 patients of 1506 had favorable outcomes, the other 101 patients had negative outcomes (patients with unfavorable prognosis) [14]. In these cases, the p significance was also under 0,05.

Conclusion

EM seems to be superior to VEM, having a relatively small number of patients with negative outcomes at 3 months after stroke onset, in contrast with the majority of the VEM patients which had negative outcomes at 3 months after stroke onset. This evidence could indicate that VEM is not (yet) a safe and feasible approaching method for stroke patients.

More studies are required in order to reveal more information especially on the proper intensity of the exercises during the rehabilitation period.

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Kinetic Methods of Post Operatory Recovery in the Tore of Achilles's Tendon

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Abstract

Background and Aims

The present research refers to the traumas and their recovery through physical exercises in the sporting activity. Accidents often appear in the sporting practice from the self-surpass attempts by effectuating certain maximum efforts that overcome the athlete's momentary physical possibilities.

Materials and methods

The paper's purpose is to promote the recovery methods. In forming the kinetic therapeutic program, one has considered the individual characteristics and the seriousness of the trauma.

The program started in good time, one has respected the program's stages and the patients respected the indications and counter indications of the kinetic therapist. For this study one has involved 6 students with Achilles's tendon trauma; they accepted the recovery program proposed by us by correlating the orthopedic measures and the recovery ones.

Results

In elaborating the recovery program, the age has been one of the important criteria in the accomplishment and evolution of the kinetic program for in youngsters the tissue recovery and the forming of the callus are much faster than in older people; as a result, the recovery will be much faster. The profession and the concrete work conditions also helped in correctly establishing the recovery methodology, in order to regain the work capacity. The personal antecedents of the patient have informed us in regards to his/her pathologic aspect, the latter having an important role in elaborating the recovery program, for there can be repercussions at a local level. Also, in this stage, one has obtained data regarding the patient's constitutional type and weight by inspecting him/her, as well as the position and the attitude of the affected limb, the articular deformities and the aspect of the tegument by palpation, the articular balance, the muscular testing and the benchmarks that have followed the static and the movement. Equally as important, has been fighting the pain.

Conclusion

In the research that comprised the post traumatic recovery programs, the articular and muscular evaluation, and the final results have confirmed that through a good cooperation between the athlete and the kinetic therapist one can shorten the athlete's sporting inactivity.

Keywords: recovery program, Achilles's tendon, sports performance

Introduction

In the sporting activity, there are accidents that come from over soliciting or traumatizing through mechanical injury the shoulder, elbow and fist articulations as well as the over soliciting or traumatizing the inferior limb articulations, especially the knee and ankle. A deficient glide or movement can produce ankle sprains and fractures of the calcaneus or the metatarsal bones. The falls on the hand can produce fist sprains and fractures of the hand bones, the forearm and strains of the shoulder as well as fracturing the bones of the scapular blade. As long as the training process, the specific physical training, is not done adequately, executing certain technical procedures can, in time, lead to serious afflictions of the arm that executes the movement or serious afflictions of the inferior limbs that execute the body's movement in the field.

Achilles's tendon is the human body's biggest tendon. Its breakage is produced relatively frequent by executing certain deficient movements during certain sporting activities or as a result of a certain violent contraction [1]. These breakages appear at its junction with the muscle or at the insertion of the calcaneus. In certain cases, the breakage can be preceded by a period or tendinosis which weakens the tendon. The breakage can be partial, but in most cases, it is total.

The proximal end of the broken tendon can be retracted and thus, on a distance of 2-6 cm, an empty space can be formed which then is filled by a hematoma which conjunctively, can transform in a young voluminous scar tissue, which can rebuild the tendon by making it longer [2].

The partial breakage can be completely asymptomatic or it can present itself like a discrete pain while walking, whereas the complete breakage is joined by an intense pain that can lead to a total losing of the leg's mobility. The risk factors for Achilles's tendinosis can include: age – people between 30-40 years old have a higher risk of suffering a trauma to the Achilles's tendon; men present a risk 5 times higher than women of making such a breakage; recreational sports that involve running or jumping or intense physical training present a higher risk for such a breakage; steroid injections are sometimes used to reduce the ankle's pain and articular inflammations; nevertheless, steroids can weaken the neighboring tendons thus increasing the risk of breaking the Achilles's tendon [3].

As any kinetic method is preceded by a kinetic prophylaxis method, let's consider as important for now the latter.

Work hypothesis: applying a kinetic program adequate to the individual needs of the athletes that have suffered Achilles's tendinosis, thus reestablishing the functional level of the ankle and implicitly the subject's quality of life. Once the pain and inflammation disappear, the kinetic program for regaining strength and the degree of movement can be started.

Research tasks: evaluating the efficiency of the means used in recovery, accomplishing an adequate and efficient level that can direct the patient during the recovery period, correlating the orthopedic techniques and measures with the respiratory ones with the purpose of forming an efficient program and researching the recovery techniques.

The effectuated study has been done during 6 months, on a sample of 6 athletes of whom 5 males and 1 female with ages between 22-34 years old. The complex evaluation of the patients has been done at the beginning of the program and after 6 months, at the end of the applied recovery program. One has followed the therapeutic effects determined by the applied recovery program, as well as the needs of the athletes and each one's evolution depending on the applied program.

Methods of research used

Applying the methods of measurement has been done by attributing numerical values to the patients based on certain rules so that the numerical values present the relevant relationships between them. One has applied tests and measurements at the beginning and end of the experiment. The obtained values have been registered in each patient's chart, in order to subsequently compare and interpret them. Thus, the evaluation of the articular deficit and the evaluation of the muscular deficit are two of the used methods for testing articulation and respectively the muscular force [7].

The Recovery Program Proposed for Recovering the Achilles's Tendinosis

The recovery program has been recommended to be learned gradually until one obtains the ability necessary for execution; nevertheless, this has required quite a lot of time and quite a lot of will from the patients [6].

The main objectives of the recovery program for Achilles's tendinosis have been the following:

- Fighting edema and especially pain;
- Normalizing the muscular tonicity which bears in mind the assurance of a normal functioning of the locomotor system; one has intended to rebuild the tonus especially to the sural triceps muscles, plantar flexor and the common flexors of the fingers;
- Developing the articular mobility;
- Increasing muscular force;
- Rebuilding stability, ability and controlled movement;
- Reeducating movement – walking.

For invigorating muscularity, one has done simple exercises that can be monotonous, this objective occupying quite e lot of time. Thereby, for the recovery plan to be efficient one must gain the trust and collaboration of the patient and convince him/her of the necessity of perseverance and continuing the treatment for a prescribed period of time. Recovering the patient is done until the full recuperation of the tendon from the functional point of view.

We remind that the post operatory recovery of the Achilles's tendon lasts up to 12 weeks which means that the program will be structured in several stages, the recovery starting from the first day after surgery.

The Recovery Program

The main objectives in recovering Achilles's tendon have been the following:

1. Fighting edema through posture and cryotherapy;
2. Fighting pain through massage with analgesic ointments, cryotherapy and cold applications, antalgic electro therapy (diadynamic currents, low frequency currents, high wave currents, galvanic current)

3. Developing mobility through passive, passive-active kinetic therapy, active kinetic therapy and hydro kinetic therapy;
4. Developing stability through kinetic therapy and resistance kinetic therapy;
5. Reeducating movement – walking.

The first period of recovery (1-14 days) starts from the first post operatory day and lasts totally 14 days that is the day the stiches come out. During this time, one follows the improvement of pain and the decreasing of the tumefaction [2]. This period comprises:

1. In this period, one accomplishes the immobilization of the ankle and the leg with the help of a calf-podal splint, the position of the patient's leg being equines or how it is known as plantar flexion. The movement is done with the help of stretches.
2. The correct position of the leg is with the leg lifted up, in bed on a pillow to avoid the forming of tumefaction; the patient must not stay too long with the leg in a fixed position or lower than the level of the body for this leads to enlargement of the leg's volume.
3. Cryotherapy must be used continuously in the first 3-4 days.
4. The patient must under no circumstances lean on the affected limb.
5. In order to fight the pain, the patient is prescribed analgesics, anti-inflammatory, antibiotics and anti-coagulants which are administered as follows: analgesics only in need; anti-inflammatory is recommended to the patient on a period of 7 days; antibiotics are administered only 5 days and anti-coagulants approximately 20 days either as pills or sub epidermal.
6. Because hygiene in case of surgeries is vital, one applies betadine bandages that must be changed every 2-3 days.

The second period (15-30 days) in the post operatory recovery of the Achilles's tendinosis starts once the stitches have been removed that is after 14 days since the surgery. In this period, one starts the so-called recovery but with baby steps. One follows the normalizing of the muscular tonus for the muscles responsible for the plantar flexion and the increase of the articular mobility. This period comprises the following:

1. The calf-podal cask splint is replaced by a special boot which keeps the leg in the maximum equines position possible. This change brings along not having the restriction of stepping on the operated limb anymore. In this period, one recommends, for a week, moving with both stretches, so that the next week using only one on the opposite part of the affliction. One does not definitely to immobilization!
2. In this period, one recommends recovery exercises for both the part above the lesion as well as the one at the level of the lesion. One follows the regaining of the physiological movements of the leg such as: flexion-extension, inversion-eversion and circumduction.

The Means Used

- Thermotherapy has an important role due to the analgesic effects; it comprises procedures that propagate a high quantity of thermic agent – one uses temperatures of 45-80 degrees Celsius. The action of thermic excitants on the human organism leads to accentuated and complex response reactions of the circulatory system.
- The massage has the role of heating the calf and leg region and relaxing tis area. During the massage nervous impulses start toward the central nervous system, either through friction that excite the muscle, tendon and other preceptors of other tissues or through impulses directed from the epidermal receptors after the tabulation.
- In kinetic therapy one uses passive and passive-active mobilizations for this period.

1. The patient starts the recovery program with thermotherapy: the patient in dorsal decubitus position is being applied with warm bandages of 38043 degrees Celsius, for 20-30 minutes. These are applied on the affected area – cotton bandages soaked in water, the latter being always covered to maintain their temperature or they can be changed every 5 minutes. The warm bandages have a hyperemia action favoring the local, resorptive and analgesic trophic processes.
2. The calf massage starts by massaging the anterior calf group. The patients sit on a chair facing the therapist; the latter holds the ankle of the patient with one hand while placing the other under the external malleolus and the police faces the external face of the tibia. One effectuates the method of tabulation several times up and down, afterwards under a comb shape tabulates strongly with the help of the dorsal part of the phalange. One executes the tabulation, the petrissage with two fingers. The posterior muscles are massaged through tabulation with one hand or two, moving them up and down, following the tabulation in a shape of soaking, then petrissage and in the end using the pluck-smoothing technique.
3. Kinetic therapy, after all the procedures aforementioned, has helped at calming the pain as well as contributing to stimulating the nervous and muscular aspects. After this, the medical gymnastics comes into play.

The results of the research

In today's society, a sedentary lifestyle has become a characteristic of modern life or better yet a life style which many of us adopt with quite a lot of easiness. This means that a person that does not engage in sufficient physical activities is having an unhealthy lifestyle favoring diseases in different segments of the human organism, such as: locomotor, nervous, cardio vascular and respiratory diseases [4].

The results obtained after applying the recovery methods exposed in the order of their evolution, starting from the values registered at the first evaluation and ending with the results of the last evaluation, have been the following:

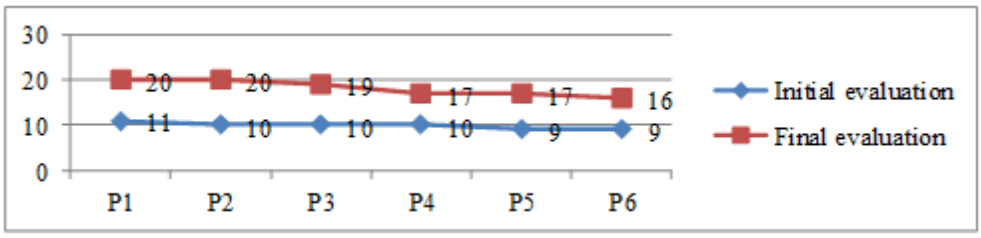

Fig. 1. The evolution dynamics of testing the articular mobility in the extension movement of the patients

To what the obtained results are concerned, to the flexion and extension evaluation studies, we can say that the values obtained at the initial testing have been limited both by the presence of pain and the inflammatory process, the final testing showing indeed better value.

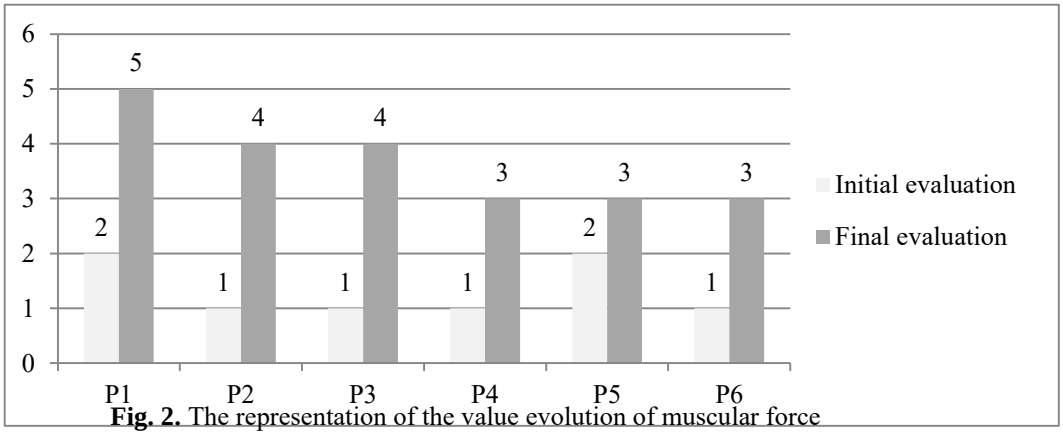

Fig. 2. The representation of the value evolution of muscular force

To what the evolution of the muscular force is concerned, we can state that initially all the subjects registered values between 1-2, which makes us affirm that they could not do movements against gravitation; after applying the medium resistance pain would also appear.

To the final testing, we notice a positive evaluation of the muscular force for all the subjects and for all muscular groups.

Conclusions

Through the obtained results we can say that the evolution of the patients has been good and the proposed objectives have been fulfilled:

- The articular mobility has increased;
- The muscular force has increased;
- The stability and balance have been regained.

In elaborating the kinetic therapy program, one has considered the individual characteristics and the seriousness of the trauma. The program started in good time, one has respected the program's stages and the patients respected the indications and counter indications of the kinetic therapist. The patients have cooperated and through the significant evolution of the evaluated parameters, within the research, one has confirmed the utility of the proposed kinetic therapy program. The latter has ensured the functional recovery of the patients, by correlating the orthopedic measures and the recovery ones. The entire research activity in which the post traumatic recovery program has been included, the articular and muscular evaluation, the prophylactic measures, which have been the object of this research and the results obtained, all of these have confirmed the hypothesis of the research.

Acknowledgment: The present paper is the result of the equal contribution of all authors.

Declaration of interest statement: No potential conflict of interest was reported by the authors.

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Study Regarding the Importance of Preoperative Physical Therapy in Functional Recovery after ACL Reconstruction

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Abstract

This paper aim is to highlight the role that physical therapy plays in the preoperative period in terms of functional recovery of patients with surgical reconstruction of the anterior cruciate ligament, this being closely related to regaining muscle strength and regaining joint mobility, an important aspect being reflected in the functional re-education.

The study was performed on a group of 18 subjects, these being divided into 2 groups, each group consisting of 9 subjects, aged between 29 and 45 years. They suffered injuries to the knees that resulted in the lesion of the anterior cruciate ligament, with the recommendation of the specialist for surgery, as well as the follow-up both preoperative and postoperative recovery program. Of these, only the first group followed a preoperative and postoperative program, the second following only the postoperative program.

The results of the research highlight the importance of practicing preoperative physical therapy in patients with ACL reconstruction.

Keywords: ligament lesion, functional deficit, joint mobility, muscle strength

1. Introduction

Ligamentoplasty is the surgical intervention that addresses the treatment of ligament lesions, the most often affected and surgically treated being the anterior cruciate ligament. In the literature, it is recommended that patients with such a condition follow a physical therapy program both before surgery and postoperatively.

The anterior cruciate ligament (ACL) is considered the primary passive element of the anterior translation of the tibia on the femur and provides stability of rotation of the knee in both frontal and transverse planes. ACL is one of the most intensely studied anatomical structures in the human body, resulting in a multitude of biomechanical, biological and clinical data, leading to paradigm shifts in almost every facet of ACL lesion management and prevention. The treatment of LIA injury is a dynamic and evolving field. The current concepts in ACL injury and surgery are being shaped by technological advances, expansion in basic science research, resurging interest in ACL preservation, and expanding efforts regarding injury prevention [1].

The subject of anterior cruciate ligament post-reconstruction recovery is an extremely vast one, offering specialists in the area the possibility of analysis and documentation in order to select the most effective therapeutic methods of intervention. A particularly important aspect is

represented by the multidisciplinary collaboration, realised between orthopedic, recovery doctor and physiotherapist, who must respect some recovery protocols that will be materialized in achieving of therapeutic objectives.

Another significant aspect is the performance of a musculoskeletal assessment, being necessary to know and apply systematically the principles of a rigorous examination of the patient. A correct diagnosis is dependent on the knowledge of the functional anatomy, on the accuracy of the patient's history, on his vigilant observation and on a specific examination.

The process of differentiated diagnosis involves the use of symptoms and clinical signs, physical examination, knowledge of the pathology and mechanism of injury, specific tests and the technique of imaging tests [2].

Over time, a series of therapeutic interventions have been developed that lead to a rapid and risk-free rehabilitation in patients with ACL reconstruction. For example, the role of PRP is still controversial and the only advantage emerging from the literature is related to a better graft maturation over time, without documenting beneficial effects in terms of clinical outcome, bone-graft integration and prevention of bony tunnel enlargement [3].

One cause of LIA injuries may be a sprained knee. Sprain is a traumatic injury of the capsulo-ligamentous system and periarticular soft tissues by their tension by a mechanical force, which by its value exceeds their resistance [4]. Anterior cruciate ligament (ACL) injuries are common and a fairly serious condition. Although diagnosis using magnetic resonance imaging (MRI) is usually straightforward, diagnostic difficulties can sometimes occur [5]. Three physical examination tests are most commonly used to assess anterior cruciate ligament injury. The best known and most commonly used technique is the anterior drawer test. The other 2 tests, the Lachman test and the pivot change test, are more difficult to perform and are used less often, especially by doctors with less experience in their practice. In addition, there is a relatively new diagnostic test: the lever sign test [6]. The evaluation of ACL rupture by oblique-sagittal MRI in addition to orthogonal MRI protocol is accurate and with high sensitivity and specificity values [7].

Clinicians and specialists in the domain of orthopedic surgery, but also in medical recovery have numerous approaches regarding the conduct of partial lesions of the anterior cruciate ligament. Surgical reconstruction of a previously ruptured cruciate ligament has become the most widely accepted treatment. An important but undeclared aspect of ACL reconstruction is graft insufficiency, which is a challenge for the orthopedic surgeon. An understanding of bone tendon healing and the intra-articular ligation process is crucial for orthopedic surgeons to choose the right graft and to initiate optimal rehabilitation protocols after ACL reconstruction [8].

The importance of preoperative physical therapy for patients with anterior cruciate ligament reconstruction is obvious because it’s normalized joint mobiliy and muscle toning is achieved to prevent the installation of muscle hypotrophy. Regarding the means of recovery, we bring into discussion passive mobilizations and assisted active exercises (for regaining joint mobility) and exercises performed with resistance (for optimizing muscle tone).

2. Purpose and objectives

The aim of the study is to highlight how the kinetic means used in the preoperative period in patients to undergo ligamentoplasty intervention influence their recovery.

From the point of view of the objectives of this research we can discuss the realization of evaluations and measurements specific to the disease, from which we can extract true results

regarding the study. Another objective refers to the completion of the recovery program on the 2 stages and the selection of efficient kinetic means, which would provide valuable information and the need to introduce them in the rehabilitation protocols, as well as conducting a case study and presenting the results through graphs and results comparison with similar studies, which aimed at the same parameters.

3. Material and methods

The study was performed on a group of 18 subjects, aged between 29 and 45 years, who presented with ligament lesion and received the recommendation of surgery. Subjects were divided into 2 groups (group A and group B), each group consisting of 9 subjects, the group A performing a preoperative and postoperative kinetic program, while the group B followed only the postoperative recovery program. The study period was between November 2019-August 2020, the subjects of this study didn't practice performance sports or another competitive physical activity. The inclusion criterion of the subjects was based on the presence of the anterior cruciate ligament lesion and they were divided into two groups according to the medical recommendation to follow or not the preoperative physical therapy.

The functional testing of the subjects was based on the achievement of the muscle testing (using the scale from 0 to 5) and the joint testing (performed knee range of motion ROM-goniometry) at the level of the affected knee joint. At the same time, measurements were done on the circumference of the thigh (10 cm above patella) and the circumference of the calf (10 cm under patella). In order to highlight the status of edema and inflamation that sets up postoperatively, we measured the mid-patellar circumference to highlighting the differences between the 2 groups, namely we measured the mid-patellar circumference of all subjects postoperatively during the 3 stages, after which we performed the arithmetic mean of the values obtained and compared the results with those obtained at the level of the healthy limb. It should be noted that the first group of subjects also benefited from a thorough preoperative evaluation, its purpose being to establish the objectives of the kinetic program, which focused on regaining joint mobility in physiological parameters, muscle strength and joint stability, all these having the role of facilitating postoperative recovery. Postoperative testing was performed in three stages postligamentoplasty (initially, intermediately and finally).

The subjects of the research followed a recovery program during six months postoperatively, with a frequency of 3 sessions per week, the duration of one session being approximately one hour, the first group also performing a preoperative program for 30 days and were performed exercises with opposite resistance at the level of the leg, in the distal third (manually and with sandbags), exercises for re-education of gait (inclined plane, with walking over obstacles, bending, on tiptoes/heels), as well as exercises aimed to joint stability (balance sheet exercises).

Achieving postoperative objectives was possible through the use of passive mobilizations, postures, isometric contractions, assisted active exercises, active exercises and active exercises with resistance. Passive mobilizations and active assisted exercises at the knee were performed in order to regain joint mobility, both for flexion and extension movement, thus reducing the risk of muscle-tendon retractions or joint stiffness. Active exercises and active exercises with resistance (performed manually or instrumentally) aimed to regaining muscle strength in the knee muscles, these being performed from the positions of dorsal decubitus, ipsilateral decubitus, ventral decubitus or sitting on the edge of the bench. Even if there is a tendency to put a special emphasis on toning the quadriceps muscle it is very important to give the same importance to the

group of flexor muscles of the knee, in order to obtain a muscle balance at the thigh [9]. The exercises on the balance board were performed in order to improve balance and static stability.

4. Results and discussions

In order to highlight the results, we performed the arithmetic mean of the values obtained by the 2 groups of subjects in the initial evaluation (14 days postoperatively), intermediately (40 days postoperatively) and finallly (4 months postoperatively).

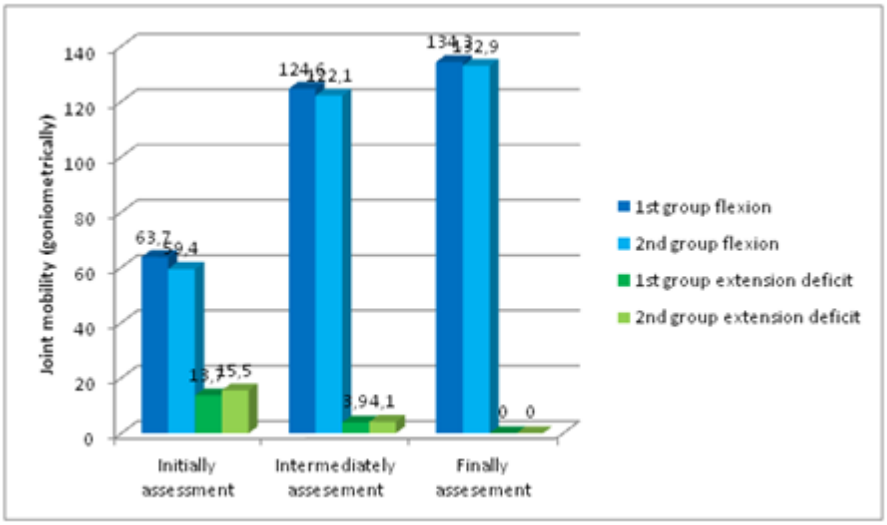

Fig. 1. arithmetic mean of joint mobility of the affected knee

According to Figure 1, joint mobility improved significantly from one stage to another among both groups of subjects. Regarding the flexion in the initial assessment, group A showed an improvement of 4.3° compared to group B, while the extension deficit was lower by 1.8°. In the mid-term evaluation, group A registered an improvement of flexion by 2.5° compared to group B and the extension deficit was lower by 0.2°.

In the final evaluation, both groups recorded physiological values of both movements, the extension deficit being fully recovered and flexion recorded slightly higher values in the case of group B, with a difference of 1.8°. The improvement and normalization of the joint testing values is due to the passive mobilizations, postures and assisted active exercises, the differences between groups not being significant in favor of the one that also performed a preoperative kinetic program. Rehabilitation after anterior cruciate ligament reconstruction should consider control of postoperative pain and edema, protection of the graft for healing, restoration of the full range of symmetrical movement to the contralateral knee, strengthening of the muscles that stabilize the knee, hip and trunk progression, improvement gradually to functional activities that are necessary to return to sports [10].

Figure 2 highlights the results obtained in muscle testing. This shows how the muscle strength of the 2 groups of subjects was improved, both for knee flexors and for its extensors.

In the initially assessment, group A recorded the values 4 for both movements, while group B recorded the values 3+ for both movements, the better values recorded by group A can be attributed to the practice of the preoperative kinetic program, during the intermediately assesement the values for the two tested movements were 5 for group A, and for group B 4+ for

flexors and 4 for extensors and during the finally assesement both groups recording physiological values of the two movements, this due to the postoperative recovery program, where was introduced isometric contractions, active exercises and active exercises with resistance.

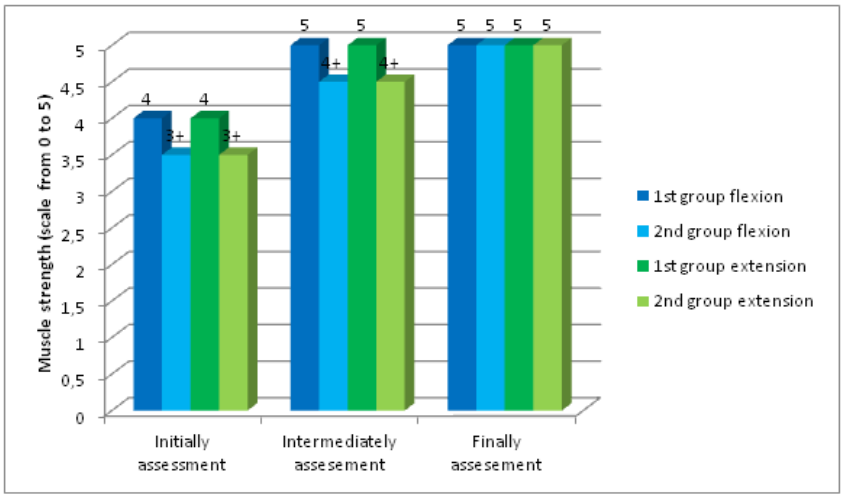

Fig. 2. arithmethic mean of muscle testing of the affected knee

Strength deficiencies of the quadriceps femoris after returning to sport post-reconstruction anterior cruciate ligament contribute to decreased knee function [11].

Figure 3 expresses the way in which the muscle perimeter of the affected thigh evolved among the 2 groups during the recovery program, the comparison being made considering the values obtained at the level of the healthy limb.

Using the figure below (Figure 3), it can be highlighted that in the initially assessment, group A recorded a difference in the perimeter of the thigh of the operated lower limb compared to the healthy lower limb of 2.1 cm, while second group recorded a difference of 3.3 cm, this being explained by the fact that group A followed a preoperative kinetic program which aimed at toning the thigh muscles in order to prevent muscle hypotonia after surgery.

During the finally evaluation, the values obtained approached the values of the ipsilateral lower limb among both groups of subjects, group A registering a difference of 0.3 cm and group B a difference of 0.6 cm, this being obtained through muscle toning exercises, especially those with resistance.

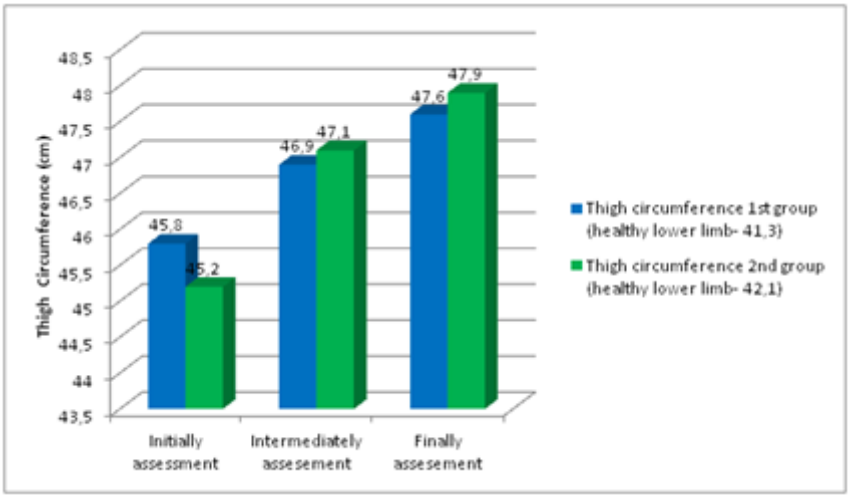

Fig. 3. arithmethic mean of thigh circumference

It is important to emphasize that practicing a preoperative program prevents muscle hypotonia and facilitates the development of the postoperative program. It was concluded that more than half of the LIA rugby injuries resulted from a contact mechanism and for non-contact injuries, lower knee flexion angles and the first ground contact of the heel in a lateral step maneuver were associated with LIA injury, so it is important to achieving knee stability [12]. The quadriceps are essential for dynamic joint stability and the weakness of this muscle group is related to poor functional results. Because of this, identifying strategies to minimize quadriceps weakness following acl injury and reconstruction represent an important clinical interest [13].

Figure 4 shows the results obtained in the measurements of the perimeter of the calf of the two groups, doing the arithmetic mean for each group, considering the measurements obtained in the case of healthy lower limb at the same level.

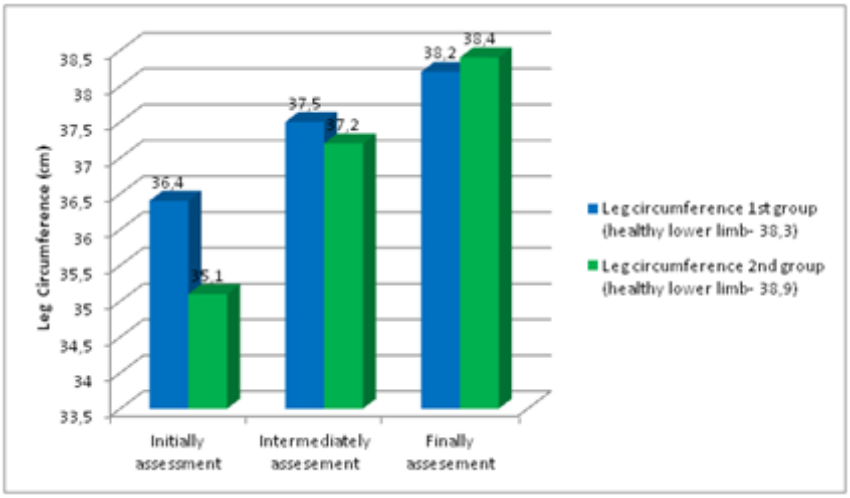

Fig. 4. arithmetic mean of calf circumferences

In this figure (4) we can observe that in the initially assessment, group A recorded a difference in calf circumference of 1.9 cm from the contralateral lower limb, while group B recorded a difference of 2.8 cm, this being explained by the fact that group A followed a preoperative kinetic program which aimed at toning the leg muscles in order to prevent muscle

hypotonia after surgery. In the finally assessement, the values obtained were close to the values of the ipsilateral lower limb among both groups of subjects, group A registering a difference of 0.2 cm and group B a difference of 0.5 cm, this being obtained through muscle toning exercises, especially those with resistance. Persistent muscle weakness after anterior cruciate ligament (ACL) reconstruction may be due to underlying activation failure and arthrogenic muscle inhibition [14].

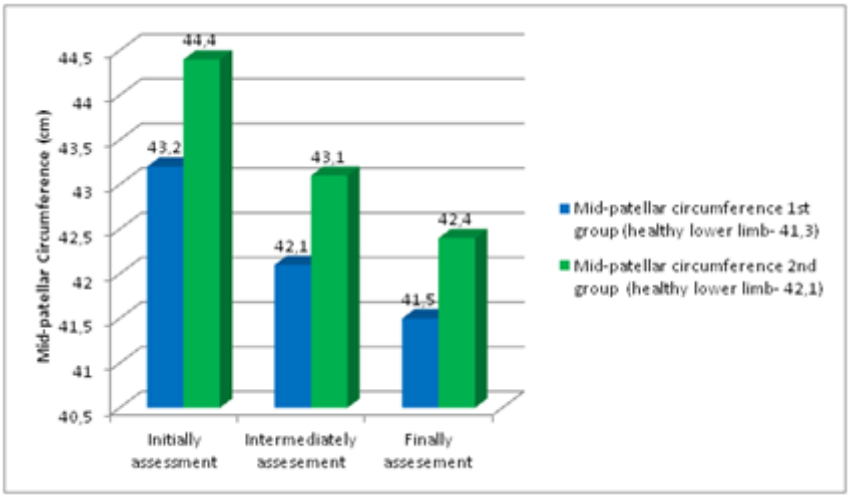

Fig. 5. arithmetic mean of mid-patellar circumference

Figure 5 shows the results obtained in the measurements of the mid-patellar perimeter of the two groups, doing the arithmetic mean for each group, considering the values obtained at the level of the healthy lower limb.

In the figure above, we can observe the results obtained by the 2 groups regarding the status of edema of the affected knee by measuring the mid-patellar circumference. The values obtained at the level of the healthy lower limb were recorded, after which the measurements recorded postoperatively were related to them. It can be seen that group A had slightly lower values of this parameter, the postoperative-initially assesement showing a difference of 2.1 cm, while group B recorded in the same evaluation the difference of 2.3 cm. In the finally assesement it is highlighted that both groups are close to normal values, group A having a difference of 0.2 cm, while group B showed a difference of 0.3 cm.

Pain, edema and inflammation of the knee joint and its surrounding soft tissue structures are common in the postoperative period after debridement of the arthroscopic knee and reconstruction of the anterior cruciate ligament. These challenges can make it difficult for the patient to recover immediately after surgery [15].

5. Conclusions

In conclusion, it can be stated that the role of a preoperative program among subjects with arthroscopic anterior cruciate ligament reconstruction is important by preventing muscle hypotonia and thus by facilitating the development of the postoperative recovery program.

The latter is essential for the functional recovery of the patient after ligamentoplasty, by achieving normal joint mobility, by regaining and integrating muscle strength and perimeters in physiological values, by improving postoperative edema, but also by functional reeducation.

The physiotherapy program recommended for patients with ligament lesions that require surgery is also recommended in the preoperative stage, through the kinetic means used in this phase, hypotonia and muscle hypotrophy are prevented and joint mobility can be regained in a shorter time and with a less effort, this aspect being highlighted by the graphs above. A particularly important aspect of the preoperative program is also found in facilitating the closure of the kinetic chain, patients who have followed such a program having the ability to perform motor tasks in closed kinetic chain with low risk of local inflammation.

Considering that not all patients with anterior cruciate ligament reconstruction consider that it is necessary to follow a preoperative kinetic program we want to highlight through this study the benefits of its realization, being necessary to conduct detailed studies, highlighting preoperative physiotherapy.

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Study Regarding the Importance of Physical Therapy in the Relief of Vertigo Syndrome in Patients with Cervical Spondylosis

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Abstract

The present study aims to highlight the role played by the specific means of physical therapy regarding the relieving of vertigo syndrome in patients diagnosed with cervical spondylosis.

These patients may present as symptoms localized pain in the cervical area, which may radiate to the upper limbs, significant mobility deficit in this area, as well as the presence of vertigo, which is observed by affecting static and dynamic balance. Through this study we want to highlight how we can improve these parameters by kinetic means.

The study was conducted on a group of 14 subjects, both male and female, aged between 40 and 58 years. They were diagnosed with cervical spondylosis and had symptoms specific to the condition, so they received a recommendation from a specialist to follow a recovery program.

The results of the research highlight the benefits of practicing physical therapy in terms of improving the functional status of patients with cervical spondylosis.

Keywords: mobility deficit, balance, functional tests, functional status

1. Introduction

Cervical spondylosis or spondylodiscarthrosis refers to the degenerative damage of the cervical spine, the etiopathogenic factors being those that provide information on the occurrence of this disease, as well as how it evolves.

Cervical pain is the most common type of pain, after headache and low back pain, about 80% of the population has neck pain at least once in a lifetime [1]. An important ethylological factor refers to age, arthritic diseases being more common at older ages, being a mechanical wear on the spine. Cervical spondylosis is a condition that involves a degenerative change in the cervical spine. Compelling evidence has shown that the incidence of cervical spondylosis increases with age. However, the relationship between age and the incidence of cervical spondylosis remains obscure [2]. Vertebral joints and interapophysis are affected by the arthritic process, with lesions and hernias of the intervertebral disc, development of the anterior and posterior osteophytes, stenosis of the conjugation holes and nerve compressions, stenosis of the spinal canal, slipping of the vertebral bodies [3].

From the point of view of the specific symptoms of this condition we can list the appearance of local pain, which can radiate to the shoulders or to the skull, but also along an arm or to the fingers, headaches, stiffness, vertigo affecting the static and dinamic balance.

Vertigo, headache, palpitation, nausea, abdominal discomfort, tinnitus, blurred vision and hypomnesia are common symptoms in patients with cervical spondylosis. However, their etiology is not as clear as the typical manifestations of cervical spondylosis such as pain, numbness, and fine-motor functions [4].

In order to establish the diagnosis, the specialists perform the anamnesis and the physical examination, being asked questions about the symptoms, diseases present, etiology. At the same time, it evaluates the mobility and the degree of pain caused by mobilizations, performs functional tests and/or recommends certain clinical evaluations. With the application of the radiographic index method, cervical spine lordosis, the full flexion to full extension ROM, horizontal displacement, and cervical instability can be accurately illustrated [5]. MRI may be an alternative way to evaluate thoracic inlet and sagittal alignment parameters in patients with cervical spondylosis when x-ray in the cranial-cervical thoracic regions cannot show anatomical sites clearly due to overlapping soft and bony tissues [6].

The treatment for cervical spondylosis is closely linked to the severity of the signs and symptoms, the purpose of which is to relieve pain, help maintain normal daily activities and prevent permanent damage to the nerves and spine. Currently, the treatment for cervical spondylosis varies, including surgery, physical therapy, chiropractic manipulative therapy, and osteopathic manipulative treatment. Surgical intervention is suitable for patients with severe or progressive neurologic deficits. Physical therapy showed advantage in restoring range of motion, flexibility, and core strengthening. Alternative therapies also showed immeasurable benefit in cervical spondylosis treatments. Although the developed surgical procedures show effect on alleviating the symptoms, most of patients with cervical spondylosis prefer conservative therapies such as electroacupuncture and massage [7].

The necessary conditions for a physiotherapy program require the prior preparation of the cervical structures: through local thermotherapy, then the approach through electrotherapy procedures aimed at combating pain and muscle contractures, as well as obtaining general nerve relaxation. Among all spinal therapies, treatment of the cervical segment is the most difficult.

The cervical segment is particularly sensitive to injuries and pain, and it also requires special care due to its great mobility and most delicate construction [8].

The program of balancing the muscles of the cervical spine will be continued with that of the functional restoration of the muscles of the scapular arch, which is frequently disturbed during the evolution of a cervical spine disease. Techniques such as initially passive and then active-assisted mobilizations can be used and after a stable progress of the cervical dynamics, the active and ample mobilization exercises of the cervical spine can be performed, as well as the active exercises with resistance.

Given that patients with cervical spondylosis may develop problems with balance and proprioception it is important to pay special attention to the recovery of these parameters, even if the loss of balance can be caused by external mechanical disturbances [9].

There are several clinical balance tests to diagnose postural instability The Romberg Test (RT) may relate directly to single sensory cognitive and motor processing [10]. Restoration of the cervical alignment is a main objective, the most frequently used techniques for this purpose are the passive mobilizations, by manual traction in the axis where is performed passive axial elongation, which will be completed, in the later phases of recovery, with elongation exercises.

Traction in the shaft for the cervical spine can also be performed with the help of mechanical systems: pulleys that will tension the cervical spine, either horizontally (from a position in a lean position) or vertically (from a sitting position), with the help of weights, which will be

permanently adapted to the patient's clinical condition or tolerance, by means of the well-known Glisson bridle, or tru-trac type devices. Cervical spondylosis is a common and disabling condition. It is generally felt that the initial management should be nonoperative, and these modalities include physiotherapy, analgesia and selective nerve root injections [11].

3. Methodology

The study was performed on a group of 14 subjects, aged between 40 and 58 years, who were diagnosed with cervical spondylosis and received the recommendation to follow a recovery program. The functional testing of subjects was based on achieving muscle balance (using the scale from 0 to 5) for specific muscle groups of the head and neck (flexion, extension, lateral inclination, lateral rotation) and joint testing (performed range of motion-ROM-goniometry) at the same movements performed on the joint of the head and neck.

In the same time, the Underburg test was performed to highlight a vestibular involvement, which involved the subjects walking on the spot, bending their arms at 90° and keeping their eyes closed, rotating their head side by side. This test is positive if there is a fall of the arms, a pronation of the forearms or a loss of balance. In order to highlight the status of balance and proprioceptive disorders we performed the Romberg balance test, a test that involves the subject to perform a series of tasks such as sitting without support, sitting up, sitting with eyes closed, standing on one leg, etc. For each of these actions a score is received from 0 to 4, the maximum score being 56 points. These tests and measurements were performed in three stages (initially, intermediately and finally).

The research subjects followed a recovery program for 8 weeks, with a session frequency of 3 sessions per week, the duration of a session being approximately one hour. In order to achieve the objectives were performed passive mobilizations, axial tractions, postures, isometric contractions, assisted active exercises, active exercises and active resistance exercises, as well as exercises that intentionally and systematically created imbalances. In order to improve body balance, exercises can be performed on unstable surfaces, with eyes closed [12]. Passive mobilizations, traction in the axis and assisted active exercises performed on the head and neck aimed to obtaining muscle relaxation, as well as ameliorating the pain syndrome, but also regaining joint mobility, for flexion, extension, lateral inclination and lateral rotation movements. Active exercises and active exercises with resistance (performed manually or by instruments such as sandbags of the helcometer or elastic band) had the effect of regaining muscle strength, these being performed from the positions of dorsal decubitus, ipsilateral decubitus, decubitus ventral, sitting position or orthostatism. In order to improve vertigo pacients were performed a series of exercises, such as balance plate exercises, standing exercises in a single lower limb, exercises for coordinating the movements of the arms with the movements of the head and neck, oculomotor coordination exercises, as well as performing exercises with closed eyes.

4. Results and discussions

In order to highlight the results obtained, we performed the arithmetic mean of the values obtained by the subjects included in the research, in the 3 assesements (initially-at baseline, intermediately-after 4 weeks of rehabilitation treatment and finally-after 8 weeks of treatment).

Figure 1 shows the results obtained in the joint testing performed on all movements of the head and neck joint. The degrees of mobility at the level of the head and neck were related to the physiological values, namely flexion and extension between 35-45°, lateral inclinations and lateral rotations between 45-60°.

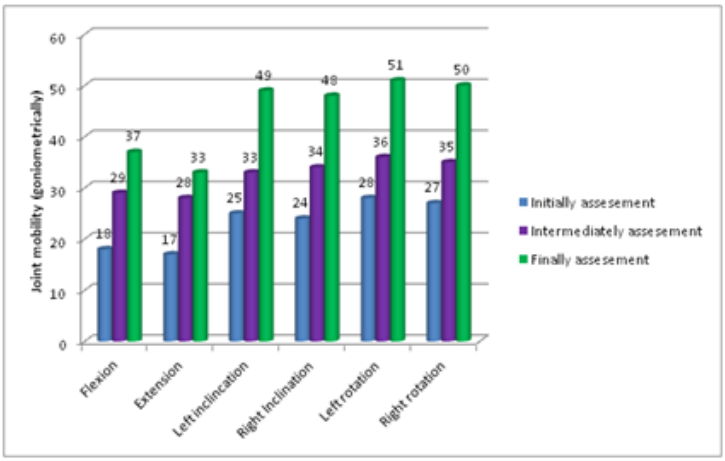

Fig. 1. arithmetic mean of range of motion of the head and neck

In the figure above, we can observe the way in which the joint mobility parameter was influenced in the case of the subjects included in the research. It can be seen that in the initially assessment (at baseline) the values obtained on all specific movements of the head and neck recorded a deficit of mobility (flexion-18°, extension-17°, left inclination-25°, right inclination-24°, left rotation-28°, right rotation-27°), following that the values will improve in the intermediately assesement(after 4 weeks of rehabilitation treatment) and in the case of the finally assesement (after 8 weeks of rehabilitation treatment) it can be observed physiological values (flexion-37°, extension-34°, left inclination-49°, right inclination-48°, left rotation-51°, right rotation-50°).

Improving and normalizing the values of joint testing at the level of specific movements of the head and neck can be due to passive mobilizations, postures, traction in the axis, but also active-assisted and free active exercises. Due to neck pain, cervical spine degeneration and cervical fusion, numerous cervical spondylosis and anterior cervical fusion (ACF) patients suffer from limitations of cervical mobility and cannot maintain their life quality; this includes difficulty of walking down stairs, washing their hair and driving cars. As an important indicator of cervical disease and postoperative life quality, the cervical range of motion (CROM) is routinely measured by clinicians and researchers to evaluate the cervical impairment, therapeutic effect and residual disability [13]. The cervical spondylosis is a condition that limits mobility in the head and neck, so it is important that specialists in the domain of recovery pay special attention to regaining joint mobility at this level.

In the figure below, we highlight the results obtained in the muscle testing performed on all movements in the joint of the head and neck.

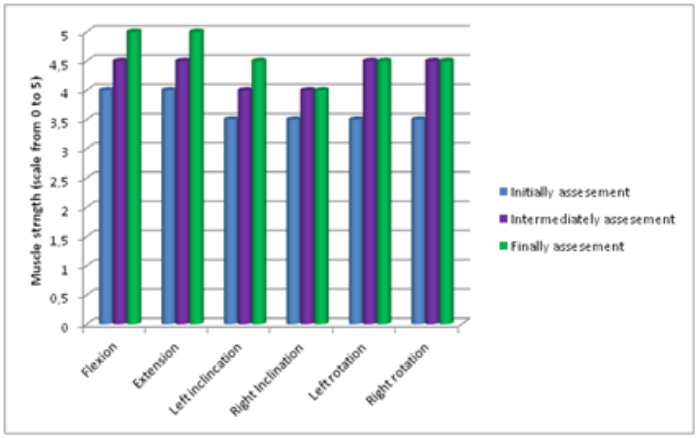

Fig. 2. arithmethic mean of muscle testing of the head and neck

Figure 2 shows how the parameter of muscle strength among subjects was improved on the movements of flexion, extension, lateral inclinations and lateral rotations of the head and neck.

In this way we can report that in the initially assessment the case study subjects recorded a deficit of muscle strength on all head and neck movements (flexion and extension-force 4, left and right inclination-force 3+, left and right rotation-force 3+), this parameter improving in the intermediately evaluation, following that in the finally assesement the muscle force will be in physiological limits for flexors and extensors (force 5) and for lateral inclinations and lateral rotations the registered force being 4+. The improvement of this parameter is due to active exercises and active exercises with resistance (opposed manually or with the help of tools such as sandbags, weights, elastic bands, helcometer), being necessary to continue the recovery program to maintain and normalize muscle strength on all directions of movement.Chronic neck pain often reflects a state of instability in the cervical spine and is a symptom common to a number of conditions described, including disc herniation, cervical spondylosis, whiplash injury and whiplash associated disorder, postconcussion syndrome, vertebrobasilar insufficiency, and Barré-Liéou syndrom [14]. Achieving normal muscle tone in the head and neck improves the specific symptoms of cervical spondylosis and provides stability that prevents the appearance or worsening of clinical signs.

Figure 3 highlights the results obtained in the Underburg test that provides information on vestibular and proprioceptive impairment. In this way we can see that in the initially assesement for 13 of the 14 subjects included in the research the test was positive, following that in the intermediately evaluation the number of subjects with positive Underburg test decrease to 6 and finally only one of the 14 subjects obtained a positive result in this test.

Cervical proprioception is critical in the maintenance of posture and movements, so its assessment in different cervical conditions has gained importance in recent clinical practice [15].

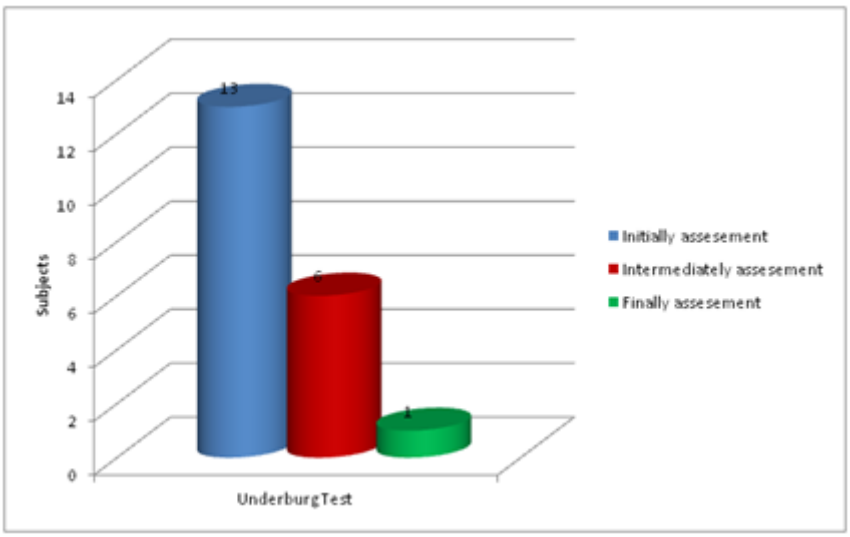

Fig. 3. Underburg test results

The patients with cervical spondylosis have proprioceptive impairment and it is necessary to perform an evaluation from this point of view and then to normalize this parameter, which was improved in this research through closed-eye exercises, adding external stimulus and using assistive devices such as the balance board or the creation of uneven, multidimensional spaces.

Figure 4 shows the results obtained by the subjects in the Romberg test, a test that has a maximum score of 56 points. Vascular risk factors predispose to vertebrobasilar ischemia.

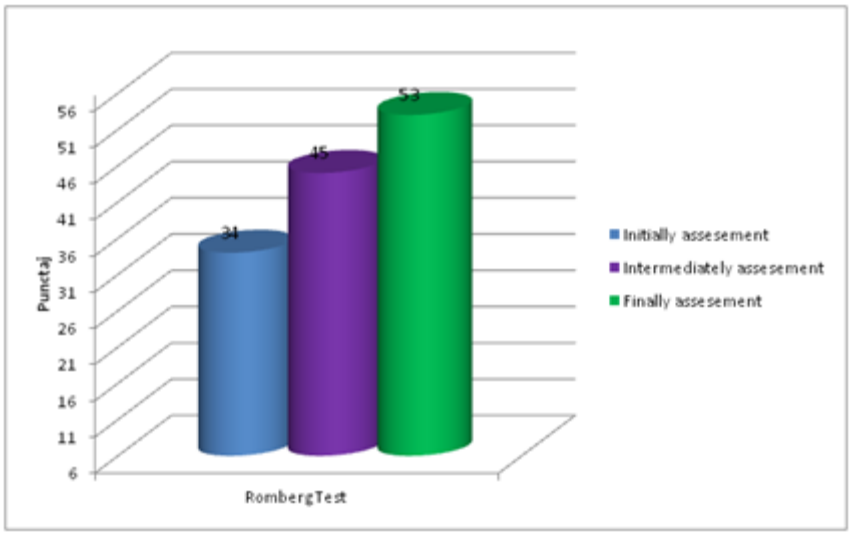

Fig. 4. Romberg test results

Cervical osteophytes can impinge on the vertebral artery causing mechanical occlusion during head turning. Presentation with vertigo in such instances is a common finding [16].

Considering that patients who have been diagnosed with cervical spondylosis may have problems with vertigo, it is important to pay special attention to this aspect of the recovery program because experiencing vertigo or dizziness obviously worsens the quality of life.

Vertigo is a symptomatology conception associated with multiple systems, including cervicocephalic movements, vestibular (inner ear), visual, vascular, neurovascular, cervical

proprioceptive, and cervical spinal cord dysfunction. Nearly 50% of patients with dizziness mean to experience vertigo [17].

Figure 4 shows the results obtained by the subjects at Romberg test. It involves performing several tasks, scored according to how they are performed. We can observe that the score obtained in the initially assessment was 34 points, in the intermediatele assesement 45 points and in finally assessment the score was 53 points. This improvement is due to the recovery program, use of kinetic means leading to the improvement of symptoms, including conditions related to balance and stability and the discomfort created by the presence of vertigo.

5. Conclusions

In conclusion patients diagnosed with cervical spondylosis may experience various symptoms such as pain, numbness, partial functional impotence or problems related to vertigo, balance and proprioception, all of which alter the quality of life.

The recovery program of patients with cervical spondylosis who have vertigo should focus on a number of objectives to improve symptoms. These objectives refer to regaining joint mobility in the head and neck within physiological limits, regaining optimal muscle strength at this level, as well as improving the parameters related to static balance, stability and proprioception.

According to the graphs presented above, the subjects included in this research showed significant improvements in all incorporated aspects. Joint mobility recorded physiological values for flexion, extension, lateral inclinations and lateral rotations, muscle tone reached force 5 on flexion and extension and 4+ on lateral inclinations and lateral rotations, in the Underburg test of those 14 subjects only one obtained a positive test and in the case of the Romberg test the score obtained approaching to maximum value, being obtained 53 points of 56 totally.

Patients with cervical spondylosis who suffer from vertigo need to go through a specific recovery program, which includes kinetic means that can restore muscle balance, but also postural balance, aspects that ultimately translate into improving the way they perform daily activities.

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Physical Development and Dietary Habits of Students at the Faculty of Physical Education and at the Faculty of Medicine in Iași

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Abstract

The students at the Faculty of Physical Education (Kinesiotherapy section) and at Medicine must be careful concerning physical development and diet, in order for them to become role models for patients. Paper purpose and objectives: the assessment of physical development using body mass index; the assessment of dietary habits.

Material and methods

The study was conducted on a sample of 114 students within the Kinesiotherapy section of the Physical Education Faculty (51 young students) and within the Faculty of Medicine (63 students). They filled out a weekly food intake questionnaire. We have analized the results using Pearson's test.

Findings

In the research sample, 74.56% of the young people recorded normal values of the BMI and 18.42% overweight values. The differences calculated are statistically significant ($p<0.05$) and they draw attention on the young people within the Kinesiotherapy section, among whom the overweight percentage is higher. Breakfast is absent from the daily schedule of 26.32% of the young people, with significant differences ($p<0.05$), and they also concern mainly the Kinesiotherapy section these students skip morning food intake more often. Milk is featured in menus mostly 2-3 times a week, as well as eggs (39.47%), the differences calculated being statistically insignificant ($p>0.05$). Bread is featured in menus, especially daily (42.98%) with statistically insignificant differences per faculties ($p>0.05$). Fruits are present in menus mostly 2-3 times (34.21%), just like sweets (32.45%), with statistically insignificant differences ($p>0.05$).

Conclusions

Among students within the Kinesiotherapy section, an alarming aspect is the inadequate distribution of food within the daily schedule, which should be improved.

Keywords: students, food, breakfast

Introduction

Diet is an external factor playing an essential role in preserving the good health of a person.

Dietary habits are formed in childhood and they may persist throughout one's entire life.

Coherent educational programmes are needed in school, which may contribute to a focus shift towards healthy foods and the reduction (as much as possible) of unhealthy food intake.

Furthermore, these programmes must orient the students towards an increase in the time allocated to physical activity and a reduction of the time destined to sedentary activities [1, 2].

Among high school students, the most important information sources are parents (82.5%), coaches (80.0%), the Internet (52.5%), and school educational programmes (42.5%) [3].

There is no mention of the extended family or the school physician, consulted only in case of sickness. There was a focus on parents and coaches, meant to provide adequate information.

They must be informed correctly, mostly in what concerns healthy diet, balanced physical development, and physical activity practice [4]. Practically, the development of preventive services becomes necessary, which is rather difficult. The simplest solution is to provide coherent information in school, among the teaching staff and mostly the PE teachers, who are often also coaches for various sports and school or extracurricular activities.

It is thus important for medical and PE university students to be provided with coherent information. Kinesiotherapy students need such information in order to work with students who have health issues, especially children with spinal conditions, as well as with adults.

The first aspect to be monitored closely is related to physical development and to the correlation between height and bodyweight, namely body mass index. Among adults, the value of this indicator evolves from underweight (below 18.4), to normal weight (18.5-24.9), to overweight (25-29.9) and obesity (over 30) [5, 6, 7]. Careful monitoring should begin in childhood and adolescence, because studies on university students have highlighted the existence of heart rate, blood pressure, and exercise capacity alterations among people with obesity [8].

Cardiac activity alterations among obese persons should be an alarming sign for specialists, because such persons are prone to strokes, associated to severe impairment of motor function and serious decrease in the quality of life. Kinesiotherapists must insist on these aspects upon coming into contact with such patients. Reliable information related to diet is necessary, because excessive intake favours the onset of obesity, while insufficient intake leads to underweight [9, 10].

The second important aspect is related to dietary habits adapted to the activity carried out, to age and gender. All foods are divided into 16 main categories, with certain characteristics recommending them for the diet of children, adults, and the elderly. We should not replace one category with another, because this may entail serious imbalances [11]. If we make a comparison between diary and meat, we observe a series of differences imposing the necessity of the presence of both groups in the menus. Both food groups contain proteins and animal fats, but milk is an important source of calcium, whereas meat provides an important amount of iron.

Practically, special attention must be paid to the adaptation of lifestyle and mostly of dietary habits. It is essential to pass from the concept of adult's disease to the one of lifestyle associated to disease, where obesity plays a crucial role. BMI modification is associated with changes in lean mass for men and with increase in body fat for women, which has negative effects on health [12].

Purpose and objectives of the study

Assessing the physical development of the students within the study; evaluating the potential differences between the physical development of Kinesiotherapy students and of medical students; pointing out the correlation between physical development and morning food intake; assessing morning food intake among the students at the two sections considered for our study; assessing the dietary habits of students by using a weekly food intake questionnaire.

Material and methods

The sample comprises 114 PE university students (Kinesiotherapy section) and medical students in Iași. We have questioned 51 students (44.73%) within the Kinesiotherapy section and 63 medical students (55.26%). The students were aged between 21 and 25 years old. The average age is 23.6 years for sports students and 22.7 years for medical students. The students filled out a weekly food intake questionnaire. The questions herein were structured on three main directions, represented by anthropometrical indicators, morning food intake, and food groups. The study took place during the first semester of educational activity (October-November) and the questionnaire was applied only once because it is a questionnaire of weekly frequency of food consumption and does not require reapplication (eating habits do not change easily). The anthropometrical indicators investigated were height and bodyweight, allowing the calculation of body mass index. We have interpreted the results using the classical method given that the subjects were over 19 years old. We have considered underweight the values under 18.4, normal those between 18.5 and 24.9, overweight those between 25 and 29.9, while obese those over 30 [5]. Morning food intake has been assessed through the question, "Have you had breakfast? – Yes; NO".

Diet by food group was evaluated with the help of five questions: How many times a week do you eat milk, eggs, bread, fruits, and sweets? The choices are: zero – once – 2/3 times – 4/6 times – daily. The findings must be correlated with the standards of reasonable diet, recommended for this age group and these food groups daily intake. The results were processed statistically using the Pearson CHI Square test.

Results

We will approach three aspects of a student's life, represented by bodyweight related to standards, morning food intake, and food groups.

Identification with the current beauty ideal (mostly for women) imposes a certain weight as the standard. Among our study sample, the situation is even more important because you cannot tell a patient that they should lose weight when your weight is far from ideal. In most cases, (74.56%) the students have normal values. An alarming sign is represented by the 7.01% of students underweight, an aspect that should be studied carefully because this is seen as an ideal situation, but it is not healthy. To the other extreme, there are 18.42% overweight students, who should also be monitored closely (Table I).

Table I. The values of body mass index among the students in the study

BMI value	Underweight	Normal	Overweight	Total
Kinesio.	3	33	15	51
Medicine	5	52	6	63
Total No.	8	85	21	114
%	7.01	74.56	18.42	

We note the presence of statistically significant differences for $p<0.05$(f=2, χ^2=7.788), which shows the presence within the Kinesiotherapy section of a higher percentage of students struggling with overweight.

This result showed the importance of carrying on with the study, focusing on the distribution of food in the daily schedule. Breakfast is important because it is consumed after a night's sleep, when the energetic reserves are all used. The study and then the recovery program are hard to achieve efficiently in the lack of proper energetic input. Concerning our study sample, 26.32% of the answers were negative, which is alarming, given that these students had been provided with proper information in this respect, but they fail to apply it (Table II).

Table II. Presence of morning food intake in the study sample

Faculty	Physical Education	Medicine	Total
Yes	32-62,74%	52-82,53%	84-73.68%
No	19-37,25%	11-17,46%	30-26.32%

The significant differences $p<0.05$ (f=1, χ^2=5.793) obtained also highlight the students within the Kinesiotherapy section, among whom the percentage of negative answers is higher.

We have found certain habits that may have negative effects on the young people's health.

In this context, it is important to make the correlation between physical development and morning food intake (Table III).

Table III. The correlation BMI – morning food intake

Breakfast	Underweight	Normal	Overweight	Total
Yes	6	66	12	84
No	2	19	9	30
Total No.	8	85	21	114

The differences calculated are statistically insignificant ($p>0.05$, f=2, χ^2=3.722), which means there is no marked orientation of malnourished or underweight students towards skipping breakfast. The significant differences calculated by faculty in what concerns the value of BMI and morning food intake suggests the necessity of a study differentiated by faculty (Table IV).

Table IV. The correlation BMI – morning food intake by faculty

Breakfast	Underweight	Normal	Overweight	Total
	Kinesio.			
Yes	2	22	8	32
No	1	11	7	19
Total No.	3	33	15	51
	Medicine			
Yes	4	44	4	52
No	1	8	2	11
Total No.	5	52	6	63

The differences obtained are statistically insignificant in both the Faculty of Kinesio. ($p>0.05$, $f=2$, $\chi^2=0.79$) and the Faculty of Medicine ($p>0.05$, $f=2$, $\chi^2=1.336$).

The study should be continued with intake by food group, in order to assess exactly the differences emerging/not emerging by faculty and to adapt intake to the standards of healthy diet.

According to the standards in effect, milk must be consumed daily, but such an answer is featured only by 12.28% of the students. Dominant intake is 2-3 times a week (39.47%) a result that is not beneficial (Table V)

Table V. Weekly milk intake

Intake	Zero	once	2-3 times	4-6 times	Daily
Kinesio.	4	11	22	9	5
Medicine	7	15	23	9	9
Total No.	11	26	45	18	14
%	9.65	22.81	39.47	15.79	12.28

A warning sign is the 9.65% of the students who answered zero, so milk lacks from their menus. The differences calculated are insignificant ($p>0.05$, $f=4$, $\chi^2=1.424$), suggesting the existence of similar dietary habits among the students in the study sample. This result should be correlated with the one obtained for the other food groups.

Eggs are products with great nutritional value and they can be prepared easily, even for a student living in a dorm. Balanced (daily) intake is stated by 10.53% of the students, to whom we add 25.44% who admit an intake of 4-6 times a week, which can be accepted. An alarming aspect is the 7.07% of negative answers and the 17.54% of once a week, which is a warning sign (Table VI).

Table VI. Presence of eggs in the menus of students

Intake	Zero	once	2-3 times	4-6 times	Daily
Kinesio.	3	6	19	14	9
Medicine	5	14	26	15	3
Total No.	8	20	45	29	12
%	7.02	17.54	39.47	25.44	10.53

Per collective, there are statistically insignificant ($p>0.05$, $f=4$, $\chi^2=6.508$) differences, but they are ever harder to understand given the value of body mass index.

We have continued the study with vegetal products, represented by bread, fruits, and sweets. Bread is featured daily in the menus of 42.98% of the students, to whom we add 19.30% of the students admitting an intake of 4-6 times (Table VII).

Table VII. Bread intake among the students in the study

Intake	Zero	once	2-3 times	4-6 times	Daily
Kinesio.	4	4	9	10	24
Medicine	4	4	18	12	25
Total No.	8	8	27	22	49
%	7.02	7.02	23.68	19.30	42.98

It is worth noting the presence of 7.02% of the students not consuming it or admitting an intake of once a week. The insignificant differences ($p>0.05$, $f=4$, $\chi^2=1.968$) calculated demonstrate the existence of similar nutritional mistakes among the students within our study.

This is a group of persons with scientific knowledge, but who fail to apply the information acquired.

We went on studying the intake of fruits, which should be carefully appraised starting from the national programme providing fruits to schools. We are talking here about young people who – 3-4 years prior – had benefitted from this programme, reason for which we may assess its efficiency. The standards of proper diet indicate a reported daily fruit intake by 28.94% of the students, to whom we add 19.30% of the young people reporting an intake of 4-6 times a week.

This means that almost 50% of the young adults eat them according to recommendations.

However, 2.63% have chosen zero and another 14.91% of the students have chosen once, which is alarming (Table VIII).

Table VIII. Frequency of fruits in the menus of students

Intake	Zero	once	2-3 times	4-6 times	Daily
Kinesio.	3	10	16	9	13
Medicine	0	7	23	13	20
Total No.	3	17	39	22	33
%	2.63	14.91	34.21	19.30	28.94

The insignificant differences ($p>0.05$, $f=4$, $\chi^2=5.207$) obtained are revealing for the efficiency of this national programme. Dietary habits have not changed and fruit intake has not increased in either faculty of the two ones studied.

The greatest surprise was represented by sweets, which are characteristic to childhood, not to young adults. The dominant intake is 2-3 times (32.46%) a week, which does not coincide with the standards into force. Only 25.44% of the students admit daily intake, adapted to the needs of the body. We may also consider acceptable the answer of 4-6 times (22.81%). We find alarming the answers zero (6.14%) or once (13.16%) because the nervous system and the red cells use carbs as unique source of energy (Table IX).

Table IX. Weekly intake of sweets

Intake	Zero	once	2-3 times	4-6 times	Daily
Kinesio.	6	8	20	8	9
Medicine	1	7	17	18	20
Total No.	7	15	37	26	29
%	6.14	13.16	32.46	22.81	25.44

By faculty, the differences calculated are statistically significant for $p<0.05$ ($f=4$, $\chi^2=10.781$) and it is worth underscoring the medical students, where daily intake answer is more frequent, but also those within the Kinesiotherapy section, where the zero answer is more frequent. We have to interpret these results with a great deal of caution, because they are in discordance with the results for body mass index, where the values of overweight are dominant within the Kinesiotherapy section.

Discussions

We will insist upon the physical development and dietary habits of students. These aspects are essential for their future professional activity, when such elements become crucial for the patients.

In most cases (74.56%), the BMI values are normal; there are also 18.42% of the students who are overweight. In a study carried out on teenagers in Poland, the authors have noted the presence of 63.4% of the young people with normal values and 26.4% overweight [1].

Among young people in Finland, the percentage of high schoolers with normal values reached 73.6%, while the overweight students accounted for 15.3% [13].

The investigation conducted on freshman college students in the USA – at the University of Indiana, mostly in Economics, Medicine, and Sport – has shown that 64.00% of the young people have normal values of the BMI, while 29.00% have various degrees of obesity [14].

Among the US students at the University of Ithaka, obesity was reported by 21.2% of the students, while normal values by 66.7% of the young people [15]. The students in Saudi Arabia are obese (26.4%) and even third-degree obese (25.0), normal values being present in only 22.1% of the situations [16]. Among the students in the study sample, there no obesity cases, but only overweight, as also shown among high school students in diverse countries. A particular aspect noted among the students within our study is related to the significant differences per collectives in what concerns physical development. These differences are alarming, because dietary habits are similar, the differences calculated being statistically insignificant.

An answer to this question may be provided by the studies making the correlation between the value of BMI in parents and children; it was a family study, which entailed a higher bodyweight [17]. This is an aspect to be studied carefully, because it is also related to certain dietary habits in the family, as well as to genetic traits.

As for dietary habits, we must focus on morning food intake, featured only in 73.68% of the cases. This is a constant habit for pre-university students, too. Students in Turkey admit skipping breakfast, namely 47.6% of them. Morning food intake is featured daily in 43.2% of the young people, followed by answers such as 5-6 times a week (8.8%), 3-4 times (14.9%), or 2 times (20.5%). Such dietary habits – once formed – persist into adulthood, which may represent a problem. [18].

It is important to assess the reasons for skipping morning food intake. Among female teenagers in Iran, it is lack of appetite (69.2%), absence of favourite products (11.4%), or lack of attention from the mother (95.8%). Among boys, the reasons are lack of appetite (71.2%), of favourite products (12.3%), or of mother's attention (4.5%). As it may be noted, the products offered are important, but parents' attention is also essential for acquiring healthy dietary habits [19].

We have insisted on the correlation emerging in the study sample between physical development and the absence of morning food intake, given that for both aspects, the differences per sections are statistically significant. The correlation calculated highlights statistically insignificant differences per sample and per each section. Among teenagers in Finland, significant differences were noted: young people with obesity skip breakfast more often (18.2% among those with normal weight and 26.5% among those with obesity) [13].

Female students in Saudi Arabia with normal weight admit the presence of breakfast on 3.6±2.6 days a week on average, while those with obesity on 3.7±2.9 days a week, the differences calculated being statistically insignificant [20].

Special attention must be paid to young people with health issues, because among anaemic female teenagers in Damanhur, morning food intake is absent in 55.0% of the situations, while among non-anaemic students, in 3.3% of the cases [21]. This aspect should be remembered by the students in both sections, because they will have to deal with such patients.

Because we are talking about students, it is important to assess the way leaving family home leads to the modification of dietary habits. Among young people at the University of Indiana, dietary habits of the family are preserved only by 44.0% of the situations. The students focus on processed foods (65.3%) such as potato chips, cookies, cereal, which they eat daily and even 2 times a day. They admit these products are not healthy (89.3%) but they still eat them [14]. In this context, it is important to assess among the students in the study sample the extent to which dietary habits change after leaving the family home.

Milk is featured in menus mostly 2-3 times (39.47%) a week; there are also 9.65% negative answers. High school students admit an intake of milk mostly 2-3 times (33.73%) a week, the negative answer being provided by 19.87% of the young people [22]. This is a similar result, which underlines a modest change of food habits upon leaving the family nest.

Among female students in Saudi Arabia, the average milk intake is 4.8±2.3 days a week among those with normal weight and 4.4±2.5 among those with obesity, the differences calculated being statistically insignificant [20].

In the study sample, eggs are present in menus mostly 2-3 times (39.47%); in addition, 7.02% of the young people chose zero. Among high school students, the 2-3 times intake is dominant: 39.75% of the young people; it is absent among 12.65% of the students [19].

Results are similar, which suggests a powerful anchoring in traditions by the young people within our study.

Bread is featured in menus daily among 42.98% of the young people; it is absent from the diet of 7.02% of the students. They give up bread very easily, because it makes them put on weight.

A similar result was obtained among the students in both faculties. They fail to understand the high-protein contents of bread [11].

Among teenagers in Austria, average weekly bread intake is 3.3 times among females and 3.1 times among males [23].

Fruits are present in menus mostly 2-3 times (34.21%); 2.63% of the students admit not consuming them at all. The statistically insignificant differences obtained suggest similar dietary habits. Female students in Saudi Arabia admit a weekly fruit intake of 2.8±2.5 (normal weight) and of 2.5±2.1 (with obesity), with statistically insignificant differences [20].

Young people in Austria report the same modest weekly fruit intake on average: 2.9 among girls and 2.6 among boys [23].

Sweets are featured in menus mainly 2-3 times (32.46%); only 6.14% of the students report not eating any. The differences calculated are significant, given the increase in daily intake among the medical students. Among students, the 2-3 times option was chosen by 22.89% of the young people, while the zero option by 3.01% of the cases [22]. There were also differences between university and pre-university students, an aspect to be monitored closely. The study conducted on young people in Saudi Arabia highlight an intake of chocolate/candy of 3.4±2.2 among those with normal weight and 3.1±2.2 among those with obesity [20].

A special attention must be paid to the answers zero (I do not eat a certain type of food) because this is a new idea: of giving up the pleasure of eating a certain type of food. In a study carried out in Turkey on the members of a fitness club, such answers are featured, too.

Eggs are not accepted by 9.5% of the members, grains by 13.2% of the persons, fruits by 8.6%, while sweets by 8.6% of the persons [24].

Conclusions

More comprehensive studies are necessary in order for health specialists – physicians, kinesiotherapists, PE teachers – to learn the dietary habits and physical development of young people. Their physical development reflects their interest for this aspect, which will allow them to be role models for patients or students.

Another important aspect to monitor is the one of nutritional programmes conducted scientifically; in our country, dietary habits are manly based on traditions. They change very hard or they do not change at all. The findings obtained concerning the fruits reflect this aspect.

Such studies are essential, but very hard to carry out, because few specialists are interested in solving the nutrition issues of students.

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Physical Development Particularities Among Pupils at the Sports High School in Iasi

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Abstract

Among the pupils within the Sports High school, it is important to assess physical development in order to highlight any deviation from normality. In this paper, we have insisted on physical development indicators, underlined by using body mass index, and on the way in which the pupils perceive their own bodyweight. Paper objectives: ranking the pupil's physical development; assessment of perceived bodyweight; evaluation of morning food intake and snacking. Material and methods: the research study was carried out on a sample of 220 pupils within the Sports High School in Iași, from the 9th, 10th, and 11th grades. The teenagers filled out a questionnaire with questions concerning their dietary habits. We have also appraised the anthropometrical indicators represented by weight and height. We have processed the results using Pearson's test. Findings: the values of body mass index highlight the existence of 74.54% young people with normal bodyweight. A warning sign is that 20.45% of them are overweight, the differences calculated being statistically insignificant ($p>0.05$) by gender and by grade. 67.27% of the pupils perceive their bodyweight as good, but 20.45% of them think they are overweight; the differences calculated are statistically insignificant ($p>0.05$). The correlation between BMI – perceived bodyweight underlines the existence of 33.63% of the pupils not assessing their weight correctly; the differences calculated being statistically significant ($p<0.000$). Skipping breakfast was recorded for 35.45% of the pupils, while the favourite snack was represented by fruits (48.63%) and sweets (48.18%). Conclusions: issues emerge related to self-perceived weight that may represent an obstacle in achieving the coveted sports performances.

Keywords: sport, bodyweight, balance

Introduction

Balanced physical development is important for all pupils, but it becomes downright essential for pupils within the field of performance sport [1]. There are physical characteristics recommending the pupil for a certain sport. Selection for training in the sport of handball should start from a specific somatic model represented by an average height of 156 cm and a weight of 40-42 kg at the age of 11 [2].

Upon starting specific training for a certain type of physical activity, it is essential to collaborate with the pupil and the family, to ensure a balanced physical development, the

increase in motor skills, and the preservation of health. Psychosocially, the practice of sport favours the development of leader activities, of competitiveness, of cooperation, of self-confidence. Sport is a field where success is approached in terms of personal growth and development. The achieving of desired performances depends very much on a successful triangle between coach, pupil, and family [3].

A special attention should be given to the dietary habits of Sports pupils and of their families.

The coach must have access to nutritional information, which is not always accessible, unfortunately. In a study conducted by North American Trainer Association (NATA), they have found access to nutritional information mostly sometimes (43.5%) or often (34.0%). Another important aspect is related to the coach pointing out the signs/symptoms of improper diet, addictions, or stress. Coaches manage to point them out mostly often (41.2%) or sometimes (37.0%) [4].

It is necessary to monitor carefully the physical development indicators of pupils, using Body Mass Index (BMI). There are calculators providing information about the values recommended for a certain age group and gender. Values evolved from malnutrition (<10), to a normal level (10-84), to overweight (84-94), and even obesity (>95) [5, 6, 7, 8]. The findings are different from those very well-known for adults; thus, it is necessary to provide further information to coaches and parents in this respect.

Special attention should be paid because, presently, there is a beauty ideal represented by slender women and muscle men. Teenage girls go on drastic weight loss diets, while teenage boys take all sorts of artificial muscle mass growth substances. These aspects must be pointed out because they entail dissatisfactions concerning one's body and serious health issues due to chaotic weight loss diets or uncontrolled supplement intake [9, 10].

Coaches and parents should be well-informed concerning the nutritional needs of pupils and the importance of breakfast and healthy snacks. Physical activity with low energetic resources is little efficient and even risky. If there was no breakfast, brunch is essential, but it should not comprise only fruits, for they are not high in calories [11]. It is important to have pastry, for it is high in calories; it also contains proteins, carbs, and fat. One should be aware of sweets, because they are only high in carbs.

The collaboration between pupils, parents, and coaches must be complete and focused on several levels, not just the one of daily sports practice.

Purpose and objectives of the study

Ranking the physical development of pupils by Body Mass Index; assessing the potential differences between the development of pupils by grade and gender; evaluating self-perceived weight; determining the correlation between the BMI values and self-perceived weight; assessing breakfast and brunch food intake.

Material and methods

The study was conducted on a sample of 220 pupils with the Sports High School in Iași.

There were pupils in the 9th grade (74 young people), the 10th grade (73 pupils), and the 11th grade (73 teenagers) aged between 14 and 18. By gender, the distribution of subjects is not equal; we have examined 88 girls (40.00%) and 132 boys (60.00%). For these young people, we have appraised physical development and dietary habits.

Physical development was assessed through height and bodyweight. We have calculated Body Mass Index (BMI) and we have interpreted the results using the BMI calculator for children and adolescents [5].

Dietary habits were studied using a weekly food intake questionnaire. The applied questionnaire is called Questionnaire for assessment of individual health, includes 37 questions related to family, fatigue, leisure (sports, television programs, computer), social relations and nutrition. We insisted on self-perceived bodyweight, on the role of diet in preserving health, and on food intake for breakfast and brunch. Self-perceived bodyweight is important. In this respect, we have insisted on the answer to the question "Do you believe your bodyweight is: just fine: too high: too low?"

It is important to find out the pupil's opinion on the role of diet in preserving health. We have objectivised it through the question: "Do you believe that good dietary habits help you to preserve your health: Yes; No?"

Food intake for breakfast and brunch becomes essential for young people exercising systematically. There are two questions related to this aspect: "Have you had breakfast? Yes; No" and "What snacks do you eat most often: fruits; sweets; vegetables; pastry; potato chips?"

We have processed the results using the Pearson CHI Square test.

Results

In this study, we have approached three basic aspects represented by physical development, self-perceived bodyweight and food intake for breakfast and brunch.

Physical development has been assessed classically using Body Mass Index adapted to a certain age group and gender. For the entire sample, we have noticed the presence of 74.54% of the pupils with normal BMI values. An alarming sign is the 20.45% of overweight pupils, who should be medically monitored (Table I).

Table I. BMI values in the study sample

Value	Underweight	Normal	Overweight	Total
	Results by grades			
9th	4	52	18	74
10th	3	58	12	73
11th	4	54	15	73
	Distribution of results by gender			
Female	5	66	17	88
Male	6	98	28	132
Total No.	11	164	45	220
%	5.00	74.54	20.45	

We have obtained statistically insignificant differences ($p>0.05$, $f=4$, $\chi^2=1.725$) by grades and by the gender of pupils ($p>0.05$, $f=2$, $\chi^2=0.233$). This is a positive result, which proves the attention paid by pupils and their families to this aspect.

We must also insist on self-perceived bodyweight. This is a psychological aspect that will influence satisfaction or dissatisfaction related to bodily aspect, which may lead to drastic weight loss diets. Among the respondents, we have noted 12.27% of the answers "too low" that should be monitored carefully. These pupils practice physical activity intensively and in their case adaptation to standards is essential (Table II).

Table II. Self-perceived bodyweight among the pupils in the study

Weight	Just fine	Too high	Too low
	Distribution by grades		
9th	54	14	6
10th	48	16	9
11th	46	15	12
	Results by gender		
Female	58	23	7
Male	90	22	20
Total No.	148	45	27
%	67.27	20.45	12.27

The differences calculated are statistically insignificant in both assessment by grade ($p>0.05$, $f=4$, $\chi^2=2.870$) and by gender ($p>0.05$, $f=2$, $\chi^2=4.581$). There is also a similar self-perception of bodyweight, which may be positive or negative.

We had to objectivise these results; thus, we have made the correlation between BMI values, including 5.00% pupils with malnutrition but different self-perceived bodyweight, as well as 12.27% of the pupils with too low weight. The differences calculated are statistically significant for $p<0.05$ ($f=2$, $\chi^2=7.556$) and they draw attention on the wrong self-perceived bodyweight in case of some young people.

In this context, it was necessary to make the correlation between BMI and self-perceived bodyweight (Table III).

Table III. Correlation BMI – perceived bodyweight

Value	Underweight	Normal	Overweight
Just fine		120	
Too high			22
Too low	4		0

The result is alarming because there are 74 pupils (33.63%) for whom perceived bodyweight is problematic. A special warning concerns the pupils who are malnourished, but who believe their weight is too high (9.09%). If they choose drastic diets, the risk for health becomes major.

The differences calculated are statistically significant for $p<0.000$ ($f=4$, $\chi^2=36.807$). Among females, the correlation BMI – perceived bodyweight highlights the existence of statistically significant differences for $p<0.000$ ($f=4$, $\chi^2=30.952$); a similar result was recorded among boys: $p<0.001$ ($f=4$, $\chi^2=23.070$).

It is important to determine potential differences between girls and boys in what concerns self-perceived bodyweight issues. Among girls, we have found 26 (26.62%) young girls with body perception issues, while among boys 48. 9 (36.36%) cases (Table IV).

Table IV. The correlation BMI – perceived bodyweight in males and females

Value	Underweight	Normal	Overweight
	female		
Just fine		49	
Too high	0		10
Too low	3		0
	male		
Just fine		71	
Too high			12
Too low	1		0

In a totally surprising manner, the differences calculated are statistically insignificant ($p>0.05$, $f=1$, $\chi^2=1.027$) an aspect to be considered, because we are not talking here about the current beauty ideal, given that such issues were recorded mostly among girls.

In this context, it is important to pass to the question related to the role of diet in preserving health. We have obtained 8.18% of the questions negative (no role), which should draw the attention of specialists. These young people exercise consistently but they do not eat properly, which may represent a great problem (Table V).

Table V. Role of diet in preserving health

Results	Answers by grade			By pupils' gender		Total
	9th	10th	11th	Female	Male	
Yes	67	65	70	83	119	202-91.81%
No	7	8	3	5	13	18-8.18%
Total	74	73	73	88	132	

An alarming aspect is the insignificant differences calculated by grades ($p>0.05$, $f=2$, $\chi^2=2.508$) and by the gender of pupils ($p>0.05$, $f=1$, $\chi^2=1.120$). We report the same denial of the role of diet among the pupils from all grades studied, among girls and boys. Nutritional educational intervention is very necessary to solve the problem.

The study of dietary habits will be limited to the assessment of morning food intake and favourite snack. To the question, "Have you had breakfast?", we have obtained 35.45% negative answers. On the day of applying the questionnaire, these pupils exercised on very low energetic reserves. The result is alarming because the differences calculated are statistically insignificant ($p>0.05$, $f=2$, $\chi^2=0.327$) by grades and also statistically insignificant ($p>0.05$, $f=1$, $\chi^2=0.003$) by gender.

If morning food intake is absent, brunch becomes essential, because it allows a restoration of energetic body reserves if it is high-quality, namely if it provides calorie-rich and nutritional food. The pupils marked one or several options for brunch. The result is not great, because fruits are the first choice, namely 48.63%, followed by sweets (48.18%). Sweets are a rather good choice for a pupil who has not had anything to eat, while fruits are not ideal in this case (Table VI).

Fruits have modest caloric values; they are an important source of vitamins and mineral elements. They are poor in carbs, which may represent a problem. Sweets are rich in carbs, thus bringing 300-400 kcal/100 g, which may represent a great problem.

The pupils also prefer pastry (28.63%), but not to a high degree, though they bring many calories, represented by carbs, proteins, and even fats. We may say that potato chips are not an issue, because only 18.63% of pupils preferred them, along with other food items.

Table VI. Type of favourite snack

Snack	Fruits	Sweets	Vegetables	Pastry	Potato chips
	Distribution by pupils' gender				
Female	42	48	9	22	13
Male	65	58	12	41	28
Total No.	107	106	21	63	41
%	48.63	48.18	9.54	28.63	18.63
	By grade				
9th	38	34	5	18	15
10th	30	41	8	26	13
11th	39	31	8	19	13

We are interested in the potential different preferences by gender or by grade. Fruits are consumed as snacks by both girls and boys; thus, the differences calculated are statistically insignificant ($p>0.05$, $f=1$, $\chi^2=0.046$). Sweets represent a snack preferred by girls and boys, the differences calculated being statistically insignificant ($p>0.05$, $f=1$, $\chi^2=2.377$).

Fruits are featured in the snacks of pupils within the 9th and the 11th grade, reason for which the differences obtained are statistically insignificant ($p>0.05$, $f=2$, $\chi^2=2.211$), sweets being also a constant snack; the differences calculated were also statistically insignificant ($p>0.05$, $f=2$, $\chi^2=2.966$).

Similar dietary habits were found among the pupils within our study, which should be known and considered by the specialists in the field of sports nutrition.

Discussions

All discussions should focus on the three main directions within the study, represented by physical development assessment, perceived bodyweight, and food intake for breakfast or brunch.

BMI values highlight the existence of 5.00% of pupils with malnutrition and of 20.45% overweight pupils. This result should draw the attention of specialists because the increase is ever less intense, which may be seen as a characteristic of the development for these pupils.

In a study carried out on pupils in the Moldavian area, there were 14.54% underweight young people and 10.00% overweight, thus pointing out differences in physical development [12].

A study conducted in 2010 on teenagers in Bucharest highlights the existence of 39.54% of the girls and 42.58% of the boys underweight, as well as 5.7% of the girls and 8.62% of the boys – overweight. A control sample evaluated in 1977 underlines the presence of 50.57% of the girls and 58.18% of the boys underweight as well as 4.75% of the girls and 7.27% of the boys – overweight [13].

Physical activities alongside balanced diet are factors contributing to ensuring normal growth/development. Among teenagers in Peshawar who exercise, 13% had obesity, while among the sedentary ones: the percentage was 22% [14].

Physical development should be monitored carefully, mostly among the pupils involved in sustained physical activity. The percentage of overweight female teenagers in Poland involved in the National Athletics Programme is 7.74%, while the obesity one – 2.36%, while those who were not involved in this programme were overweight in 15.82% of the cases or obese (11.10%); the differences calculated are statistically significant. The teenagers involved in this programme were overweight in 5.71% of the cases or obese (1.90%), while those not involved in any programme were overweight (18.75%) or obese (9.05%), the differences calculated were statistically significant [15].

Young Africans have different malnutrition or overweight/obesity values from one country to another. Malnutrition varies from 12.6% in Egypt to 31.9% in Djibouti, overweight from 8.7% in Ghana to 31.4% in Egypt, while obesity from 0.6% in Benin to 9.3% in Egypt. These different values highlight the specifics of each country, a very important aspect because we cannot generalise the results only given the experience of two or three countries [16]. In a sample of young people in Malaysia, malnutrition is featured in 19.2% of the pupils, overweight in 15.0%, while obesity among 8.8% of the teenagers [17]. Teenagers in Finland, though, suffer from malnutrition in 11.1% of the cases and from obesity in 15.3% of the situations [18].

The second aspect studied is represented by self-perceived bodyweight. In the study sample, 12.27% of the young people believe their weight is too low, while 20.45% believe their weight is too high. BMI values indicate 5.00% of the young people underweight and 20.45% overweight.

These differences should be well-known and monitored. In another study carried out on the pupils within a Sports high school, back in 2013, the authors have found 11.9% pupils who believed to be too fat and 10.71% who saw themselves as too thin.

Practically, over 20% of pupils within the Sports high school have bodyweight issues, or at least so they think [19].

Young females in southern Iran believe to be obese (4.41%) or overweight (22.25%), but also slightly underweight (14.32%) or severely underweight (5.95%) [20].

In the study sample, for 33.63% of the young pupils, perceived bodyweight is not adequate.

Such issues are present among both female and male pupils. In a research conducted on teenagers in Korea, a similar phenomenon was recorded, with pupils being underweight (52.6%) or having normal weight (78.5%) and assessing themselves correctly.

Among the overweight or the obese, there are situations (49.1% in the overweight and 68.4% in the obese) where self-perceived weight is lower. In what concerns findings by gender, in the underweight pupils, 100% of the boys self-assess correctly, while 52.9% of the girls self-perceive as obese [21].

As for teenagers in Brazil, 66.7% of the answers highlight correct self-perceived body image, but 33.3% of the pupils have mildly (16.9%), moderately (10.5%) or severely (5.9%) inadequate self-perceived body image, with insignificant differences by gender [8]. Studies carried out on teenagers in Spain underscore an alarming result, because only 23.7% of them are happy with their body; most of them are dissatisfied (57.00%) [22].

The third aspect studied is related to dietary habits. It is important to assess the role of diet in preserving young people's health. In the study sample, we have found 8.18% of the young people who believe that diet is not important for preserving health. This is an interesting answer, denoting lack of proper information. High schoolers in Tennessee receive information about nutrition mostly from their parents (82.5%), from their coaches (80.0%), or from friends (52.5%). Of course, the information received depends on the proper knowledge of the persons providing it. They believe they need more information related to healthy nutrition (55.0%), diet and exercise (50.1%), as well as proper snacks (47.5%) [23].

It is essential to assess the presence/absence of breakfast and brunch. In our study sample, 35.45% of the pupils had no breakfast on the day previous to filing out the questionnaire.

Among teenagers in Finland, the authors reported intriguing results concerning morning food intake and bodyweight. Among the underweight pupils, 13.9% of the pupils do not have breakfast daily; 18.2% of those with normal values have the same habit, while among those with obesity – 26.5%; the differences calculated are statistically significant [18].

The favourite snack of the Sports high school pupils is represented by fruits and sweets.

Fruits are problematic for the pupils who came to school without any morning food intake, because fruits do not have many calories. Among teenagers in Sudan, the favourite snack is represented by fruits (35.7%), potato chips (18.6%), or a sandwich (17.1%); however, 20.5% skip it entirely [24]. Some young people skip it, while others have two snacks daily (35.2%) or even three (11.4%), an aspect to be monitored closely, because it entails the risk of future obesity.

Such studies are important for the Sports high school pupils because issues related to them may impair sports performance and their health, eventually.

Conclusions

The study has concerned three main directions, which have enabled the highlighting of numerus issues. In the Sports high school, there are underweight pupils, but also overweight pupils, which demonstrates incorrect daily food intake. Such aspects require careful monitoring, because evolution towards a pathological condition is rapid.

Pupils should have proper knowledge concerning their own bodies and the normal values of their weight, because those who believe to be overweight may use drastic weight loss diets, which may not be necessary. An underweight pupil does not need weight loss diets, even if he/she may believe to be overweight.

Special attention must be paid to proper distribution of food throughout the day, by avoiding to skipping morning food intake. Such issues can be solved only through effective collaboration between the school physician, the coach, the family, and the pupil. There should be a specialised sports nutrition physician in school, because the coach and the family do not always hold the best information.

Specialised research studies should include as many subjects as possible, in order to ensure that Sports pupils maintain good health and that they attain the sports performance they want.

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Implications of Forward Head Posture in Computer Users – A Systematic Review

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Abstract

Today's working population takes advantage of modern technology, especially of the utility of the computer, which enhances a sedentary behavior in the workplace, but also recreationally.

Many scientific studies have shown that prolonged computer use involves a series of risk factors, which consequently promote postural changes, the most common deficiency observed in computer users being forward head posture. The aim of this study was to conduct a systematic literature research of publications which have focused on the association between the implications of forward head posture in computer users and the prevalence of musculoskeletal pain. Scientific studies of which the primary outcome of interest was "forward head posture in computer users" were identified thorough a search in scientific databases such as PubMed, Scopus and Clarivate Analytics. A total of 28 studies published after 2010 met the inclusion criteria. Findings show that abnormal head position has a significant effect on the human body, forward head posture being highly correlated with improper muscle activity (creating postural imbalances), great repositioning error (due to reduced proprioceptive function) and a high prevalence of musculoskeletal disorders and presence of neck pain (especially among women).

The present study confirmed associations between non-neutral head postures (forward head posture) in computer users with a high prevalence of musculoskeletal disorders and an increased occurrence of neck pain.

Keywords: forward head posture, neck pain, computer use, musculoskeletal disorders, head posture

Introduction

In today's fast-paced society the usefulness of a computer is highly noted being ensured that this technology is used either at the workplace or at home.

Scientific studies have often found that prolonged computer use involves a series of risk factors due to the duration and frequency of the static activity involved. A professional computer user spends daily 7-8 hours and weekly an average of 40 hours in a static position leading to a sedentary behavior; this kind of activity now occupies around 60% of total working hours in general population [1-3]. Nowadays general risk factors which enhance a sedentary behavior include reduced periods of physical activity during means of transportation to the workplace (walking or cycling), promoting sedentary activities at home (computer use in a recreational manner), reduced manual work and promoting sedentary activities at the workplace [1]. Often risk factors that are associated with computer use are highlighted by prolonged sitting, repetitive

movements, non-neutral body postures, static muscle loading, poor ergonomics at the workplace and few rest breaks [4].

Prolonged static postures and a sedentary behavior affect and cause modifications in all systems of the body. Sedentarism is one of the leading risk factors in the development of metabolic diseases, type 2 diabetes, obesity and cardiovascular diseases [5, 6]. Non-neutral body postures have a great impact on the functionality of the upper body biomechanics; most often seen postural deficiency in computer users can be observed in a sagittal plane (forward head posture, rounded shoulders, exacerbated thoracic kyphosis, flattened lumbar curve and a posterior tilted pelvis) [7, 8], which consequently can affect the joint position sense, associated with reduced proprioception [9] and reduced respiratory function [10, 11].

Strong evidence was found that the most common observed postural change in computer users is forward head posture (FHP) defined as a forward displacement of the head on the cervical spine [12], significantly associated with holding the neck in a forward flexed posture for a prolonged period of time. (Fig.1)

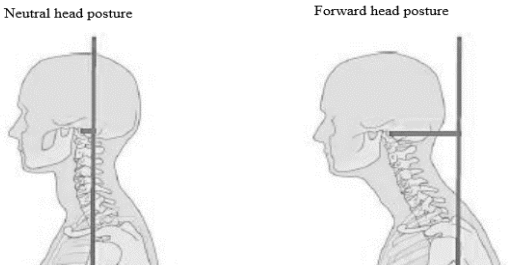

Fig. 1. Neutral head posture vs. forward head posture [13]

Objective

The aim of this study was to review recent research publications which have focused on the correlation between aspects of sagittal head posture (forward head posture), computer use and the prevalence of neck pain.

Material and methods

Records were identified through a thorough search in 3 electronic scientific databases PubMed, Scopus and Clarivate Analytics. Selection criteria was based on the publication date (only studies published between 2010-2020 were selected), their accessibility (full free text) and according to the key words used. The primary outcome of interest was “forward head posture observed in computer users”. Secondary outcomes include “neck pain”, “computer users”, “musculoskeletal disorders” and “head posture”. The search in selected databases provided a total of 89 studies. After screening the records found and removing duplicates our records number was 77 studies. When screening for full-text articles as well as their objectives and outcomes, a total of 28 studies were eligible to be included in this review.

Results

The concern regarding consequences of prolonged computer use at the workplace and the presence of musculoskeletal disorders has been consistent over several decades. One major postural change that was observed in computer users is the faulty position of the head – FHP, often associated with presence of pain.

Prolonged sitting and non-neutral head postures during occupational activity have been proven to be of a great risk to promote the occurrence of neck pain in people who use computers at the workplace [14]. Valide methods for measuring FHP have been described in scientific studies with the use of craniovertebral angle [12] or radiographic investigations [15]. After assessing head posture using X-rays, Sun *et al*., [15] confirmed that in people with spontaneous neck pain there is a significant association of pain with reduced cervical lordosis and FHP.

Measurement of changes in the thoracic spine and head position have also been linked with FHP. When measuring cervical and thoracic postures in computer users by measuring the craniovertebral and high-thoracic angle [16], a significant relationship was found between abnormal postures of the head and cervicothoracic spine and presence of neck pain, but little evidence was proved to exist in the correlation of shoulder posture and neck pain. Later in 2015, Park *et al*., [18] stated that the evaluation and measurements of FHP requiers a more thorough assesement, appart from measuring the craniovertebral angle. Three methods – craniovertebral angle, head position angle and head tilt angle were compared in a study with 78 participants.

Subjects were organized in 3 groups of which 2 contained participants with FHP. Findings of the study show that subjects with smaller craniovertebral angle have more FHP, a larger head position angle was observed in participants with an exacerbated FHP and a larger head tilt angle was associated with the position of the head in extension relative to the cervical spine.

Significant correlation was found between FHP, neck pain and disability when measuring the craniovertebral angle [12]. Postural changes of the cervical spine as a consequence of sustained computer work have been observed through a modification of the upper cervical region and affects mostly cervical flexion range [18].

Compensatory postural actions have been seen in subjects with FHP, modifications in the curve of the cervical spine promote muscular imbalances which cause modifications in the scapulohumeral region (rounded shoulder posture) [19]. Also, findings of Shaghayegh *et al*., [20] demonstrated that subjects which present a forward posture of the head have a smaller craniovertebral angle, more noticeable in sitting rather than standing.

Muscle activity is proven to be affected in people with FHP due to changes in muscle length and a reduced ability to generate force. During a surface electromyography (EMG) measurement, Lee *et al*., [7] demonstrated a decreased activity of the splenii and sternocleidomastoids muscles in the FHP group during neck protraction (due to the shortening of these muscles in FHP) and weakness of cervical flexor muscles and scapular retractors (trapezius muscle). In a study that investigated thickness in cervical muscles (longus colli, sternocleidomastoid, semispinalis capitis, rectus capitis posterior and oblique capitis superior) in women with and without FHP, results presented a greater thickness of the sternocleidomastoid muscle in women with FHP associated with reduced activity of deep cervical flexor muscles [21]. FHP has a great impact on respiratory system caused by reducing muscle power in the neck muscles, consequently on the respiratory muscles and a reduced respiratory function [22].

The relationship between FHP and proprioceptive activity was investigated by Yong *et al*., [23] by assesing the value of the sense of position error (joint position error) using a digital

inclinometer. Their results demonstrated a significant correlation between the severity of FHP and joint position error. Kang *et al*., [24] confirmed the association in subjects which present a relatively protruded head and neck posture with a change of the center of gravity in an anterior direction in static and dynamic situations, which affects the ability to maintain postural balance.

In a comparative study, Choi *et al*., [25] assesed the presence of fatigue in the cervical muscles due to non-neutral head postures. The results confirmed that between two types of monitors (regular fixed monitors and moving monitors), reduced neck fatigue was observed when using a moving monitor which contradicts findings of Yoo [8] who demonstrated that the use of a fixed workstation has proven to help prevent FHP. A profilactic point of view in postural imbalances like FHP should include ergonomic, individual and psychosocial modifications of the workload [26] and work environment [27], concurrently. [28-30] The association between reduced muscle activity, non-neutral head postures and musculoskeletal disorders has been demonstrated over the years to be more prevalent in computer users, especially among women [31]. In a cross-sectional survey which was addressed to 202 computer users in Estonia a high prevalence of musculoskeletal disorders was associated with at least one anatomical region, the most prevalent pain site being at the neck (51%) [32].

Differences in muscle activity and physical exposure have been observed in 117 office workers during a more complex design in method of measurement which included computer interactions, questionnaires, EMG of trapezius muscle and observation of shoulder, head, neck and torso posture while participants were performing computer work. Authors believed that each of these factors were relevant in developing musculoskeletal disorders in computer users when performing the same tasks [33]. In a comparative study which observed the prevalence of self-reported musculoskeletal symptoms between computer users and non-computer users, demonstrated a higher risk for the computer users, influenced mostly by factors like age, gender and physical exposure time [34, 35]. Moreover, higher perceived exertion, perceived comfort and working technique were associated with an increased risk of developing musculoskeletal symptoms [36, 37]. Recommendations regarding an active workstation, taking more work-breaks and increasing physical activities have been proved to be efficient in reducing the prevalence of musculoskeletal disorders and improving quality of life among computer users [1, 6, 38].

Discussion

The results of this study confirm that prolonged duration of the computer use is consistently associated with non-neutral postures of the head, observed through forward head posture and musculoskeletal disorders of the neck and upper extremities. The results also confirm that forward head posture is associated with neck pain mostly caused by postural changes and amplitudes of the cervical spine observed with reduced cervical lordosis and reduced cervical flexion. These findings are similar with the results of Mahmoud *et al*., [39] who determined a correlation between FHP and neck pain.

When measuring the craniovertebral angle in subjects with FHP and neck pain results demonstrated a lesser angle in these subjects, which supports study findings of Singla & Veqar [40], also, modifications of the head position angle and head tilt angle have been associated with FHP, mostly noticeable in sitting rather than standing.

Modifications in the curve of the cervical spine promote muscular imbalances which consequently affect muscle activity and their ability to generate force, noticeable by the weakness of neck flexors muscle group and shortening of neck extensors muscle group.

Reduced muscle power in the neck muscles has a great impact on the respiratory muscles, reduced respiratory function often found in subjects with FHP. A significant change observed due to faulty head posture is in the anterior positioning of the center of gravity which affects muscular balance and sense of positioning, reducing proprioceptive activity. Results that uphold findings of Szczygieł *et al*., [41] in their review study.

Conclusions

Computer users are more prone to develop a forward head posture which can lead to an increased occurrence of neck pain. Forward head posture promotes improper muscular activities that negatively affect postural balance, consequently proprioceptive and respiratory function. A high prevalence of musculoskeletal disorders with a great impact on the neck region has been demonstrated among computer users, especially in female subjects.

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Sleep-Breathing Disorders in Athletes: A Systematic Review

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Abstract

Sleep plays an essential role in overall health. A negative impact of sleep deprivation has been recognized on physical performance, including reaction time, accuracy, vigor, submaximal strength, endurance, cognitive functions such as judgment and decision making.

Professional athletes are often unable to achieve sleep recommendations during training or competition periods. Association of sleep breathing disorders (SBD) worsens physical performance and alter health status in athletes. Little is known about the incidence of SBD among athletes performing different sports.

Objectives

The aim of our study is to analyze published articles on SBD in athletes in order to investigate their prevalence in different sports, differences between genders and their impact on health and sport performance. We are also aiming to present methods used to evaluate the presence of SBD among professional athletes.

Method

The four major databases, PubMed, Google Academic, ScienceDirect, were searched for identifying articles targeting SBD in athletes. The search included all work published between 2010 and 2020. Randomized controlled trials (RCTs) or quasi-RCTs, prospective observational studies with controls, retrospective matched-pair studies, and comparative studies from well-defined registries/databases were included. The main outcomes were: sleep breathing disorders, obstructive sleep apnea, athletes, sports, physical performance.

Results and conclusions

Sleep-breathing disorders are frequent among professional athletes, impacting physical performance and health status. High prevalence of sleep-breathing disorders was observed among swimmers, rugby and American-style football players. There is an urgent need to conduct sleep-breathing disorders identification through screening and diagnostic methods within the athletic community.

Keywords: sleep breathing disorders, athletes, sports, physical performance

Introduction

Sleep plays an essential role in overall health. Together with nutrition, hydration, conditioning and mental preparation, sleep is considered a key component of human performance model.

Sleep has a direct, measurable and highly predictable effect on player performance. It has been observed a negative impact of sleep deprivation on physical performance, including reaction time, accuracy, vigor, submaximal strength, endurance, cognitive functions such as judgment and decision making [1]. On the other hand, it has been demonstrated that sleep extension can improve reaction times, mood, sprint times, tennis serve accuracy, swim turns, kick stroke efficiency, and increased free throw and 3-point accuracy [2] Some studies suggest that sleep duration might be inversely related to risk of musculoskeletal injury [3]. Professional athletes were often unable to achieve sleep recommendations during training or competition periods. Sleep was impaired the night of competition compared with previous nights. Early morning training, increases in training load, travel departure times, jet lag and altitude can impair athletes' sleep [4].

Association of sleep-disordered breathing (SDB) worsens physical performance and alter health status in athletes. Sleep disordered breathing (SDB) is characterized by abnormal respiratory patterns or pauses in breathing during sleep, ranging from snoring to sleep apnoea.

Although the prevalence of SDB in general population is estimated to be 4%, little is known about the incidence of SBD among athletes performing different sports. Snoring is quite frequent among athletes. Restless legs syndrome is another SBD increasingly recognized as an important cause of poor sleep, perhaps more so in athletes than previously suspected. Obstructive sleep apnoea (OSA) is an SDB characterized by snoring and involuntary stop breathing (apnoea) for at least 10 seconds, repetitive during sleep, leading to fragmented sleep with resultant sleepiness, decreased daytime functioning and increased cardiovascular risk. If untreated, OSA impacts negatively sleep quality and determines an increased risk of developing chronic diseases such as cardiovascular disease, diabetes, depression and dementia [5, 6].

OSA should be suspected, particularly among athletes with increased body mass index (>28 kg/m^2) and large neck circumference (>40 cm) – well-known risk factors in OSA development in general population [7]. Sleep disorders may be more common in specific sports. OSA prevalence could be even much higher in strength power athletes (e.g., rugby, American football) than the general population possibly due to a large body mass and neck circumference OSA is a serious medical condition, associated with high risk of stroke, high blood pressure, arrhythmias, which could potentially result in premature death. [8].

A study of Kim J. and collaborators showed that SDB (classified as apnea-hypopnea index ≥5) is associated with relative impairments in vascular and left-ventricle diastolic function, thereby suggesting a link between SDB and maladaptive ventriculo-arterial coupling in athletes [9]. The study estimates a prevalence of 55% of SDB in college football players (although derived from a relatively small cohort – 40 participants), compared with previous reports (8% to 25%), confirming that SDB is highly prevalent in athletes [9, 10]. It also demonstrates that young athletes are at risk of developing in early-life subclinical cardiovascular disease including increased arterial stiffness, similar to that reported in older, more co-morbid members of the general population [11, 12].

Athletes with a clinically significant sleep problem are more likely to report more general health complaints and mood disturbance. Identifying and treating SBD in athletes is critical not only for improving general health but also for achieving and maintaining optimal fitness and

performance. Snoring and daytime fatigue or sleepiness together with physical characteristic for OSA occurrence need to be taken in consideration by responsible stuff members in order to address the athlete for professional sleep study and proper treatment.

The aim of our study is to analyze published articles on SBD in athletes in order to investigate their prevalence in different sports, differences between genders and their impact on health and sport performance. We are also aiming to present methods used to evaluate the presence of SBD among professional athletes.

Matherial and Method

The four major databases, PubMed, Google Academic, ScienceDirect, were searched for identifying articles targeting SBD in athletes. The search included all work published between 2010 and 2020. Randomized controlled trials (RCTs) or quasi-RCTs, prospective observational studies with controls, retrospective matched-pair studies, and comparative studies from well-defined registries/databases were included. The main outcomes were: sleep disordered breathing, obstructive sleep apnea, athletes, sports, physical performance.

Results and discussions

From the initial search, we identified over 45 articles. The titles and abstracts of these articles were then reviewed to screen for publications that potentially addressed SBD in athletes. After this screening, we identified 28 articles that potentially fitted our selection criteria. After a subsequent screening of the full texts of these articles, we confirmed that 19 fulfilled our selection criteria.

SDB prevalence in different sports

Caia J. and collaborators explored the prevalence of OSA within a professional rugby league team and determine associations of OSA with ethnicity, positional group, and physical characteristics [13]. The authors performed an observational prospective cohort study, which enrolled 22 professional rugby league athletes. The subjects underwent one night of home-based polysomnography. The following sleep parameters were used for sleep analysis: apnea-hypopnea index (AHI), rapid eye movement (REM) AHI, non-REM AHI and supine AHI.

Linear models were used to assess if playing position (back or forward) or ethnicity (European-Australian or Polynesian) influenced sleep parameters. In this original paper 7 athletes were classified with mild OSA (6 forwards and 1 back) and 3 had moderate OSA (2 forwards and 1 back). Increased body mass index (BMI) was associated with a moderate increase in AHI and non-REMAHI, while higher skinfold thickness moderately related to a higher AHI non-REMAHI and supine AHI. This exploratory study found 10 cases of OSA, representing 45% of the study group. These data suggest a high prevalence of OSA among rugby players, with greater BMI and skinfold thickness being predisposed to OSA. The prevalence of SDB among rugby players was analyzed also by Dunican I. and collaborators in a study which enrolled 25 elite rugby union team. The subjects underwent in-laboratory polysomnography (PSG) during the “off-season” of the Super Rugby competition. Two sleep disorders were evaluated based on this sleep study: OSA, defined as AHI≥5 events/hour and the periodic leg movements during sleep (PLMs), defined as 15 events/hour. The players filled-in sleep-related questionnaires to

assess daytime sleepiness, perception of insomnia, risk of OSA, and the presence of restless legs syndrome (RLS). OSA was identified in 24% of players and PLMs ≥15 events/h in 12%.

Questionnaire responses showed that all players had insomnia defined as subthreshold insomnia and excessive daytime sleepiness. This study confirm that the presence of sleep disorders and excessive sleepiness are common in elite rugby union players [14].

Prevalence of SDB has already been demonstrated to be high among American football players. Previous studies showed that SDB are present among 14%-19% of American football players, who represent a unique cohort of young, well-conditioned athletes but have several risk factors for SDB, including male gender, high body mass index, and a large neck circumference.

In a cohort of 302 football players, George C. and collaborators found a 5-fold higher risk of SDB compared with young community-based volunteers [15]. Further studies confirmed this high incidence rates among American football players. Rice T.B. and collaborators evaluated 137 active veteran players from 6 National Football League teams using a single-channel, home-based, unattended, portable, sleep apnea monitor [16]. They found that the prevalence of OSA was 19% (95% CI, 12.8-26.6%). Mild OSA was diagnosed in 16.4% of subjects and only 4.4% (95% CI, 1.6-9.2%) of participants had moderate or severe OSA. The authors fond no correlation between linemen and non-linemen and the prevalence or severity of OSA. In contradiction with previous studies, the authors found no strong correlation between OSA and anthropometric measures, respectively between OSA and cardiovascular risk factors. In this study, the prevalence of OSA in active players was modest, predominately mild [16].

A double fold risk of SDB was also noticed among collegiate football players compared to general population in a study conducted by Dobrosielski D.A. and collaborators using STOP-BANG questionnaire, random administered to members of a collegiate football team [17].

The authors stratified the players into high and low risk for SDB. During the pre-season period those who completed the questionnaire underwent a sleep evaluation using a single-channel (finger pulse oximetry) photo plethysmography-based device. The results evidenced that 48% of the players were high-risk (neck size = 44.6±2.2 cm, body mass index = 33.0±5.4 kg/m^2) vs low-risk (neck size =41.4±2.8 cm, body mass index =27.6±3.6 kg/m^2) (both *P* values <.001).

An AHI >5 was found in 2 players at high-risk for SDB (8.3%, 95% CI 1.0-20.0%) and in 2 players at low-risk for SDB (7.7, 95% CI 1.0-18.4%). Based on the results obtained in this study, the prevalence of SDB among collegiate football players seems to be 8%, regardless of risk stratification [17].

Taking into consideration the high prevalence of SDB among American football players, Peck B. and collaborators conducted a study aimed to develop a risk profile to identify collegiate football players at risk for SDB [18]. The study enrolled male collegiate football offensive and defensive linemen and track and field team members who were asked to complete surveys that analyzed sleep quality/quantity: Multivariable Apnea Prediction (MAP) index and daytime alertness/sleepiness (Epworth Sleepiness Scale). Blood pressure, and neck, waist, and hip circumferences, as well as body fat and lean tissue percentages were measured.

The authors showed that, compared to track athletes, football players had a greater risk of developing SDB since football linemen had larger necks, more body fat, and a larger waist-to-hip ratio and higher systolic blood pressure. The MAP index was greater in linemen ($p<0.05$).

The results of this study add more proof to the previous observation that the body characteristics of linemen may predispose them to OSA [18].

Sleep was analyzed in a group of elite swimmers by a research group coordinated by Surda P. and published in 2019 [19]. Their research consisted in 2 studies. The first one, was an

observational case-control, questionnaire-based study involving 157 elite and non-elite swimmers, 36 non-swimming athletes and 50 controls. This study showed that excessive daytime sleepiness is more prevalent among elite swimmers than controls. The second study enrolled 20 elite swimmers, assessed their sleep quality and duration using actigraphy and SDB presence using overnight pulse oximetry monitor. This study showed that OSA, defined as AHI ≥5 was diagnosed in 30% of elite swimmers. Analysis of actigraphy data revealed that on nights prior to training days, 'going to' bed time was significantly earlier and total sleep time was significantly reduced [19].

SDB gender and ethnics specificity

Silva A. and collaborators was aiming to investigate the gender differences for sleep complaints and disorders among elite athletes during preparation for the Rio 2016 Olympic Games [20]. The authors enrolled in this original prospective study 146 athletes from the Brazilian Olympic Team, 86 males and 60 females, representing 59%, respectively 41% from the study group. The assessment of the Olympic athletes' sleep took place during the preparation period for the Olympic Games in a week when they did not take part in any training or competitions, through Polysomnography (PSG) evaluation. The subjects were evaluated by a sleep specialist, who validated PSG and interviewed them regarding their sleep complaints during a clinical consultation. The results showed that 53% presented sleep complaints during the medical consultation. The most prevalent complain was insufficient sleep/waking up tired and was identified in 80 subjects (32% from the study group), 47 men and 30 females (p=0.12).

The second most common complaint was snoring, identified in 54 subjects (21% from the study group), 37 men and 17 females (p=0.01), followed by insomnia, identified in 48 subjects (19% from the study group), 26 men and 22 females (p=0.56). Other sleep problems acknowledged by the Olympic athletes participating in this study were: excessive daytime sleepiness (8.8%), night awakening (5.6%), breathing complaints (4%), moving a lot during sleep (3.2%), restless legs (1.6%), talking in sleep (1.2%), nightmares (1.2%), bruxism (1.2%), somnambulism (0.4%). Regarding sleep pattern findings, total sleep time (TST) was 5.31±0,49 hours, without statistical significance between men and women (5.26±0.54 hours in men vs 5.38±0.39 hours in women (p=0.12), sleep efficiency 86.11±9.85%, statistically significant higher in women compared to men (83.53±10.96% in men vs 89.80±6,47% in women (p=0.01), with slow sleep stages significantly higher than men (23.43±7.01 minutes in men vs 25.81±7.52 minutes in women (p=0.05). Compared to women, men enrolled in the present study had significantly higher sleep latency (37.74±39.83 minutes in men vs 22.23±23.63 minutes in women ($p<0.01$) and wake after sleep onset (27.31±24.34 minutes in men vs 17.42±12.57 minutes in women ($p<0.01$). Prevalence of sleep disturbances revealed by PSG was higher in men than women: insomnia was present in 18 men vs 10 women (p=0.13), periodic leg movement (PLM) was present in 3 men vs. 2 women (p=0.65). OSA was diagnosed only in male subjects and according to AHI, 6 men had mild OSA, 3 men had moderate OSA and 1 man had severe OSA [20]. The study revealed that most of elite athletes enrolled in the study reported some sleep complaints, with men reporting more sleep complaints than women, which is different compared to sleep reports from general population Snoring was the only sleep complained that reached statistical significance among men compared to women, similar with data found in general population.

The PSG showed that all athletes, irrespective to gender, sleep less than recommended.

Sleep disorders (insomnia, SDB and PLM) were reported in 36% of male athletes versus 18% of female athletes, explaining the greater reduction of sleep quality in men than women [20].

The correlation between ethnicity and SDB was analyzed by Caia JP and collaborators, who used linear models to assess if ethnicity (European-Australian or Polynesian) influenced OSA occurrence [13]. When considering ethnicity, differences were observed between Polynesians and European-Australians for REM-AHI (p=0.02). Mild OSA (AHI=5-15/hour) was observed in 7 athletes (3 European-Australians, and 4 Polynesians) and 3 athletes had moderate OSA (AHI=15-30/hour), all 3 were Polynesians. Polynesian athletes represented the majority of OSA reported cases in this study [13].

SDB implications in athletes

The impact of sleep related problems on overall health was studied by Biggins M. and collaborators in 2015 [21]. The researchers applied sleep-related questionnaires in order to identify category of clinical sleep problem (Athlete-Sleep-Screening-Questionnaire), sleep hygiene (Sleep Hygiene Index), general health (Subjective Health Complaints), mood (Sports Profile of Mood States), chronotype (Morningness-Eveningness Questionnaire), and injury (self-reported injury) on 58 elite multi-sport athletes. The study showed that 67% of elite multi-sport athletes had clinical sleep problems, 41% were considered mild and 16% were considered moderate, none of the subjects had a severe clinical sleep problem. According to this study, athletes with a clinically significant sleep problem were more likely to report worse sleep hygiene, more general health complaints, and mood disturbance [21].

A study published in *ERJ Open Research*, conducted by Iso Y and collaborators, on 42 male rugby players aged 18-19 years, showed that the athletes with SDB are also more likely to have low levels of oxygen in their blood and higher pulse rates during the night, suggesting that athletes with SDB may be at risk of heart abnormalities, even the level of SDB was mild [22].

They also experienced more periods of time when their blood oxygen levels were unusually low. The researchers also suggested that SDB is a factor in the phenomenon of seemingly healthy young athletes dying from a sudden and unexplained heart attack. Further examinations showed that resting heart-rate was higher among SDB athletes, and that SDB athletes experienced more incidents of extra or disruptive heartbeats than non-SDB athletes, suggesting that SDB may be linked to heart abnormalities [22].

Conclusions

SDB are frequent among professional athletes, impacting physical performance and health status. High prevalence of SDB was observed among collision sport athletes, such as rugby or American-style football players but also in swimmers. There is an urgent need to identify and manage SDB in order to optimize their athletic performance, overall health status and to safeguard their health. Simple assessments, based on sleep-related questionnaires and sleep studies should be incorporated into medical evaluation of athletes.

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Simeox and Airway Clearance Techniques in Critical Cystic Fibrosis Patient – A Case Study

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Abstract

Chronic lung damage is the leading cause of morbidity and mortality in patients with cystic fibrosis. Chronic infection and inflammation are invariably leading to progressive respiratory failure. The viscous and adherent lung secretions obstruct the respiratory tract, favoring the bacterial colonization, and through the content in mediators of the inflammation it accentuates the destruction of the airways and of the lung tissue. This case study was conducted at the National Cystic Fibrosis Center in Timisoara, within the Pediatrics Clinic II in Timisoara. We tracked the evolution of a 15 years old patient with cystic fibrosis who, at that time, was in critical condition. The patient was hospitalized in intensive care unit and was monitored electrocardiographically, as well as in terms of ventilatory indices and oxygen saturation. In addition to these indices, we also followed the evolution of the right hemiparesis. Respiratory clearance techniques (Simeox, postural drainage, percussion, Active Cycle of Technical Breathing, oscillating Positive Expiratory Pressure = PEP): physical exercises, inhalation therapy was performed several times a day for 3 weeks during hospitalization in the intensive care unit, then daily in the hospital salon and after at home for a period of 3 months. Simeox device allowed us to apply the treatment, effortlessly, reducing fatigue, increasing compliance and favoring often expectorations-initially at each cycle, and after at 2 cycles. The result of this this study showed that optimizing the clinical status of the critical cystic fibrosis patient hospitalized in intensive care unit, is extremely difficult, but it can be achieved by combining the techniques of respiratory physiotherapy, respiratory nursing, non-invasive ventilation, inhalation therapy and individualized Simeox therapy.

During the Intensive Care Unit stay the patient improved her clinical status, SpO_2 enhanced from 44% to 94% and she was to able to breathe without oxygen and ventilator.

Ventilometric indices evolve from forced expiratory volume in 1 second (FEV1) = 33%, forced vital capacity (FVC) = 67%, forced expiratory flow (FEF 25-75) = 18% (evaluation 1 month before hospital admission) to FEV1 = 43%, FVC = 76%, FEF 25-75 = 26% (after 3 months from hospital discharge). Respiratory physiotherapy should be included in the schedule of each patient with cystic fibrosis and should be performed under the supervision of a specialist,

in association with drug therapy. Non-invasive ventilation can improve the function of the inspiratory muscles, can increase oxygen saturation and reduce dyspnea.

Keywords: cystic fibrosis, respiratory physiotherapy, Simeox

Introduction

Cystic fibrosis (CF) is the most common autosomal recessive monogenic condition, in European descent populations with an incidence of about 1 in every 2500 live births and has a progressive, potentially lethal evolution [1].

Although CF is a multi-organ disease, the patient's well-being and physical condition depend to a large extent on the degree of lung damage. The two main phenomena contributing to the onset of respiratory distress are: airway obstruction, through viscous and adherent mucus that cannot be eliminated, and the onset of chronic infection, particularly with certain germs (Pseudomonas aeruginosa, Staphylococcus aureus, Haemophilus influenzae) which, once installed, can be very difficult to eradicate [2-4].

The mechanisms by which chronic infection causes airway obstruction and destruction of the epithelium and bronchial tree walls are the decisive aspect of respiratory tract pathogenesis.

Viscous lung secretions obstruct the airways, favoring bacterial colonization, and the content in mediators of inflammation accentuates the destruction of the airways and lung tissue [3, 5].

The aim of the study is to evaluate the effectiveness of the physiotherapy techniques in a cystic fibrosis critical case hospitalized in the intensive care unit. The techniques were chosen according to: the patient's age, clinical-evolutionary status, patient compliance and preferences and the physiotherapist experience.

Material and method

The study took place at the National Cystic Fibrosis Center in Timisoara, within the Pediatric ClinicIIin Timisoara and followed the evolution of a 15-year-old patient with cystic fibrosis with ΔF508 mutation.

The patient is in the records of the center from the age of 3 years being monitored and performing regular treatment every 3-6 months. Over the years, respiratory physiotherapy consisted in a combination between inhalation therapy (Pulmozyme and hypersaline solution), incentive therapies (TrainAir), specific physical exercises and respiratory clearance techniques (postural drainage, modified postural drainage, Active Cycle of Respiratory Techniques, PEP Mask, Bottle PEP, PEP Oscillating Flutter, RC-Cornet, Vibravest therapy, Simeox therapy). The patient is often stubborn, does not want to perform the treatment, she only cooperates in the exacerbation and hospitalizations periods, even though she had two brothers with the same diagnosis who died. She arrived at the Pediatrics Clinic II in critical condition with acute respiratory failure, chronic obstructive pulmonary disease with acute lower respiratory tract infection, Pseudomonas, Burkholderia, Klebsiella, Pulmonary candidiasis, bronchiectasis, splenomegaly, respiratory rate (RR) = 40, dyspnea with orthopnea, peripheral capillary oxygen saturation (SpO_2) = 44%, tachycardia heart rate (HR) = 140 b/min, bilateral vesicular breath sounds, crackling and subcrepitant rales, cyanosis, blood pressure (BP) 98/60mmHg, marked respiratory effort, nutritional and stature status deficiency. In the intensive care the patient suffers an ischemic stroke remitted in 2 weeks.

We appealed to complex medication: antibiotics in triple combination, antifungals, proton pump inhibitors, analgesics, diuretics, probiotics, bronchodilators, mucolytics, pancreatic enzymes, anticoagulants, anticonvulsants, neurotrophics, we started non-invasive mechanical ventilation and after 8 hours bilevel mechanical ventilation ASTRAL 15, IPAP 14-17 mm H_2O, expiratory positive airway pressure (EPAP) 5-8 mmH_2O, RR = 35, FIO_2 = 85%.

Through non-invasive ventilation we provided ventilatory support without the help of an invasive artificial pathway (intubation or tracheostomy tube) trying to avoid accidents due to oro-tracheal intubation: nosocomial pneumonia, sinusitis, otitis or airway trauma. At the same time, the ventilation breaks could be used for the administration of oral medication, for nebulization and respiratory physiotherapy, maintaining the protection mechanisms of the respiratory tract.

The techniques chosen for intensive care consisted mainly of the Simeox technique, associated with respiratory nursing, modified postural drainage, vibrations and tapping.

Pulmozyme aerosol therapy was performed before Simeox respiratory physiotherapy, with prior relaxation, homogeneous inspiration, with physiotherapist-guided inspiratory phase (inhalation through the nose, then abdominal, 60-70% of maximum inspiration, maintenance of apnea for 2-3 seconds for air to reach behind secretions, avoid continuous coughing, relaxed, passive exhalation, with open glottis).

The choice of the Simeox technique was made because the patient was able to perform respiratory physiotherapy with great ease in performing the treatment, effortlessly, without fatigue, expectorating often, initially at each cycle, then at 2 cycles. During the 3 months until the return for control, the patient demonstrated compliance, perseverance and desire to perform the treatment.

Results and discussions

The patient was parenterally fed using urethral tube, and has a slow favorable evolution.

After 5 days she can maintain spontaneous breathing for short/medium term without mechanical ventilation, hemodynamically stable, afebrile, obtaining remission of tachycardia.

On the 9th day, the biphasic positive airway pressure (BIPAP) ventilation is stopped and the optiflow-nasal cannula with an increased flow of 16-25 l is mounted, continuing the Simeox technique 3-4 times a day and obtaining respiratory balance. From day 10 it is easily remitted.

Motor aphasia and the right hemiparesis had a favorable evolution in 24 hours from a neurological-conscious, with spatial and temporal orientation, remission of right hemiparesis.

From day 15, she breathes spontaneously on the O_2 mask, SpO_2=94% being transferred to the section. The Simeox treatment continued 3 times/day with PEP Oscillating-Flutter, Active Cycle of Respiratory Techniques and Inhalation Therapy with Pulmozyme.

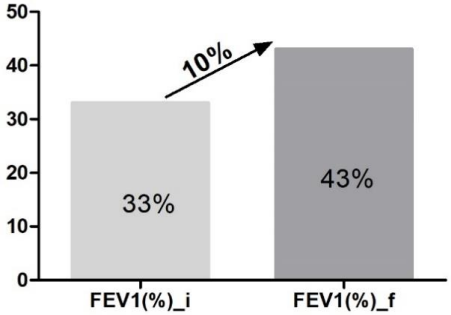
We performed the exercises gradually, progressively in association with the Respiratory Clearance Techniques and we aimed to obtain relaxation, to improve joint mobility and muscle suppleness, to increas the aerobic effort capacity and muscular tonus. The patient is discharged 25 days after admission and continues therapy at home: Simeox in association with the other airway clearance techniques (ACT), Inhalation Therapy and light/moderate physical exercises.

Combining modern physiotherapy techniques, we noticed the improvement of the clinical status with a slow favorable evolution after 5 days: the patient can spontaneously maintain short/medium term breathing without mechanical ventilation, is hemodynamically stable, afebrile and we observe tachycardia remission. On the 9th day, we stopped BIPAP ventilation

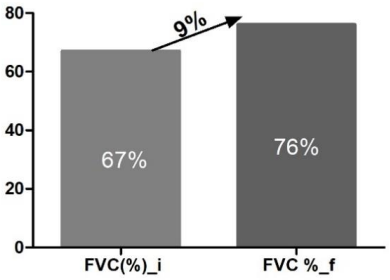
and OptiFlow nasal cannula with increased flow 16 to 25 l is mounted and she is respiratory balanced. The 10th day we see her conscious, ST-oriented, and we observe righthemiparesis post strokeremission. In the 15th day, she breathes spontaneously on O_2 mask, the SpO_2 is 94% and she is transferred from intensive care to the section.

Ventilometric indices evolve from forced expiratory volume in 1 second (FEV1) = 33%, forced vital capacity (FVC) = 67%, forced expiratory flow (FEF 25-75) = 18% (evaluation 1 month before hospital admission) to FEV1 = 43%, FVC = 76%, FEF 25-75 = 26% (after 3 months from hospital discharge) (Fig. 1, 2, 3).

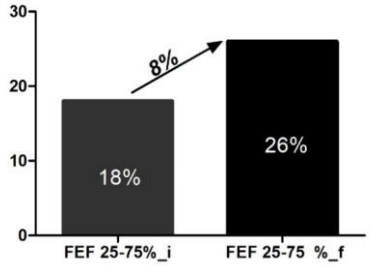
During hospitalization we found the following problems: the sticky and viscous nature of the mucus makes this difficult to mobilize, stagnant mucus in the distal areas of the lungs promotes infections, hyperinflation and expansion caused by increased residual volume, dyspnea and low oxygen saturation. Classical techniques such as Postural Drainage, CATR, Flutter, PEP Mask are daily activities that are or can be painful and require great effort from the patient. Thus, we mainly performed respiratory physiotherapy with the help of the Simeox Technique. The benefits of the Simeox technique can be summarized in: liquefaction and transport of bronchial mucus from the distal area of the lungs, avoidance of bronchial collapse, decreased chest expansion/hyperinflation, the patient is relaxed, confident and feels less tired. Light and medium physical exercises were performed daily, the average HR and the degree of effort being adjusted so that SPO_2 remains >90%. Light exercise increased ventilation and was performed before ACT with a bronchodilator and mucolytic role.



FEV1(%) i-forced expiratory volume in 1 second at initial evaluation;
FEV1(%) f-forced expiratory volume in 1 second at final evaluation
Fig. 1. FEV1 evolution



FVC (%) i-forced vital capacity at initial evaluation; FVC (%) f-forced vital capacity at final evaluation
Fig. 2. FVC evolution



FEF (%) i-forced expiratory flow at initial evaluation; FEF (%) f-forced vital capacity at final evaluation
Fig. 3. FEF evolution

Conclusions

Optimizing the clinical status of the critical patient with intensive care hospitalized on cystic fibrosis is extremely difficult, but it can be achieved by combining the techniques of respiratory physiotherapy, respiratory nursing, non-invasive ventilation, aerosol therapy and individualized Simeox therapy. Through the Simeox technique, the patient mobilized and eliminated a much larger amount of secretions without difficulty, without fatigue, she did not have to exert effort as in the case of other techniques. At the same time, the patient was relaxed using this technique, without additional stress because the technique was simple and the device acting on the mucus tixotropy. Clearance of secretions from cystic fibrosis patients' lungs is an important component in the fight to maintain lung function.

Different airway cleansing techniques (ACT) could be used by the patient, but patient preference and efficiency are key elements in choosing the technique in the critically ill patient with cystic fibrosis.

Respiratory physiotherapy should be included in the schedule of each patient with cystic fibrosis and should be performed under the supervision of a specialist, being associated with drug therapy. Non-invasive ventilation improved the function of the inspiratory muscles, increased oxygen saturation, reduced dyspnea, and Simeox proved comfort and efficiency in performing the treatment, effortlessly, without fatigue, with increased compliance and the patient expectorates often, first at each cycle, then at 2 cycles. Complex techniques of incentive therapy, sports, respiratory clearance and daily exercise are becoming increasingly important after the patient has been discharged. Their positive effects have been demonstrated by improved ventilometric indices.

Modern physical therapy means the individualization and personalization of respiratory therapy, aerosol therapy, physical effort programs and incentive techniques.

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Functioning in Adolescents with Upper Limb Fractures Included in a Rehabilitation Programme

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Abstract

Background

In children, upper limb fractures determine important functional consequences both on daily life actives and leisure sports.

Material and methods

The prospective study included a number of 33 adolescents (aged between 13 and 17 years) with upper limb fractures (humerus, elbow or forearm fractures). The patients were directed to the rehabilitation department after the orthopaedic management of the fractures.

They followed a rehabilitation programme consisting in physical exercise (average duration of 60 minutes per session), massage, warm thermotherapy and occupational therapy for 10 daily sessions; these procedures were applied according to the particularities of each case. All patients continued the exercise programme at home for 6-8 weeks. The patients were assessed using the QuickDASH Outcome Measure questionnaire and Visual Analogue Scale at the beginning of the rehabilitation, after 1 month and after 3 months.

Results

The upper limb functioning enhanced significantly after the rehabilitation programme (QuickDASH score: initial- 37.24±7.52, after 1 month- 28.55±7.09, after 3 months- 19.88±6.4, $p<0.0001$). The pain complaints diminished considerably.

Conclusions

In adolescents with upper limb fractures rehabilitation brings important benefits in regaining the normal functioning. The return to sports activities should be also considered in this category of patients.

Keywords: Functioning, upper limb fracture, rehabilitation

Introduction

The paediatric fractures have an increasingly frequency; there are studies that report an incidence between 10% and 25%. The most common cause of upper limb fractures is falling [1].

This is due especially to an insufficient assessment of the risk of falling, although in this age group the skeletal system is more elastic than in adults and has a higher capacity of remodelling and consolidation [2]. Another cause of the high incidence is due to the participation in sports activities, the possible high body mass index and low bone mineral density [3]. The increasing incidence of road accidents represents another cause of paediatric fractures of the upper limb [4].

In children and adolescents, the upper limb fractures have important functional consequences both on daily activities and leisure sports. The medical management targets pain reduction, a rapid regain of mobility, prevention of late complications such as stiffness, restriction of hand ability or growth disorders of the fractured bone [2].

The objectives of the present study were the following: to quantify the number of adolescents that were directed to the Rehabilitation department after the orthopaedic treatment of the upper limb fractures, to identify the most common type of fracture and to assess the functioning impairment.

Methodology

The prospective study included adolescents with upper limb fractures (humerus, elbow or forearm fractures). The patients were directed to the rehabilitation department after the orthopaedic management of the fractures. The following demographic and clinical data were collected: age, gender, environment, fracture site, mechanism of fracture, type of treatment and fracture sequelae.

All the patients were included in a rehabilitation programme. They performed 10 daily sessions consisting in tailored therapy, adapted to patients' age and compliance to treatment, type of fracture, orthopaedic and/or surgical treatment. The functioning impairment and pain level were also considered when conducting the rehabilitation.

Before the physical exercise programme, the patients underwent warm thermal therapy (40°C) for 10 minutes, applied on the affected joint. This had in view improvement of local microcirculation and release of contracture. The massage targeted the release of contracture, stimulation of local circulation and vascular and trophic effect. The stimulation of normal innervated muscles, as well as the stimulation of partially denervated muscles (in cases with radial or ulnar nerve paralysis) was also performed when necessary. The massage of articular capsule (Cyriax technique) was indicated in cases with joint stiffness. Some patients needed electrotherapy in order to release the pain (TENS-transcutaneous electrical nerve stimulation) or to stimulate the hypotonic muscles of periarticular affected joint (low frequency electrotherapy: rectangular impulses). In cases with radial or ulnar paralysis, electrotherapy with the exponential impulses was used. We should mention that when applying thermotherapy, manual massage and electrotherapy, we took into consideration the existence of the metal osteosynthesis.

The physical exercise programme was individualised to each patient considering the above-mentioned parameters. It included corrective postural elements of the involved parts, methods and techniques for mobility and strengthening, as well as for ability regain. In cases with radial or ulnar nerve paralysis, proprioceptive neuromuscular facilitation techniques were applied. The physical exercise programme lasted around 60 minutes depending on the complexity of each particular case and the adolescent's compliance. Occupational therapy aimed to regain of upper limb functioning and age specific abilities of daily living, as well as the return to leisure and sports activities. The last one was not a simple objective, but a real motivation for this category of population.

Affirmatively, all patients continued the exercise programme at home for 6-8 weeks. They stated that the programme was performed daily and lasted around 30 minutes per day.

Elements of occupational therapy were also included and accomplished at home.

The patients were assessed using the QuickDASH (Disabilities of the Arm, Shoulder and Hand) Outcome Measure questionnaire and Visual Analogue Scale (VAS) at the beginning of the rehabilitation (initial assessment), after 1 month and after 3 months. The QuickDASH contains 11 items that measure an individual's ability to complete tasks, absorb forces, and severity of symptoms. It uses a 5-point Likert scale from which the patient can select an appropriate number corresponding to his/her severity or function level [5].

Results

The age of adolescents included in the study ranged between 13 and 17 years. 69.7% of adolescents belonged in the 15-17-year group, boys being more affected (57.5%). The demographic characteristics are presented in Table 1.

Table 1. Demographic characteristics of the patients

Variables	Number of patients (%)
Gender	
Girls	14 (42.4%)
Boys	19 (57.6%)
Environment	
Urban	24 (72.7%)
Rural	9 (27.3%)
Age group	
13-14 years	10 (30.3%)
15-17 years	23 (69.7%)

Table 2 includes data related to the fracture site, types and mechanisms of fracture, orthopaedic and/or surgical treatment and fracture sequelae.

Table 2. Patients' data related to the fractures

Variables	Number of patients (%)
Fracture site	
Humerus	5 (15.2%)
Elbow	11 (33.3%)
Forearm	17 (51.5%)
Type of fracture	
Closed	26 (78.8%)
Open	7 (21.2%)
Mechanism	
Falling/sport accident	26 (78.8%)
Direct hit/crush/compression	4 (12.1%)
Road accident	3 (9.1%)
Treatment	
Closed reduction and immobilisation	19 (57.6%)
Metal osteosynthesis and immobilisation	14 (42.4%)
Sequelae of the fractures	
Pain	33 (100%)

Stiffness	28 (84.8%)
Atrophy	33 (100%)
Radial nerve paralysis	2 (6.1%)
Ulnar nerve paralysis	3 (9.1%)

The upper limb functioning enhanced significantly after the rehabilitation programme (see Table 3). Moreover, the pain complaints diminished considerably.

Table 3. QuickDASH score and VAS in study patients

	Initial assessment	After 1 month	After 3 months	p^a	p^b
QuickDASH score	37.24±7.52	28.55±7.09	19.88±6.4	<0.0001	<0.0001
VAS	6.1±1.4	3.7±1.6	1±0.9	<0.0001	<0.0001

DASH: Disabilities of the Arm, Shoulder and Hand; VAS: Visual Analogue Scale; p^a relates to the differences between initial and second evaluation; p^b relates to the differences between initial and final evaluation

Discussions and conclusions

Our study pointed out the fact that an early and sustained physical exercise programme started in the specialised rehabilitation centre and continued at home for a certain period of time, altogether with occupational therapy, play an important role in functioning regain in adolescents who had suffered upper limb fractures.

A higher QuickDASH score indicates a greater level of disability and severity, whereas, lower scores indicate a lower level of disability. The score on both test ranges from 0 (no disability) to 100 (most severe disability). In our study, the QuickDASH score had significantly decreased scores both at 1-month and 3-month assessments; this indicating a real progress in patients' function level.

The results of present research agree with the review performed by Bruder *et al*., (2011).

They analysed 13 studies including 781 participants with upper limb fracture. The aim of their research was to identify the effect of physical exercise on impairment reduction and improvement of upper limb functioning [4]. In 2017, the same authors published a new review that included 1299 patients with upper limb fractures; their objective was to analyse if the prescribed exercise programmes could not be efficient for impairment reduction or for regain of activities. The authors concluded that there is evidence that standard prescribed exercises could be efficient in reducing disorders and improving activities. However, the early start of exercises combined with a reduced immobilisation period is more efficient than a late exercise programme following a long immobilisation [6].

Roll *et al*., (2017) published a review that assessed 59 articles addressed to the analysis of exercises and occupational therapy in patients with musculoskeletal disorders of forearm, wrist and hand; among these disorders were also included the fractures. They concluded that the strongest evidence sustains the protocols of early active movement [7].

Assessment of functional status in children and adolescents, as well as in adult patients [8], [9] represents a key part in the rehabilitation of musculoskeletal disorders due to fractures, inflammatory diseases or degenerative process.

Our study, although with a smaller number of patients, targets a certain category of subjects, namely the adolescents. Besides the physical exercise programme, we draw attention to

occupational therapy that should be included as a part of the rehabilitation of patients with upper limb fractures.

We conclude that in adolescents with upper limb fractures rehabilitation brings important benefits in regaining the normal functioning. The return to sports activities should be also considered in this category of patients. The Quick DASH score is an early and easy to use assessment tool of the function level in physically active adolescents.

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Medical Rehabilitation Adapted to a Case of Amyotrophic Lateral Sclerosis and Multiple Comorbidities

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Abstract

We report a patient with amyotrophic lateral sclerosis and multiple comorbidities, admitted to the Medical Rehabilitation Clinical Hospital Baile Felix, Romania. The diagnosis was based on the anamnesis, history of the disease, local examination and electromyography, as well as on the El Escorial criteria developed in 1990 and reviewed in 2008 by Awaji-shima.

Medical rehabilitation adapted to the patient had the following objectives: prevention of vicious postures, prevention of bedsores, spine and girdle muscle relaxation, prevention and treatment of joint stiffness and muscle retractions, improving spasticity, coordination, control and balance, restoring motor control over the trunk and girdles, re-education of orthostatism and gait. The physical therapy program included corrective postures in functional positions of the limbs, methods of muscle relaxation, passive mobilization of the paretic segments, stretching exercises, Bobath method, Kabat's diagonals and Vojta therapy. Respiratory physical therapy used exercises to improve the respiratory muscles tone, for abdominal muscle training, control and coordination of breathing, respiratory rehabilitation techniques, techniques for mobilizing bronchial secretions. Occupational therapy improves stability in sitting position, transfers and verticalization (standing) as well as performance of ADLs. Robotic devices for upper limb training, speech therapy and psychological counselling complemented the therapeutic means.

Conclusion

Medical rehabilitation adequate to the general condition of the patient improves the quality of life by adapting the rehabilitation program to the functional remnant.

Keywords: Amyotrophic lateral sclerosis, medical rehabilitation, comorbidities, quality of life

Introduction

Amyotrophic lateral sclerosis (ALS) is a motor neuron disease characterized by degenerative changes most marked in the anterior horn cells of the spinal cord, the motor nuclei of the medulla

and the corticospinal tracts, with a poor prognosis. It can be either familial or, more often, sporadic. Familial ALS cases harbour mutations in genes that have various roles, not only in neuronal function but also in non-motor cells [1]. To date, the aetiology of sporadic ALS remains unclear [2]. The incidence of the disease was estimated at 2.2 per 100,000 person-years for the general population in Europe [3]. There is no specific diagnostic test for ALS; therefore, the diagnosis is based on the presence of symptoms, signs and laboratory evidence consistent with progressive upper and lower motor neuron dysfunction. Health care professionals focus on optimizing the quality of life of affected individuals using pharmacological treatments and non-pharmacological strategies. Various rehabilitation interventions have the potential to play an important role in the appropriate management of each case and to improve their quality of life, but further research is needed [4].

Case presentation

We present the case of a 71-year-old woman diagnosed with amyotrophic lateral sclerosis and multiple comorbidities, admitted to the Rehabilitation Clinical Hospital Baile Felix, Romania following tetraparetic motor deficit, dysarthria and inability to perform activities of daily living (ADLs), with an insidious onset, one year ago, with muscle weakness that developed progressively, initially affecting the right lower limb, later accompanied by impairment of orthostatism and gait.

Her past medical history revealed left fronto-parietal ischemic stroke, hypertension, thrombophlebitis in her left lower limb, varicose ulcer in her right lower limb, hypertensive heart disease, NYHA class III heart failure, grade II mitral regurgitation, grade II tricuspid insufficiency, chronic venous insufficiency C4-CEAP, sarcopenia.

Physical examination revealed overweight (BMI was 29.33 kg/m2), asymmetrical facies (central facial palsy), slightly pale skin, sinuous, indurated varicose cords in the lower limbs, bilateral perimalleolar stasis dermatitis. Examination of the respiratory system revealed: kyphotic thorax, low thoracic amplitude; diminished vesicular murmurs, shallow breathing, increased respiratory rate (25 breaths/min). Examination of the musculoskeletal system revealed that she used a wheelchair propelled by another person; transfers were performed only with 100% assistance from another person, could not maintain the sitting position at the edge of the bed; she actively mobilized the upper limbs bilaterally; muscle testing revealed upper limb force of 3/5; lower limbs marked spasticity, Aschworth Scale = 4; without motor control of the lower limbs.

Neurologic examination also revealed pyramidal syndrome; motor aphasia; fluid dysphagia; symmetric pupils, weak pupillary light reflex bilaterally; bilateral homonymous hemianopsia; partial urinary control and diaper use. The patient had high risk of falling = 28p on the John Hopkins Health System Corporation Scale. Global Assessment of Functioning (GAF) Scale revealed a score of 65.

The psychological evaluation found collaborative attitude; bradylalia, dysarthria, nasalization of sounds; written language could not be performed; ruminant thoughts, low tolerance to frustration; mild cognitive deficits in memory, attention, concentration; slightly impaired computational skills and mental efficiency. Regarding the affective level, she had moderate depression (14p on the Beck scale), anxiety, cried easily and had depressive symptoms of mild intensity. Personality characteristics were: extraversion, influential and impressionable.

Assessment of cognitive function using Reisberg scale revealed stage 3.

The native CT scan of the brain revealed a porencephalic cavity of approximately 19x13 mm in the left frontal lobe labeled as sequelae of ischemic stroke.

Native brain MRI showed discrete periventricular leukoaraiosis; porencephalic-gliotic sequelae lesion with dimensions of 2.3/2.4 cm; chronic stroke in the left frontal cortico-subcortical region; multiple chronic ischemic lesions of several millimeters were identified bilaterally in the fronto-parietal white matter.

Laboratory tests were within normal ranges. The electromyography (EMG) concluded: motor and sensory velocities kept within normal ranges in the studied segments, removing the suspicion of a demyelinating peripheral polyneuropathy. However, the needle EMG in the deltoid, brachioradialis, vastus medialis and gastrocnemius muscles detected abundant spontaneous activity-fibrilation spike waves; delayed recruitment, polyphasic and polymorphic motor unit potentials, some of giant amplitudes and deficient maximal contraction. DXA investigation showed osteopenia (lumbar T score: -2.2) and sarcopenia (appedicular lean mass: 0.52).

The diagnosis was based on El Escorial criteria developed in 1990 and reviewed in 2008 by Awaji-shima.

During the hospitalization the patient followed a cholesterol-lowering, low-sodium, calcium-rich diet, proper hydration. Pharmacological treatments used neurotropic, nootropic, beta blocker medication, angiotensin II receptor antagonists, anticoagulant medication, statin medication, anti-aggregation platelet agent, ergot-derivative medication, central muscle relaxant, other nervous system drugs (Riluzol 50 mg, 1-0-1), vitamin D.

Medical rehabilitation had the following general objectives: prevention of bedsores, improving the motor deficit, prevention and treatment of joint stiffness and muscle retractions, reeducation of transfers and ADLs, re-education of orthostatism and gait, improving coordination, control and balance, correcting posture and body alignment, decreasing spasticity, improving breathing, prevention of complications and relapses, maintaining the vital functions in physiological parameters, improving the speech disturbance and increasing the quality of life.

An appropriate physiotherapy program adapted to the general condition of the patient included: corrective postures in functional positions of the limbs, spine and girdle muscle relaxation, passive mobilization of the paretic segments, stretching exercises, Bobath method, diagonals Kabat, Vojta therapy, restoring motor control over the trunk and girdles, improve breathing by eliminating tracheobronchial secretions and improve swallowing.

Respiratory physiotherapy used exercises to improve the respiratory muscles tone, especially the diaphragm, for abdominal muscle training, control and coordination of breathing, respiratory rehabilitation techniques, techniques for mobilizing bronchial secretions. Occupational therapy improves stability in sitting position, transfers and verticalization as well as performance of ADLs. Robotic upper limb training devices, speech therapy and psychological counseling complement the therapeutic means.

To assess the degree of disability and the progress the patient made during rehabilitation we used the FIM scale [5]. When the patient was admitted for the first time the FIM total score was 63 and it decreased to 39 after 3 months.

Robotic devices for lower limb training could not be applied due to the increased spasticity the patient had. Hydrothermokinetotherapy that uses the oligomineral thermal water at 36oC, an important natural spa cure factor, could not be applied due to her multiple comorbidities.

Follow up recommendation were related to the prevention of falls and continuing the kinetic program at home. The patients house and environment should be adapted to her condition.

Discussion

ALS diagnosis and treatment have evolved over the years. Electrodiagnostic analysis in patients with possible ALS is critical for the ALS diagnosis itself, but also for orientating towards other potentially treatable diseases [6]. Symptoms may be described as "limb onset" and "bulbar onset". In limb onset form patients may experience difficulty with simple actions, such as holding a cup or buttoning a shirt. Patients with bulbar onset may experience challenges with chewing, swallowing, and speaking, such as nasal or slurred speech [7].

Although the degeneration predominantly affects the motor system, cognitive and behavioral symptoms have been described for over a century, and there is evidence that ALS and frontotemporal dementia overlap clinically, radiologically, pathologically, and genetically [8, 9].

Our patient was a 71-year old woman, with recent medical history of cerebrovascular and cardiovascular disease, with no history of diagnosed ALS in the family, but, from anamnesis, we found out that her mother had similar symptoms in her 30s and passed away in her 40s.

The patient presented progressive weakness in all four limbs, severe language disturbance, increased deep tendon reflexes, atrophy of the lower limb's musculature. The psychological assessment suggested mild cognitive impairment.

Bulbar onset patients have been described as having higher rates of cognitive impairment and shorter illness duration than spinal-onset patients because of the more rapid progression of motor symptoms, as seen in our case. In this case, the diagnosis was rather difficult, because, initially, the patient's symptoms were attributed to stroke in the left frontal region.

Only when the patient's motor deficit progressed and her speech intelligibility declined, without imagistic evidence of a new ischemic lesion, a clinical differential diagnosis of ALS was made, and confirmed by EMG. ALS is a severely disabling disease. The degree of disability can be assessed using different scales [10-12]. Osteopenia, sarcopenia and the risk of falls contribute to loss of independence and a severe prognosis [13-15]. Medical rehabilitation and vitamin D supplementation are strongly recommended especially in older adults, contributing to falls prevention [16].

This case is particular because of the coexistence of an ischemic stroke, which can partially explain the symptoms, and it emphasizes the importance of EMG in patients with progressive muscle weakness and language disturbance. The presence of many comorbidities influences clinical and therapeutical decision-making [17,18].

The care of these patients has increased substantially in recent years. There is currently only one drug licensed for the treatment of ALS – Riluzole [19]. Other treatments for ALS are designed to relieve symptoms and improve the quality of life. This supportive care is best provided by multidisciplinary teams of healthcare professionals. The best possible way to limit the progression of ALS is early diagnosis together with anti-glutaminergic therapy and physiotherapy.

ALS as well as other conditions especially of genetic etiology cannot be cured. In the absence of a specific, targeted treatment, early and intensive intervention of medical rehabilitation methods remain the only long-term treatments that maintain or/and restore the patient's functionality, increasing the quality of life [4, 20, 21].

Conclusion

Medical rehabilitation adequate to the general condition of the patient improves the quality of life by adapting the rehabilitation program to the functional remnant.

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Benefits of Complex Rehabilitation Program in Patients withTotal Knee Arthroplasty

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Abstract

Introduction

In this study we started from the premise that the use of physical therapy in combination with Instrument Assisted Soft Tissue Mobilization (IASTM) techniques, Medical Flossing, neuromuscular taping and electrotherapy procedures will reduce pain, improve joint mobility, muscle strength, stability and functional level, myofascial relaxation and the resumption of safe walking in patients with total knee arthroplasty.

Material and method

Six patients with total knee arthroplasty, 3 women and 3 men with a mean age of 63.16±10.38 years participated in this study. The selection of patients was made according to the free will of each participant. The evaluation of the subjects included: evaluation of pain, evaluation of joint mobility, evaluation of muscle strength, evaluation of stability in the lower limbs and evaluation of functional level. Patients followed a recovery program that consisted of: individual physiotherapy for 50 minutes, magnetodiaflux – prosthesis program, ultrasound – hydrocortisone gel (3-8 minutes), laser, IASTM technique, Medical Flossing and Neuromuscular Taping.

Results

The functional level increased between the initial evaluation, average value 38±13.6 points, and the final evaluation, average value 25.7±8 points, the difference between the two evaluations being 12.3±6.2 points. Regarding joint mobility, on the affected knee there was an increase for flexion between the initial and the final evaluation on average with 10±2.9, and on the unaffected knee the increase between the initial and the final evaluation was on average of 4.2±1.9. For muscular strength, on the affected knee there was an increase for the hamstring muscles on average of 1.5±0.54 points, while for the quadriceps muscle the strength increased on average by 1.83±0.75 points, and at the level of the unaffected knee, the increase in strength in the case of the hamstring muscles had an average of 0.66±0.51 points, respectively 0.83±1.16 points for the quadriceps muscle. The level of pain intensity had at the initial evaluation an average value of 32.5±18.64%, and at the final evaluation this value was 11.66±12.11%, the registred progress being of 17±19.69%.

Conclusions

The results of this research lead to the appreciation that the application of a standardized physiotherapy program together with IASTM techniques, Medical Flossing, Neuromuscular Taping and specific electrotherapy procedures, determine significant benefits in terms of functional level and quality of life for people with total knee arthroplasty.

Keywords: knee arthroplasty, IASTM technique, medical flossing, neuromuscular taping

Introduction

The knee, *a highly mechanically stressed joint* [1], plays a key role in statics and locomotion and is the largest joint of the body, but also the least protected by soft tissue, being due to this fact *one of the most traumatized joints among active population* [2]. At the level of the knee and not only injuries can be a cause of osteoarthritis, especially if they are repeated or if they cause major damage to the constituent elements of the joint [3]. The degenerative process affects the knee joint more frequently than the other load-bearing joints of the body. The functional impact of the degenerative process located at the knee includes a variety of symptoms: pain, gait problems, stability problems, strength and mobility loss, edema, muscular tensions etc.

Halpern has been talking about a real knee crisis in the United States since 2003, due to the fact that more and more people are suffering from injuries to the knee joint, which are becoming more serious and more common than ever [4]. Anterior cruciate ligament rupture is considered to be the first step toward knee osteoarthritis. People with a deficient anterior cruciate ligament have a higher risk of developing knee osteoarthritis compared to the rest of the population. [5]

Knee prosthesis is one of the most commonly used medical solutions today, especially since the onset of the degenerative process occurs in much younger people. Knee arthroplasty, even if it is invasive, allows a return to a functional level close to the one before the onset of the disease, especially if it is followed but also preceded by a functional rehabilitation program.

On the other hand, the non-timely operation of the arthritic knee causes a series of secondary complications, including lumbar damage [6], which should not be neglected because at the level of Western countries it is estimated that about 80% of the population suffers from low back pain and that percent continues to grow [7].

Purpose and objectives

The aim of this study was to test the effectiveness of a complex recovery approach in patients with knee arthroplasty.

The main objective of this study is to find effective methods for the functional rehabilitation of patients with knee arthroplasty and to monitor the effects of applying these recovery methods.

Hypothesis

In this study we started from the premise that the use of physical therapy in combination with IASTM techniques, Medical Flossing, neuromuscular taping and electrotherapy procedures will reduce pain, improve joint mobility, muscle strength, stability and functional level, myofascial relaxation and the resumption of safe walking in patients with total knee arthroplasty.

Material and methods

The study was conducted at the Fiziohelp Med Center in Salonta, Bihor, Romania. A group of 6 patients with a mean age of 63.16±10.38 years and a mean weight of 88.66±13.66 kg was selected, 50% women and 50% men. The selection was made according to the free will of each of the patients. The admission criterion for participation in this study was single-knee arthroplasty. Patients with painful symptoms and functional limitation in the other knee or in any other joint of the lower limb were excluded.

The evaluation of the patients was performed on the first and last day of treatment, the patients followed a treatment protocol for 10 days. This general recovery program consisted of: Individual physiotherapy for 50 minutes; Magnetodiaflux – program for prostheses; Ultrasound – hydrocortisone gel; 3-8 min; laser; IASTM technique; Medical Flossing; Neuromuscular taping.

The assessment protocol included: evaluation of pain, evaluation of joint mobility, evaluation of muscle strength, evaluation of stability in the lower limbs and evaluation of functional level.

For the evaluation of the pain intensity we used the Visual Analogic Scale (VAS), with the expression of the pain level in percentages, values between 0-100%. Patients were asked about the intensity of the pain they generally feel. The evaluation also aimed to assess the intensity of pain at different moments of the day using a questionnaire: "How do you feel the pain in the morning?", "How do you feel the pain after the physical therapy session?" and "How do you feel the pain in the evening?"

The evaluation of the joint mobility was performed with the help of the goniometer recording the values of the angles of the flexion and extension movements in the knee joint.

To assess the level of muscle strength we used manual muscular testing for global muscle strength, assessing the strength of the muscles that perform the flexion and extension movement, by reporting the results to the International Standardized Scale from 0 to 5. To facilitate the statistical interpretation of the results we noted muscle strength levels from 0 to 10, where 0 corresponds to a level of force of F0, and 10 corresponds to a level of force of F5.

The assessment of stability at the knee joint was performed using the Stork Test with eyes closed. The Knee Injury and Osteoarthritis Outcome Score (KOOS) questionnaire was used to assess the functional impact of knee joint damage. [8]

Results

Regarding the pain, assessed with the help of the VAS Scale, we found a decrease in pain intensity on average by 17±9.69% at the end of the study.

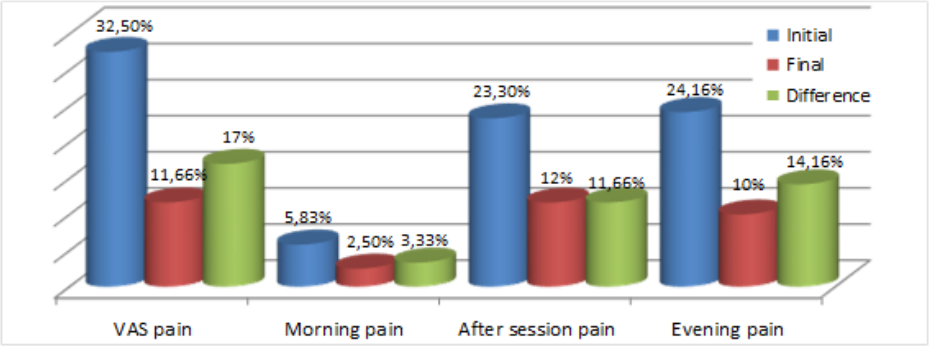

Fig. 1. Pain assessement results

The results obtained from the questionnaire for pain at different times of the day show a decrease in the intensity of pain more intense during the evening, on average 14.16±10.68%, compared to the intensity of pain after the session, on average 11.66±5.16%, and the intensity of morning pain, averaging 3.33±5.16%.

Regarding knee joint mobility, the extension was normal at the initial assessment but also at the end of the study, both for the affected lower limb and for the unaffected lower limb.

For the flexion of the affected knee the average progress was 10±2.9º. Considering that the normal value of flexion is about 130º it means that there is a deficit related to the average of the group of 11.7º (130º-118.3º).

In the initially unaffected lower limb, the average value of flexion was 127.5±3.8º, and finally 131.6±3.7º, without any of the patients showing extension deficiency.

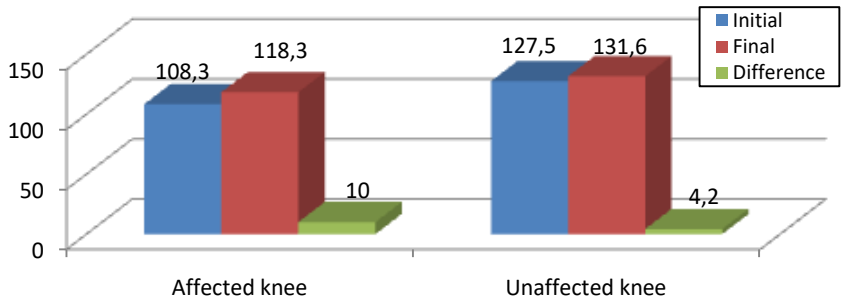

Fig. 2. Range of motion assessement results

For muscular strength, on the affected knee there was an increase for the hamstring muscles on average of 1.5±0.54 points, while for the quadriceps muscle the strength increased on average by 1.83±0.75 points, and at the level of the unaffected knee, the increase in strength in the case of the hamstring muscles had an average of 0.66±0.51 points, respectively 0.83±1.16 points for the quadriceps muscle.

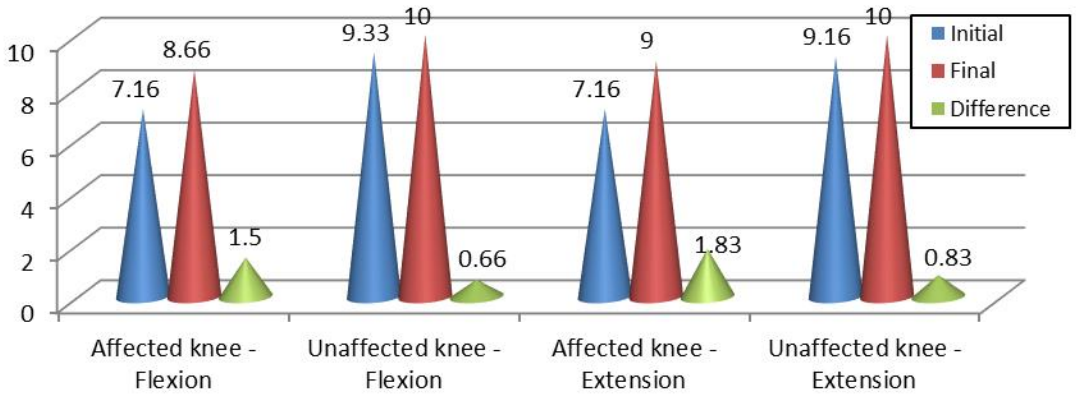

Fig. 3. Strenght assessement results

Regarding the stability of the knee joint, this evolved from an initial average value of 28.33±2.58 seconds, to a final average value of 33.16±2.92 seconds, the average progress being 4.83±0,75 seconds.

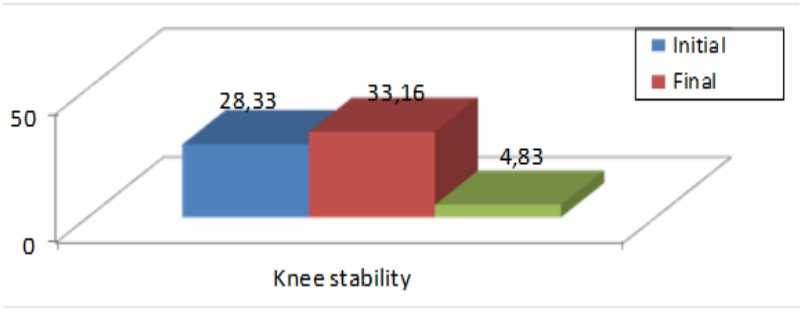

Fig. 4. Stability assessement results

The functional level increased between the initial evaluation, average value 38±13.6 points, and the final evaluation, average value 25.7±8 points, the difference between the two evaluations being 12.3±6.2 points.

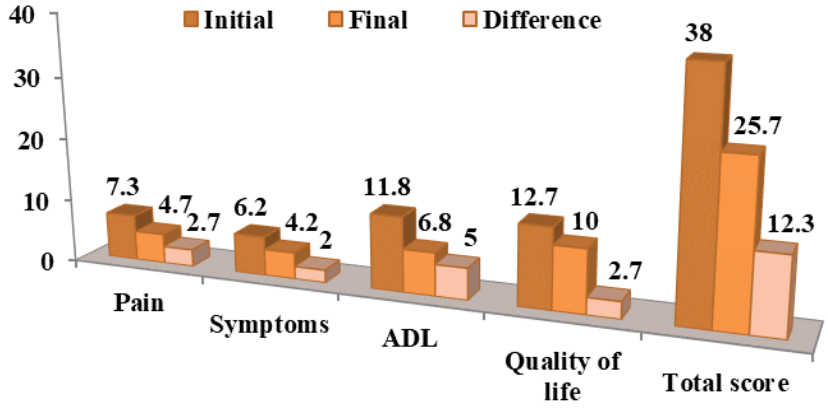

Fig. 5. Functional level assessement results

None of the patients experienced extreme knee pain, with four of them falling under 50 having mild pain and the next two over 50 having moderate pain.

Discusions

Pain is one of the major problems of people with osteoarthritis of the knee and the main cause of functional decline directly associated with lack of participation and decreased quality of life.

Puolakka *et al*., (2010) conducted a study that aimed to assess the degree and risk factors of persistent pain after knee arthroplasty. Regarding the intensity of the pain, they obtained an initial average of the group of 35.6%, and finally an average of 45.5%. One week after surgery, the pain was moderate in some people, gradually increasing in some patients to persistent pain [8]. In our study we evaluated the intensity of pain both initially, with a group average of 32.5±18.64% and finally with an average of 11.66±12.11%. Following the application of the treatment, the intensity of the pain decreased, reaching a slight level of pain.

Grama *et al*., (2012) follow the evolution of knee joint mobility in a retrospective study on advanced degenerative diseases of the knee treated by applying arthroplasty with different types

of prostheses. In this study, the authors found that the joint mobility of the prosthetic knee had an average of 110º on the flexion movement, and 0º on the extension movement [9].

Our study highlights with the help of the assessment of joint mobility that the group had an initial average on the flexion movement of 108.3±7.5º and the final one of 118.3±8.5º, observing a satisfactory progress. The extension amplitude was 0º.

Borda (2012) follows the evolution of muscle strength in the knee in patients with total knee arthroplasty. These patients followed a 2-week recovery program to assess muscle performance on the knee flexors and extensors using the isokinetic method. Muscle testing was done at 2 angular speeds: 90º/sec, respectively 180º/sec. Following the application of this treatment, the group of patients recovered reaching an almost normal level of muscle strength [10]. Unlike the previous study, in this study we evaluated muscle strength on both flexion and extension movement using manual muscle testing tchnique based on the scale from F0 to F5, obtaining a favorable evolution with increasing muscle strength of the affected lower limb on both movements.

Overall, at the end of the rehabilitation period there was an improvement in the results in terms of patients' quality of life, due to the procedures applied during the treatment as well as the physiotherapy programs and the method of myofascial relaxation.

Conclusions

The results of this research lead to the appreciation that the application of a standardized physiotherapy program together with IASTM techniques, Medical Flossing, Neuromuscular Taping and specific electrotherapy procedures, determine significant benefits in terms of functional level and quality of life for people with total knee arthroplasty.

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The Benefits of Manual Therapy in Treating Cervical Pain of Various Causes and Migraines

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Abstract

Hypothesis

In accomplishing this study, we started from the premises that a rehabilitation program which uses manual techniques in trigger points' therapy, has beneficial effects in the recovery of individuals with cervicalgia of various causes. Thus, the aim is to diminish pain, to improve articular mobility, to reduce the number of active trigger points and, last but not least, to improve the quality of life.

Material and method

The study was conducted on a sample of 9 patients (6 females and 3 males), with an average age of 47.78±15.23 years, presenting chronic cervical pain and migraines determined by spondylosis and/or cervical disc herniation, cervical polydiscopathy, cervical-dorsal spondyloarthrosis, cervical radiculopathy, etc. Pain assessment was made on VAS scale from 0 to 10, where 0 represents the lack of pain and 10 is unbearable pain. The cervical spine mobility was also assessed with the help of the goniometer. The trigger points were analyzed in order to depict the active areas which cause local muscle contracture and pain. For the purpose of assessing the quality of life, the health assessment questionnaire disability index (HAQ-DI) was used. The patients benefited of a rehabilitation protocol during 10 sessions consisting of specific physical exercises, massage, manual therapy and myofascial stretching.

Results

The pain intensity decreased in all three situations – "How do you feel the headache and cervical pain?": most days, an average of 3.56±0.88; most disagreeable day with 5.00±0.71 and best day with 2.33±0.50. The cervical spine mobility also improved for flexion with 5.78±1.72, for extension with 2.22±2.64, for left side lateral head tilt with 4.44±3.00, for right side lateral head tilt with 5.00±0.00, while for left-right rotations, with the same value, which is 6.11±2.20.

Acute trigger points' therapy determined the reduction of pain and muscle tension, thus at the end of the rehabilitation program, for 4 out of the 7 muscles, the points became inactive in all patients. The quality of life (HAQ-DI) improved and the effect dimension was between 0.096 for ADL-s and 0.527 for getting dressed.

Conclusions

After completing the rehabilitation protocol, the followings results were obtained: diminishment of pain, improvement of cervical spine mobility and reduction of acute trigger points, all these ultimately leading to the improvement of the quality of life.

Keywords: quality of life, trigger therapy, cervical pain, migraine

Introduction

Cervical pains often determine the occurrence of migraines. Approximately one out of ten people has migraines, 75% of them being women [1]. The functional performance is reported to be affected not only in degenerative rheumatic diseases, but also in inflammatory systemic conditions [2]. Physiotherapy realizes a holistic approach to the individual, whether he is more or less healthy, or prone to certain diseases, or chronically or acutely ill, in order to maximize his functional capacity and to improve his quality of life [3]. Moreover, the kinetic means have a positive influence in increasing the movement amplitude, improvement of body posture, and alignment of global spine mobility, of thoracic mobility and of respiratory capacity [4]. In the cervical pain treatment, the trigger points' therapy has an important role, in addition to the massage maneuvers which lead to the diminishment or release of muscle contraction or tensions [5]. It seems that the trigger points' therapy plays a more important part in diminishing migraines than it was believed before. Thus, it was noticed that 93.9% of the subjects have Trigger points with triggered pain patterns which reproduced the migraine pain and other symptoms. [1].

The Trigger points are defined as painful points to palpation [6] which, by pressing them, feel like a nodule, causing pain in real time which persists for a while. [7] According to Sorina Merlici, the Trigger points' identification criteria are: patient's recognition of pain in a certain point, sensitivity of the painful point, reproduction of pain sensation, presence of tensed muscle band and local contraction at palpation. [8]

The Trigger points are located in the skeletal muscles, discrete, and hyperirritable, causing intense pain, stiffness, weakness, restricted movement, etc. If they are situated at cervical level, they can lead to the occurrence of migraines, nausea, dizziness, seeing impairments, vasoconstriction and localized ischemia. Metabolites with nervous irritant features also occur at cervical level and produce a local spasmodic response.

They can be inactive during the individual's lifespan, but they can be triggered as a result of cold, heat exposure, anxiety, etc. [7], possibly determining nervous compression manifested when too much compression is applied upon the nerve by the surrounding tissues.

This pressure can be the result of repetitive movements or of maintaining the body in a certain position for a long period of time. [9]

The *purpose* of this study was to emphasize the benefits of manual therapy, respectively of trigger points' therapy, together with massage and physiotherapy specific exercises, in diminishing cervical pains and migraines and, implicitly, in improving the quality of life in patients suffering of cervicalgia of various causes.

The objectives of the study were the diminishment of pain and migraines caused by cervicalgia, recovery of articular mobility at cervical level, reduction of active trigger points' number which cause the pain and improvement of the quality of life.

Methods

Subjects. This study is based on an experiment, the most often used research method in physiotherapy [10], to which a sample of 9 patients participated (6 female and 3 males), with an average age of 47.78±15.23 years, presenting chronic cervical pains and migraines determined by spondylosis and/or cervical disc herniation, cervical polydiscopathy, cervical-dorsal spondyloarthrosis, cervical radiculopathy, etc.

Assessment. Each patient benefited of a detailed assessment in order to depict the imbalances caused by the presence of the active trigger points and migraines. Pain was assessed based on the answer to three questions, respectively "How do you feel the pain: during most of the days? when do you have the best day? when do you have the most disagreeable day?" [11]. The cervical spine mobility assessment was also made for the flexion, extension, lateral tilting and rotation movements, in order to depict the eventual movement range diminishment caused by trigger points and migraines.

In the assessment of painful points, pressure was applied through palpation specific to the respective muscle type, in order to release the contracted sarcomere. The thumb or four fingers from one or both hands was used in order to apply constant pressure which should move the tissue. When the resistant barrier occurs, it is expected to disappear and a slight softening of the tissue should be felt under the finger. It is continued this way, by applying a constant force upon the tissue, each time the resistance occurs, and in the end, the tissue is relaxed [7].

The Health Assessment Questionnaire (HAQ) was used to assess the quality of life in our patients. The questionnaire contains eight domains of activity (dressing, arising, eating, walking, hygiene, reach, grip, and common daily activities), each domain being graded from 0 to 3, representing: 0 – impossible, 1 – very difficult, 2 – difficult, 3 – without difficulty.

Rehabilitation program. The treatment consisted in individual physiotherapy – exercises for the back, isometric, resistive isotone contractions, PNF techniques, exercises for coordination recovery, stretching – 30 minutes; cervical massage – 10 minutes and manual therapy on trigger points.

The treatment of trigger points was applied for the following muscles: the superior trapeze muscle, the sternocleidomastoid muscle, the masseter muscle, the temporal muscle, the lateral pterygoid muscle, the medial pterygoid muscle, the splenius muscles of the head and neck and the suboccipital muscle.

Results

We recorded a decrease of pain intensity with 3.56±0.88 points for the first question with an average increase of effect (0.745), 2.33±0.55 points for the second question and a high increase of effect (0,854) and 5.00±0.71 points of intensity for the third, the effect size being high in this case too (0.947) (table I).

Table 1. Pain assessment results

How do you feel the pain?	Initial	Final	Difference	Effect size ES
In most days?	5.33±1.41	1.78±0.97	3.56±0.88	0.745
When do you have the best day?	2.67±0.87	0.33±0.50	2.33±0.55	0.854
When do you have the most disagreeable day?	8.56±1.51	3.56±1.13	5.00±0.71	0.947

The joint mobility improved with values between 6.11±2.20 for head rotation movements and 2.22±2.64 for extension, the other values being within this interval, the effect size being small for extension and leftwards rotation (ES≤0.2), and average for the other movements (0.2<ES<0.8) (table II).

Table II. Cervical spine mobility results

Movement (degrees)	Initial	Final	Gain	Effect size ES
Flexion	24.22±3.93	30.00±3.54	5.78±1.72	0.386
Extension	28.33±6.12	30.56±6.35	2.22±2.64	0.089
Left lateral tilt	27.22±4.41	31.67±3.54	4.44±3.00	0.279
Right lateral tilt	28.33±3.54	33.33±3.54	5.00±0.00	0.353
Leftwards rotation	40.00±7.91	46.11±8.21	6.11±2.20	0.189
Rightwards rotation	40.00±7.07	46.11±7.82	6.11±2.20	0.205

Trigger points' therapy determined a decrease of muscle tension, cervical pain and migraines, thus, at the end of the rehabilitation program, in 4 out of the 7 muscles, the trigger points became inactive (0.00±0.00), while in the other 3 muscles, they remained active only in 0.22±0.44 of the cases in the temporal and splenius muscles and in 0.11±0.33 of the cases in SCM (table III).

Table III. Trigger therapy results

Trigger point	Initial	Final
Superior Trapeze	1±0	0±0
SCM	0.78±0.44	0.11±0.33
Temporal	0.44±0.53	0.22±0.44
Suboccipital	0.22±0.44	0.00±0.00
Masseter	0.00±0.00	0.00±0.00
Splenius	0.44±0.53	0.22±0.44
Pterygoid	0.00±0.00	0.00±0.00

The quality of life improved as a result of applying the rehabilitation program, the effect size being smaller in accomplishing ADL-s (0.096) and in moving around (0.147), and average for the other activities (table IV).

Table IV. Quality of life results – HAQ

Activities	Initial	Final	Gain	Effect size ES
Getting dressed	2.44±0.53	3.00±0.00	0.56±0.53	0.527
Standing up	1.89±0.33	2.44±0.53	0.56±0.73	0.322
Feeding	2.67±0.50	3.00±0.00	0.33±0.50	0.333
Moving around	2.11±0.60	2.44±0.53	0.44±0.73	0.147
Personal hygiene	2.33±0.71	3.00±0.00	0.67±0.71	0.471
Grabbing, bending	1.56±0.53	2.56±0.53	1.00±0.50	0.474
Grip strength	2.33±0.50	2.89±0.33	0.56±0.53	0.333
ADL-s	2.00±0.71	2.22±0.44	0.22±0.44	0.096

Discussions and conclusions

The main symptoms of patients with cervicalgia, irrespective of cause, are cervical pains which determine, in most cases, migraines, as well as the decrease of cervical spine mobility.

Thus, Rayssilane Cardoso de Sousa and Ludmilla Karen Brandão Lima de Matos state in a study that the presence of muscle contractures and an increase of the respective muscles' tone could be the cause for tension-type cephalalgia which, in turn, causes pain which spreads in different areas of the cranium. Their study was conducted on a sample of 9 patients, all females, and the result was a diminishing of pain from 7.33±0.167 to 2.56±0.580, a statistically significant increase for all movements in the cervical spine and an improvement of the quality of life (assessed by the health questionnaire SF-36), with the exception of 2 domains, which are the emotional role (t=0.0518) and mental health (t=0.0548). [12]

Another study conducted on 18 patients divided in 2 groups, control and experimental. The experimental group benefited of a trigger points' therapy and physiotherapy, while the control group benefited only of physiotherapy. The authors concluded that there are no additional benefits for the experimental group, compared to the control group, but both groups recorded a significant improvement in pain, cervical mobility and physical function. [6]

Our study, similar to other studies [6, 12], showed, that the association of trigger points' therapy with massage and physical therapy exercises, determine a decrease in active trigger points for the muscles which were acted upon. The consequence is a decrease in muscle tension, an increase in joint mobility, a decrease in cervical pains and migraines, as well as an increase in the quality of life of patients suffering of cervical pains of various causes.

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Effectiveness of Physical Therapy Interventions for Children with Autism, Through Recreational Activities – Roller Skating

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Abstract

Purpose

The purpose of this present paper work was to highlight the importance of developing psychomotricity in children diagnosed with ASD through physiotherapy and leisure physical activities such as roller skate. This type of activity demand balance, attention, muscle toning, and offers to the child the possibility of social integration and the formation of a healthy lifestyle.

Methods

A total of 6 boys, aged 4.5 to 6 years, diagnosed with Autistic disorder (AD) were participated in this study. Interventions consisted in physiotherapy sessions and roller-skating lessons, twice per week, for 6 months. The outcomes measures included static and dynamic balance tests, socialization level assessment and roller-skating evaluation.

Results

Improvements were found in balance, mental age and roller-skating skills.

Conclusions

Roller-skating has the potential to provide a practical way to improve motor behaviour and the social interaction of people with ASD. Children with ASD, as future adults, can be integrated into socio-recreational activities by capitalizing their skills.

Keywords: Exercise, roller skating, autism, Balance

Introduction

Autism is a common developmental disorder that can be diagnosed by 18 months.

Children with autism are prone to problematic behaviours due to their deficiencies in thinking, communication and social skills.

Autism Spectrum Disorders (ASD) are low-level cognitive neurodevelopmental disorders that affect approximately 1% of the population and are characterized by disorders in three areas of function: social (which affects a person's abilities to function properly in school, work, and other areas of life), communication and interaction with other people and restricted interests and repetitive or stereotypes behaviours [1]. Repetitive behaviours are a prevalent feature (around 90%) and begin around the age of 3-4 years [2]. These comprise a range of motor, behavioural or cognitive abnormalities. Given the significant negative effects of these disorders on people with

autism and their early onset, finding relevant intervention methods to treat and reduce them is important.

Previous studies show that physical exercise decreases in stereotypy, aggression, off-task behaviour, improved objective sleep on nights [3]. The application of motor activities aims at engaging in social actions as diverse as possible in order to integrate those with difficulties in social adaptation [4]. Participating in recreational physical activities may be a challenge for people diagnosed with autism due to social integration difficulties, motor skills, communication breakdowns and self-monitoring [5]. Furthermore, children with autism cannot play with peers and participate in team sports and various sports activities [6].

Physical activities that do not require teamwork can provide an opportunity to practice skills without provoking potentially demanding social interactions (e.g., jogging, horse and bike riding, swimming, martial arts techniques training, rock climbing, yoga, roller-skating).

Roller skating has the advantages of allowing parallel involvement with colleagues and family members of all ages and having relatively uncomplicated rules (maintaining balance, propelling forward, following a designated route) [7].

Children with ASD are more likely to have difficulties with balance, postural stability, gait, joint flexibility, and movement speed [8], [9]. These disorders in motor abilities may reduce chances of practicing physical activity. For this, physiotherapy has an important role.

The physiotherapy means and methods applied in the development of balance and learning the roller-skating on children with ASD, contribute to the development of the ability to adapt to the environment, the development of attention and concentration and interaction with other people.

By the methodical and systematic use of physiotherapy means in the optimal period of development of certain components of psychomotor skills (balance, coordination), results can be obtained by accessing a more complex level of expression of physical, social and other abilities.

Rolling is an activity with a special enthusiasm, which gives the child freedom of movement.

It requires balancing the whole body and uses natural movements to go forward.

The basic rule is balance control. Faith *et al*., show in their study that a rollerblading program for 12 weeks, three times a week leads to improved balance, motor behaviour and functional capacity of children with ASD [10].

The purpose of this present paper was to highlight the importance of developing psychomotricity in children diagnosed with ASD through physiotherapy and leisure physical activities such as roller skate that demand balance, attention, muscle toning, and to the child the possibility of social integration and the formation of a healthy lifestyle.

The overall objective of this study was to improve the social inclusion of autistic children.

In order to achieve this objective, we have established as specific objectives the development of static and dynamic balance and the learning of roller skating.

Methods

Participants

A total of 6 boys, aged 4.5 to 6 years were recruited from the School Center for Inclusive Education Crystal, special integrated groups in Oradea, Romania. They were all diagnosed with Autistic disorder (AD).

The study had the approval of the institutional ethic committee, while parental consent and participant assent were received from all participants before commencing with data collection.

Interventions

Physiotherapy sessions took place for 30 minutes, twice per week, for 6 months. The physiotherapy program included exercises to capture attention (various types of gait with changes in rhythm or movement at the sound signal), balance exercises using sponge block and on the gym bench, lower limb coordination exercises using ball, milestones, hoops, bowling.

Roller skating sessions were conducted in an indoor gymnasium at child's school, in addition to physiotherapy program. Each session consists of 30 minutes lessons, twice per week, for 6 months. The roller-skating lessons included skill practice and exercises that are individualized based on each child's abilities. The child was initially familiar with helmet, knee pads, and elbow pads, being then challenged and assisted to apply them himself. Then exercises were performed for basic skating skills such as moving forward, gliding and stopping in a safe and supportive way. Once he mastered the proper stance and how to move forward and stop, the distance and direction of movement changed. The lessons also included the practice of falling and lifting, various movements with the lower or upper limbs from standing on rollers, forward and back rolling variants, rolling with a stick grabbed by the ends, rolling towards a set point, rolling between pylon. Age-appropriate language was adopted on a consistent and explicit basis so that each child understood relevant roller-skating terminology to transition more smoothly between activities during each testing and skating session.

Evaluation

Prior to this intervention, participants attended pretesting over a 2-week period during which they took part in their regular daily activities. Each outcome measure was assessed 3 times over this period to ensure baseline stability.

Children were tested before and after the intervention in the following areas: Static balance – applying Flamingo, neutral stance and Romberg tests; Dynamic balance – applying the Bass test, Static and dynamic balance – applying the Bruininks Oseretsky Test of Motor Proficiency (BOT-2), the socialization field – applying the Portage scale – the socialization area and the roller coaster evaluation.

The Flamingo Test assessed the ability of participants to remain in balance on the dominant foot [11]. The number of trials that the subject needed to complete in 1 minute (the chronometer was stopped whenever the subject did not comply with the protocol conditions) was measured.

The outcome was expressed as the number of trials (number of falls).

The tests were demonstrated to all participants and the children were allowed to practice three times to become familiar with the test. Tests were practiced with eyes open without shoes on the wooden beam (50 cm long, 5 cm high, 3 cm wide). The child has to bend his free leg backwards and grip the back foot with his hand on the same side, and stand like this for 1 min. Participants were instructed to maintain this position as long as they can. Stopwatch was used to note each time the person loses balance either by falling off the beam or letting go of the foot being held or hands removed off the body. Then the number of attempts needed to stand on one leg for 1 min is counted. Lower scores indicate better performance.

During the neutral stance, children stood as still as possible, as follows: 4.5-year-old children, sitting with eyes closed, with their feet shoulder width apart and their hands behind back, torso bent forward; 5-year-old children sitting on tiptoes, with their feet shoulder width apart and their eyes closed; 6-year-old children, standing on the dominant leg, with the other knee bent (leg raised). The test was scored in seconds.

The Romberg test is used for the clinical assessment of patients with disequilibrium or ataxia from sensory and motor disorders [12]. The subject is asked to stand with feet together and eyes closed, with the arms crossed in front of the body. The essential feature is that the patient becomes more unsteady with eyes closed. Losing balance can be defined as increased body sway, placing one foot in the direction of the fall, or even falling. The test was scored in the seconds to maintain the position and the points according to the Romberg scale from 0 to 4, as following: 0 = stepping, 1 = losing balance, 2 = excessive swaying, 3 = swaying, 4 = normal.

The Modified Bass test is an assessment of balance, in which the participants alternate foot hopping and holding a static position for five seconds at each point [13]. Dynamic forward and diagonal movements are coupled with statically maintaining landing positions. It is marked on the ground at certain distances, a number of 10 spaces (circles). From a standing position, the subject is asked to make a jump, land in the next space on the other leg, and maintain balance for 5 seconds. Continue like this until he covers the entire route. Each successful landing earns the subject 5 points. Each second the subject holds a steady position, they are rewarded with another 1 point; a total of 100 points are possible for the entire test.

Higher scores imply better balance.

The BOT-2 is a standardized assessment of motor abilities that measures manual coordination, body coordination and balance, strength and agility, and fine motor skills. The balance subscale uses two-footed and one-footed postures under various conditions (eyes open, eyes closed, and balance beam) and posture when walking forward on a line and heel to toe on a line. Balance scores range from 0-36, with higher scores indicating better balance.

The BOT-2 is normed for ages 4-21 years and has demonstrated strong test-retest reliability, strong internal reliability, and high interrater reliability [14].

For the socialization field we applied the Portage scale – the socialization area to establish if the child is at a level of development specific to his chronological age. Portage is a scale for assessing the level of development of children aged 0-6 years [15]. The scale includes a number of 83 items, which assess the child's skills, abilities and capacities in 6 areas (infant stimulation, socialization, language, self help, cognition, and motor skills).

For the roller-skating evaluation, we made a rating scale from 0 to 3, as following: 0 = does not accept being shoe-reeled, 1 = he sits on the rollers and does arm exercises, 2 = rides on rollers with support, 3 = rides independently.

Results

The general characteristics of the study group are shown in table 1. The value of Portage score for socialisation area indicates un moderate delay for the group (score 52,17), the most affected subject presenting a profound delay (score 25,73).

Table 1. Characteristic of the study group

	Mean and SD (years)	Range
Age (years)	5.17±0.75	4-6
Mental Age (years)	3.00±1.09	2-4
Portage – socialisation (score)	52.17±19.70	25.73-73.68
BMI (kg/m2)	18.72±3.84	13.97-25.50

BMI = Body mass index

Six months after the physiotherapy program, the balance test values of the children were significantly better than those before intervention ($p<0.05$) for Static balance test, BOT – 2 – balance subscale and Bass test (Table 2). The values for Romberg and Flamingo tests have improved but not significantly ($p=0.06$).

Table 2. Balance results on 6 months

	Initial	Final	p value
BMI (kg/m2)	18.72±3.84	19.22±3.73*	0.028
Flamingo (score)	11.75±4.5	11.33±4.71	0.066
Static balance (sec)	3.33±2.50	6.5±2.58*	0.026
Romberg (sec)	4.33±2.06	5.33± 2.25	0.063
Romberg (score)	2.5±1.22	2.83±1.16	0.157
BOT-2 – balance (score)	11.00±3.34	15.00±3.40*	0.042
Bass (points)	14.50±7.39	21.00±8.71*	0.027
** Significative difference (Wilcoxon test, p<0.05)*			

Six months after the physiotherapy and roller-skating intervention, the Portage score for socialisation area was higher but not significant and the roller-skating skills improved significantly in 6 months, for whole group (Table 3).

Table 3. The evolution of Portage scale and roller-skating skills over 6 months of intervention

	Initial	Final
Age (years)	5.17±0.75	5.67±0.51
Mental Age (years)	2.67±0.98	3.17±1.50
Portage – socialisation (score)	52.17±19.70	56.40±27.19
Roller skating (score)	0.33±0.51	2.33±0.51*
** Significative difference (Wilcoxon test, p<0.05)*		

Discussions

The objectives of this study were to improve balance and learn to roller skate in children with autism, in order to improve their social inclusion.

Poor postural balance has been repeatedly demonstrated in ASD and appears to interfere with the development of fine motor skills and the ability of patients to control themselves behavior during social interactions [16].

The results obtained from the applied physiotherapy and roller-skating program show an improvement of both static and dynamic balance for all subjects. The score for socialisation area increased but not significantly, indicating however a positive evolution from moderate to slightly delayed.

The roller-skating skills improved significantly in 6 months. The evolution of the learning of rollerblading of the subjects in this study was satisfying, knowing that, initially none of the children in the study was able to maintain position without help, some of them didn't even want to wear protective equipment or rollerskates. Roller skating can be a good leisure activity for children with ASD because it is a form of physical activity and an opportunity to engage in

parallel activities with other children in a community environment with uncomplicated social rules [7].

Learning to roll on skates can have several benefits on children with ASD development, because it is an activity that develops balance, kinesthesia, complex perception of movement, stimulates the spatial perception of positions and directions in relationships with people, objects and environment, develops attention and concentration, stimulates interaction with other people and the desire to perform motor activities autonomously [17].

According to the study of Lloyd *et al*., [18], motor deficit occurs later in the development of the child with ASD and becomes more pronounced with age. Therefore, activities aimed at reducing functional limitations should be given priority alongside other interventions to improve social interaction and behavior.

By practicing physical exercise, and sport in general, people with intellectual disabilities have the opportunity to experience some unique life situations, to gain greater autonomy and access to new cultural activities that encourage social integration [19].

Conclusion

Our results, as well as the results of other studies [10], suggests that roller skating has a big potential to provide a practical way to improve motor skills and the ability of children with ASD to perform their daily tasks. ASD children, as future adults, can be integrated into socio-recreational activities by capitalizing on their skills.

Acknowledgments

Anca Ciurba, Dorina Ianc and Emilian Tarcău have contributed equally to the study.

Conflict of interest

The authors declare no conflict of interest.

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Systematic Review of 3D Printed Orthosis for the Hand

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Abstract

Introduction

3D printer technology is gaining more and more applicability in the field of medicine and rehabilitation, a phenomenon explained, on one hand, by its results and benefits, and on the other hand, by increasing accessibility and reducing financial implications, which it develops alertly.

Recently, devices such as orthosis, prostheses, exoskeletons, etc. have begun to develop, which represent an evolution in the field of rehabilitation tools.

Objectives

This study aims to analyze published articles on 3D printed orthosis, gathering information about the current state of these devices, manufacturing methodologies, application conditions and the results of their integration into the treatment schemes of the upper limb.

Method

In this study were included and analyzed 10 specialized articles targeting 3D printed orthosis devices applied at the level of the hand region for pathologies specific to the area.

Results

3D printed orthoses have a number of benefits and features that recommend them as a more effective alternative to the traditional method of immobilization.

Conclusions

It is necessary to carry out additional multidisciplinary studies for the real evaluation of the benefits of integrating 3D printed orthoses in different treatment schemes.

Keywords: 3D printed, orthosis, hand

Introduction

Orthosis is a medical tool used for the fundamental purpose of limiting and influencing joint movements in a given area, being usually integrated into the patient's treatment protocol after surgery, trauma or joint deformity. Moreover, orthoses can also be used for prophylactic purposes to reduce the load on a joint, to prevent bone fractures or to make up for poor muscle function, a phenomenon explained by the technological and technical complexity of orthosis devices in our days [1].

Regarding the upper limb sufferings, orthoses are mainly integrated to facilitate and maintain the functional results of various treatments in the recovery scheme (whether medical, surgical or physiokinetic), and secondary to encourage the use of the upper limb which is deficient in self-care, professional and recreational activities. The devices meant for this level may restrict or facilitate a given movement, or may influence the transfer of loading forces which act in areas in need of protection, aspects determined according to the proposed purpose and objective [2, 3].

The use of upper limb orthoses is often associated with a number of complications such as: edema and circulatory disorders, skin lesions, muscle atrophy, joint stiffness, neuralgia and compartment syndromes (eg carpal tunnel syndrome), tendencies, etc [4-7].

The technology of 3D printers is in full development, being integrated in multiple sectors and fields of activity, finding its applicability in the field of rehabilitation and recovery. Thus, 3D printing is an additive process of making a three-dimensional object, of various shapes and sizes.

The aim of the research is to make a comparative analysis of the results of the integration of 3D printed orthoses in different treatment schemes.

Methods

For the realization of the present review study, a series of databases were used: ScienceDirect, Google Academic, PubMed, ResearchGate, platforms from which were extracted for a first stage of analysis specialized articles published between 2000-2020. The selected and included articles in the present study are publications that have cumulatively met the following inclusion criteria: they were made in English, targeted 3D printed orthosis devices, targeted the region of the hand and specific pathology and are available free of charge. Exclusion criteria: were made in a language other than English, targeted other types of devices (eg prosthesis, exoskeleton, etc.), targeted other regions of the body. We used the following keywords: “3D print”, “3D printed orthosis”, “3D printed hand orthosis”, “personalized orthosis”, “CAD”, “cast modelling”, “orthosis modelling”, “reverse engineering”, “personalized medicine”, “orthosis”. Following the title analysis stage, a number of 38 articles were extracted, later reduced to 23 based on the analysis of their abstracts, from which a number of 10 articles were selected for this study.

Results and discussions

Chae *et al*., 2020 integrates 3D printed orthoses in the treatment scheme of three patients suffering from peripheral nerve injuries, namely the ulnar nerve, median nerve and a neuropathy in the lower limb. The results of the study represent the differences between the values of the initial and final tests, these being for case 1: initial polydigitopalmar gripping power = 16 kg / final = 22 kg, initial bidigital gripping power = 5 kg / final = 7 kg, initial subterminolateral gripping power = 4.5 kg / final = 4 kg, initial terminal gripping power = 5 kg / final = 6 kg; Initial VAS = 7 / final = 3; initial JHFT score = 12.85 ± 1.77 / final = 14.12 ± 0.89 and QUEST score (Quebec User Evaluation of Satisfaction with Assistive Technology) = 4.62. And for case 2: initial polydigitopalmar gripping power = 12 kg / final = 18 kg, initial bidigital gripping power = 4 kg / final = 3 kg, initial subterminolateral gripping power = 4 kg / final = 3 kg, initial terminal pre-gripping power = 3 kg / final = 1 kg; Initial VAS = 6 / final = 4; initial JHFT score = 9.85 ± 2.91 / final = 9.00 ± 4.24 and QUEST score = 4.08. The conclusion of this article is that

3D printed orthoses can be integrated into treatment schemes for peripheral nerve injuries, demonstrating a number of results and benefits [8].

In the study conducted by Kashapova *et al*., 2017 a prototype orthosis is evaluated that has integrated in its composition a removable ultrasound system to facilitate bone healing and reduce the time of use of the orthosis. In order to evaluate the benefits of the prototype, 4 groups were formed consisting of patients with diaphyseal fractures in the upper limb, and the following treatment schemes were applyed: group 1: orthosis and daily/unlimited ultrasound treatment / 15 days; group 2: orthosis and ultrasound treatment daily / 3 times a day / 15 days; group 3: orthosis and ultrasound treatment daily / 1 per day / 15 days; lgroup 4: the traditional method based on gypsum and ultrasound treatment was applied daily / 1 per day / 15 days. On groups 2, 3 and 4, ultrasound treatment of intensity = 1.2 W / cm^2 was applied for sessions that gradually increased from 5 to 15 minutes. The results at the end of the research were for: group 1: pain relief and edema reduction from day 1, without circulatory improvements and incomplete bone fusion, with a series of side effects, group 2: pain relief and edema reduction from day 2, improvements circulatory system on day 3 and complete bone fusion on day 20/28, no side effects, group 3: relief of pain and reduction of edema from day 5/6, circulatory improvement on day 7 and complete bone fusion after day 45, no side effects, group 4: pain relief from day 7/9, reduction of edema from day 10/12, circulatory improvements from day 10 and complete bone fusion after day 60, without side effects. The conclusion of this article is that a 3D printed orthosis device combined with ultrasound treatment can be an effective alternative for upper limb fracture recovery [9].

Chen *et al*., 2017 integrates customized 3D printed orthoses in the treatment schemes of 10 patients diagnosed with distal radius fracture. This research involved 10 patients aged between 5 and 78 years, of which 4 were male and 6 were female. To evaluate the experiences, a series of questionnaires were designed that evaluate elements such as: stability of immobilization, venous circulation, pressure points, comfort, skin irritations, smell, etc., where 0 = poor / 1 = acceptable / 2 = good / 3 = excellent, moreover, patients were instructed to self-check for compartment syndromes in week 1. The first results of the group showed the absence of compartment syndromes, the absence of complications associated with venous circulation disorder, the absence of pressure points, meeting orthopedic requirements and patients' preference for 3D printed orthosis, to the detriment of the traditional one. Based on the questionnaires performed, the clinical efficacy is evaluated with a score of 9.8 out of 12, and patient satisfaction with 11.5 out of 15. The conclusion of this study implies the importance of conducting additional studies in the field, considering that this research is the first clinical study that aimed the applying of the 3D printed orthoses in the recovery of fractures of the hand with a first series of positive results [10].

In the study conducted by Agudelo-Ardila *et al*., 2019 a methodology for designing an orthosis model for the upper limb is evaluated, respecting the technique of reverse engineering and reverse manufacturing technology, using in this case tools specific for the CAD program.

After testing the device at factors such as pressure and temperature (according to FEA) the prototype proved to be a viable device to be integrated into a treatment scheme, obtaining a maximum pressure score = 972.7 MPa and showing temperature resistance. Moreover, although this procedure proved to be slower compared to the traditional method, a lower financial investment per device was achieved. The conclusion of this study is that the procedure for making a 3D orthosis is relatively simple, and the benefits of its implementation are a real progress in the field of recovery [11].

Li & Tanaka, 2018 evaluates a staged procedure for designing an orthosis type device and analyzes a version of the CAD program, as well as other technical tools. A number of 5 people who were attending the courses of an assistance school were invited to participate in this study, being subjected to a fundamental course lasting 15 minutes. At the end, the participants were evaluated through an exercise that involved designing an orthosis on their own, following the assimilated indications. The results are represented by the actual time in which the participants solved the imposed requirements (varies from 8 to 20 minutes) and the quality of the individual projects for which no major errors were reported. The conclusion of the study is that the design of a 3D orthosis for upper limb pathologies can be performed efficiently and in a timely manner by an inexperienced person with minimal training [12].

Lin *et al*., 2018 analyzes an intelligent and short-lived modeling technique for the 3D design of a customized, hygienic and ergonomic orthosis using the VTK Kitware (Visualization Toolkit) program. The FEA (finite element analysis) results for the evaluation of the obtained models were: mechanical load = 3MPa, maximum pressure = 10.2 MPa, maximum deformation = 0.15 mm and minimum safety factor = 3.44. The actual design of a model takes approximately 20 minutes. The conclusion of this article is that in the design of a viable orthosis device for integration in patient recovery, other programs that involve low duration and difficulty can be used, in addition to the CAD program [13].

Baronio *et al*., 2016 evaluates the requirements of making a 3D printed orthosis for the upper limb, focusing on obtaining the geometric sketch of the segment. The results of the study are represented by the main problems identified in the critical analysis for making an orthosis, such as: the need for static positioning of the member without interest for the scanning phase and the execution time varying between scanners, the need for specific technical knowledge for the design phase, often not found in orthopedic doctors or orthosis technicians, difficulties in complying with the project's specifications at the time of printing, a phenomenon dependent on the compatibility between instruments. The conclusion of the study implies the need to start additional and in-depth research in this field, involving all relevant disciplinary aspects: orthopedics, recovery and rehabilitation, design, programming, etc., to eliminate the obstacles encountered in making an orthosis [14].

Souza *et al*., 2017 evaluates a methodology for making a 3D printed orthosis, while implementing the prototype obtained in a case study. A 24-year-old male patient diagnosed with a distal radius fracture in his left hand participated in this study. The result of the study is represented by the characteristics of the prototype: low weight = 53g. low cost = $ 3, low design and printing time, hygienic, ergonomic, personalized, aesthetic and the possibility of integration into the treatment scheme. The conclusion of this study indicates that the 3D printed orthosis can meet the needs and objectives proposed, while being an effective alternative to the traditional method, at least in terms of distal radius fracture [15].

Lobo *et al*., 2018 analyzes a series of theoretical recommendations in the design of three types of devices used in recovery: technical clothing, support devices (orthoses, exoskeleton, etc.) and smart devices (sensors for measuring activity, etc.). Regarding the support devices sector, there are a series of review studies that demonstrate the low degree of compliance of patients with various orthosis/prosthesis devices due to factors such as: pain, discomfort, aesthetics, etc. (as cited by Swinnen *et al*., 2015), elements that could be avoided by using the FEA2 model in making an orthosis. The conclusion of this article may be that there is a significant need for new specialized articles in the field of devices used in recovery to assess their actual effectiveness and

to encourage their development, given that this study provides only a number of theoretical recommendations [16].

Conclusions

The technology of 3D printers finds its applicability in the field of medicine and rehabilitation, as suggested by the studies included in this paper, but the efficiency and benefits of integrating 3D printed orthoses in different treatment schemes are insufficiently researched at present.

However, we believe that there are sufficient resources today for the development of 3D printed orthosis devices, a statement based on the conclusions and results of the studies analyzed, while considering the potential advantages that these devices have, from manufacturing methodology to improving the situation of patients, including the reduction of complications associated with classical orthoses in the upper limb.

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The Effectiveness of Short Term Soft-Tissue Treatment Procedure Using Indiba Fascia in the Rehabilitation of Acute Lateral Epicondylitis

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Abstract

Lateral epicondylitis is one of the most common conditions in the elbow joint and can affect professional and amateur tennis players as well. Modern radiofrequency therapies are growing their popularity in the rehabilitation of acute and chronic sport injuries. Indiba Activ is a noninvasive technology and operates at 448 kHz. This study aimed to examine the effectiveness of the soft tissue mobilization techniques using Instrument Assisted Soft Tissue Mobilization (IASTM) electrodes of Indiba Fascia technology in the treatment of acute "tennis elbow". 10 amateur tennis players who experienced specific symptoms for less than 3 months were divided into 2 groups: IA (Indiba Activ application using resistive electrode) and IF (Indiba Fascia treatment using IASTM electrodes). Each group received a daily specific therapy using Indiba equipment (15 minutes at a medium and subthermal unit) combined with manual therapy for 2 weeks. The evaluation of the pacient was done before and after the 2nd week of the treatment and had been made using Visual Analogue Scale and the Pacient-Rated Tennis Elbow Evaluation Questionnaire (PRTEE). The results confirm that both therapies using Indiba device can produce significant improvements in terms of pain in acute lateral epicondylitis, a slightly better score being obtained by IF group after two weeks of treatment. Future controlled studies are needed to establish a successful combined therapy for a longer rehabilitation plan.

Keywords: acute lateral epicondylitis, tennis players, soft tissue, Indiba, IASTM electrodes

Introduction

Also known as the "tennis elbow", lateral epicondylitis represents one of the most common elbow disorders and can affect both athletes and non-athletes. The fixed etiology of lateral epicondylitis is not fully identified. Recent studies [1, 2] show the association with a series of repetitive microtrauma caused by excessive movements in the forearm and hand, but lateral epicondylitis can also result from direct trauma. In sports, the main targets are tennis players, improper ball-hitting technique and inadequate equipment being the most significant risk factors [3]. The most frequently affected is the short radial extensor muscle of the carpus, but often symptoms are present in the other muscles originating on the lateral epicondyle [4]. Excessive mechanical forces and anatomo-functional particularities of the muscles contribute to the creation of favored factors for the stress of the tendons of origin during the flexion and extension movements of the elbow [5].

The clinical content of acute lateral epicondylitis includes pain or burning sensation around the lateral epicondyle with the possibility of proximal extension on the forearm or arm. The severity of the pain may vary, having an intermittent or constant form. Most often the local symptomatology is triggered by extension movements of the wrists or the environment with or without resistance [6, 7]. The main complications of acute lateral epicondylitis treated improperly are immature tissue repair, subsequent degeneration of the original tendon and finally the possibility of tendinosis [8]. Such an inefficiently managed strategy can contribute to a number of more severe symptoms that affect the quality of life. Clinical evaluation includes palpation of the painful area (lateral epicondyle facet) and performance of specific clinical tests (grip strength test, middle finger extension resistance test, Cozen test, Mill test) [9]. However, when physical examination and the history of the condition do not provide sufficient information, paraclinical investigations are recommended for a better understanding of the particularities of each patient (potential joint capsule disorders, osteochondral defects, calcium deposits, etc.) [10].

A multitude of physiotherapeutic means have been recommended to treat conservative lateral epicondylitis, especially chronic one: Shockwave therapy, Dry needling, cryotherapy, laser therapy, myofascial therapies or muscle strength development exercises, etc. [11, 12]. In contrast, the number of studies showing the initial management of acute lateral epicondylitis is very limited.

The purpose of the research

This study aimed to examine the effectiveness of soft tissue mobilization techniques using Instrument Assisted Soft Tissue Mobilization (IASTM) electrodes of Indiba Fascia technology in the acute treatment of the “tennis elbow”. Modern radiofrequency therapies are an element of novelty in recent years in the functional recovery of athletes, the evidence of studies involving the use of the Indiba device being minimal.

Material and method

The test was performed on 10 subjects, amateur tennis players, who showed clinical signs of acute lateral epicondylitis for less than 3 months. The other criteria for selecting patients were: pain intensity on the Visual Analog scale at least 5, presentation of pain after the positive Cozen and Mill tests, participation in games or tennis tournaments only at the amateur level. The 10 subjects were structured on two equal groups, their monitoring taking place in different periods (Group IA – July 2020, Group IF – August-September 2020). Subjects were chosen based on the day they presented for treatment with the clinical details described specifically for an acute lateral epicondylitis. The regular equipment of the Indiba technology is used successfully, but the study aims to prove the effectiveness of Indiba Fascia additional system, added as equipement used in the recovery of athletes starting the month of August. Both groups benefited from an initial recovery protocol for 2 weeks which included 5 sessions per week, as follows: Group IA – treatment that included Indiba Activ technology with application through capacitive and resistive electrodes, combined with manual therapy; IF group – treatment based on the application of Indiba technology using the capacitive electrode and IASTM electrodes, specific to Indiba Fascia, combined with manual therapy. The main maneuvers of manual therapy included

myofascial techniques, deep tissue massage, stretching and manipulations. Moreover, research subjects sporadically applied ice to control inflammation.

Indiba Technology User Manual recommends that in the acute phase of soft tissue trauma therapy be performed for 15 minutes. Use via the capacitive electrode takes place in the epicondylar muscles, at a moderate thermal unit (depending on the patient's feedback on the perception of moderate heating), while the resistive electrode (5 minutes) and those specific to Indiba Fascia technology (10 minutes) are used in the area of the lateral epicondyle, at a minimal, subthermal unit, specific to the acute inflammatory stage. Indiba systems generate an electromagnetic wave with a frequency of 448 kHz and determine a bio-stimulation and/or thermal effect with an important role in increasing the body's self-healing capacity (Fig. 1).

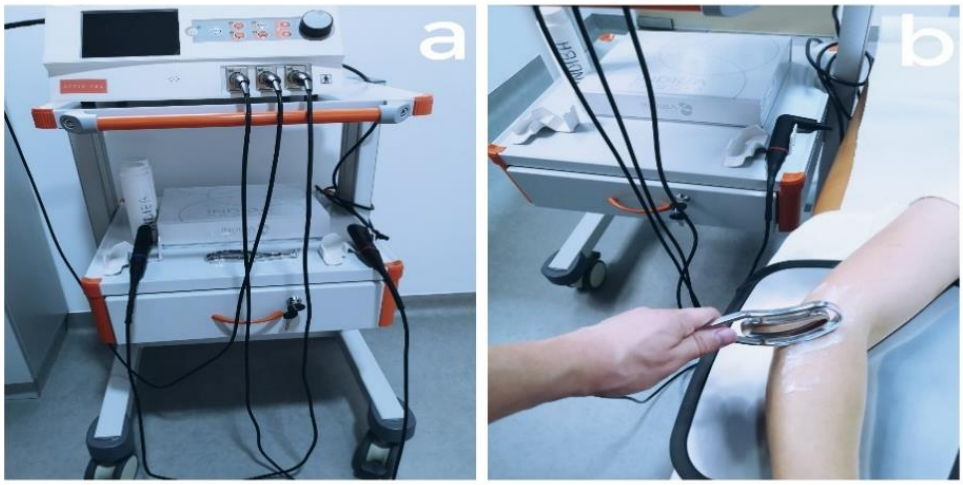

Fig. 1a. The device of Indiba Activ 701
Fig. 1b. The application of Indiba Fascia using IASTM electrodes

To date, the following have been demonstrated: the positive effect in increasing deep blood flow [13]; the ability to stimulate stem cell proliferation and differentiation [14]; induction and support of thermal adaptations of skin tissue that reflect an efficiency of cellular metabolism and deep circulation [15]; producing significant improvements in pain and disability in acute lateral epicondylitis, observed in a case study and without using Indiba Fascia technology [9]; beneficial effects in the treatment of osteoarthritis of the knee [16].

The Visual Analogue Pain Scale (VAS) and the Patient-Rated Tennis Elbow Evaluation Questionnaire (PRTEE) were used to monitor the evolution of the research subjects. Subjects indicated through VAS the intensity of pain, which ranged from 0 (no pain) to 10 (unbearable pain). The PRTEE questionnaire provides a number of specific indicators to highlight pain and functionality before and after two weeks of early treatment of acute lateral epicondylitis.

Statistical data were processed using the One-Sample T Test from the SPSS Statistics Data Editor program.

Results

The results are presented and interpreted according to the tables and graphical representations below. Table 1 presents the main features of the research subjects, with the following measurements: age, gender, weight and history of symptoms. Table 2 and Figure 2 demonstrate

the statistical representation of the Visual Analog Scale values according to the baseline and after two weeks evaluations. PRTEE Questionnaire is another important indicator of the research, Table 3 and Figure 3 showing the statistical representation of the results after the baseline and after two weeks completions.

Table 1. Presentation of the subjects

Measures	Group IA (n=5)	Group IF (n=5)
Mean age (years)	22.8±2.86 (19-26)	21±6.20 (17-32)
Gender (M/F)	2/3	3/2
Mean weight (kg)	62±8.15 (56-76)	67.60±4.77 (62-74)
Mean history of symptoms (weeks)	4.62 (1-12)	4.22 (1-12)

Table 2. Statistical representation of VAS values (mean, standard deviation and p-value)

	Group IA	Group IF	p-value (between E1 and E2)	p-value (between groups)
E1 (baseline)	6.8±0.83	7±0.70	<0.001	0.139
E2 (after two weeks)	4.4±0.54	3±0.70		

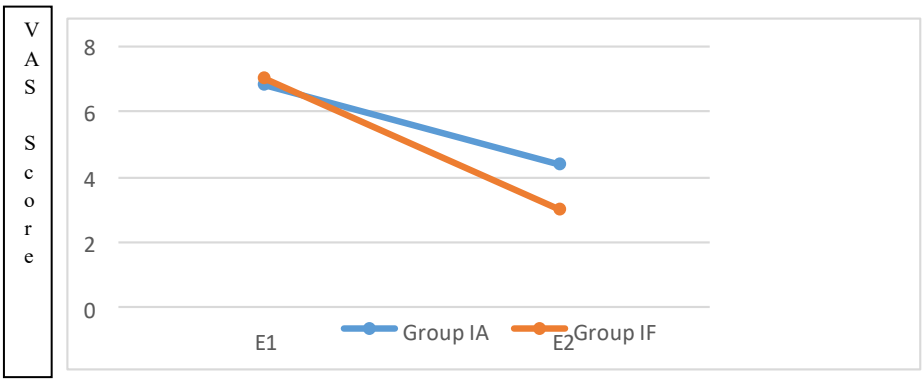

Fig. 2. Graphical representation of the mean values of the VAS score

Table 3. Statistical representation of PRTEE Questionnaire (mean, standard deviation and p-value)

	Group IA	Group IF	p-value (between E1 and E2)	p-value (between groups)
E1 (baseline)	72.2±10.3	66±5.7	< 0.001	0.139
E2 (after two weeks)	48.4±9.31	40.2±11.09		

Fig. 3. Graphical representation of the mean values of the PRTEE Questionnaire results

Discussions

Table 1 contains the presentation of the research subjects and a series of information about them regarding the age, gender, weight and history of the symptoms. The research subjects are between 17 and 32 years old and weight between 62 and 74 kg (the average age of subjects in group IA and IF is quite close, but the average weight indicates a difference of about 5 kg in favor of the IF group). For most subjects (both groups), the onset of specific symptoms began approximately 4 weeks before the initiation of the recovery program.

The data contained in Table 2 and Fig. 2 demonstrate a decrease in pain symptoms for both groups of subjects, according to the Visual Analogue Pain Scale ($p<0.001$), Group IF shows mean VAS values reduced to 3±0.70 after two weeks, compared with 7±0.70, following the initial assessment. A slightly higher trend of improvement in group IF results (based on the use of Indiba Fascia technology and manual therapy), compared to group IA (based on classic Indiba Activ technology), the differences not being statistically significant (the p-value between groups being 0.139).

Table 3 and Fig. 3. confirm the improvements of the subjects according to the both scales (pain and function) during usual and specific activities. Statistical representation of PRTEE Questionnaire shows a slightly better improvement for IF group, getting 40.2 points at the final assessment. The decline in the PRTEE questionnaire score demonstrates the effectiveness of Indiba Activ and Indiba Fascia technology, the difference between the two groups being quite minimal (8.2 points).

Early management of lateral epicondylitis can reduce symptoms and contribute as a fundamental active part to the prevention of specific complications. Both treatments proved effective, the difference in pain intensity on the VAS scale between the two groups in E2 being 1.4 in favor of the IF group.

The results can be compared with the VAS score values obtained in other recent articles that include comparisons of different therapies or meta-analyzes. A very limited number of studies have followed the treatment of lateral epicondylitis using the Indiba device by now. There is a recent case study in a single patient with acute lateral epicondylitis that demonstrates the positive effects of Indiba therapy, but without the use of Indiba Fascia equipment [9]. A more detailed research on PubMed shows positive evidence of the use of other therapeutic methods in the short and medium term for the recovery of the acute lateral epicondylitis. Similarly, other evaluations presented after 2 weeks of treatments includes good clinical results after the use of dry needling, manual therapy, exercise therapy, extracorporeal shockwave therapy (ESWT), etc. The mean of the VAS score is quite comparable for most of the studies, our results showing slightly more significant results than in other researches [6, 17, 18, 19].

Conclusions

As pain relief and important improvement in function have been observed with Indiba Activ and Indiba Fascia technology, their use may also be recommended with the initiation of the exercise program specific to complete functional recovery. Thus, the contribution to the increase of grip strength can be tested in the medium term, a specific indicator in the evaluation of the potential of tennis players to continue their activity.

The results obtained can promote Indiba technology (with the advanced use of Indiba Fascia treatment tools) as a true solution with anti-inflammatory role on soft tissues in the recovery of sports injuries.

There is a wide range of non-surgical treatment methods for lateral epicondylitis. Further research may present comparisons between the evolution of the patients from this study and others who benefit from different or combined treatment methods.

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Review Study on Fascial Therapy in Low Back Pain

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Abstract

Introduction

Low back pain is a major problem worldwide, affecting about 70% of the population in a lifetime and about 15% of the population at some point. Many patients with chronic benign pain or patients with "non-specific" back pain may suffer from painful myofascial syndrome because this condition is under-diagnosed.

Objectives

This study aims to discover the existence of a link between the fascia in the back and low back pain and if fascial therapy is good or not in treating these pains.

Material and method

The present study analyzed articles from the following databases: google academic, science direct, pubmed and research gate, articles, published between 2011 and 2019.

Results

Following the 17 articles analyzed, the connection between fascia and lumbar pain was highlighted, but especially the importance of fascial therapy in treating people suffering from low back pain. Only one study showed that IASTM (Instrument Assisted Soft Tissue Mobilization)-assisted therapy did not show statistically significant changes.

Conclusions

After the evaluations performed, it was shown that fascial therapy has positive effects in treating pain, degree of disability, but also in increasing the range of motion in patients suffering from low back pain.

Keywords: low back pain, fascial therapy, fascia, cupping

Introduction

Low back pain is a major problem worldwide, affecting about 70% of the population over a lifetime and about 15% of the population at some point. The workplace has a high impact on back pain, with approximately 1% of the adult population in the United States having a permanent back problem and another 1% of the population having a temporary back disability.

The recurrence rate in low back pain is high, about 70% to 80% [1]. The prevalence of chronic benign back pain, in which the exact cause is not known, is estimated at 15%. There are

no exact figures to describe the prevalence and incidence of low back pain in which the main side is musculature, but muscle damage (the presence of myofascial comorbid syndrome in the lumbar, abdominal, pelvic and hip region) is present in all cases of low back pain. Many patients with chronic benign pain or patients with "non-specific" back pain may suffer from painful myofascial syndrome because this condition is under-diagnosed [1, 2].

Schleip R. and Findley T, in 2007 presented the first definition of fascia: "The fascia is a soft tissue element that is part of the connective tissue system and penetrates the human body, forming, throughout the body, a continuous three-dimensional matrix. It penetrates and surrounds all muscles, organs, bones, nerves and blood vessels, creating a unique environment for the body's systems to function" [3].

Carla Stecco presented in 2015 a new medical definition of fascia: "The fascia is a sheath, a membrane or any other agglomeration of connective tissue, which can be dissected, which forms inside the human body, having the role of choosing, covering and separate the muscles and internal organs" [3].

The two definitions, as noted, are different and even target the different interest of several groups of researchers on fascia. The fascia is both tissue and system. At the same time, it has certain properties and functions. Which means that the two definitions complement each other, even if they come from two different conceptions. Therefore, each definition that has emerged over time does nothing but complete the understanding of the term fascia.

For the treatment of the fascia there are several methods by which the fascia can be manipulated such as: IASTM (Instrument Assisted Soft Tissue Mobilization), Cupping (Suction Therapy), Medical Flossing, Foam Rolling Technique.

Objectives

Through this study I aim to find out if there is a link between the fascia in the back and low back pain and whether fascial therapy is beneficial or not in treating these pains. For this I will gather several articles on this topic in which various researchers have studied this phenomenon and have reached a conclusion on the effects of fascial therapy in back pain.

Material and method

The present study analyzed articles from the following databases: google academic, science direct, pubmed and research gate. These articles were published in the period 2011-2019, and were selected according to the following criteria: to be written in English, to follow the link between fascia and back pain, to use fascial therapy techniques in low back pain. We excluded from the study articles that used fascial therapy in an area other than the lumbar area, articles that appeared before 2010, articles that I could not download to read them in full, articles that had animal subjects. Initially, I selected a total of 53 articles, of which, following the use of exclusion criteria, I selected and analise a number of 17 articles that I will present.

Results and discussions

Following the analysis of the 17 articles, the connection between fascia and lumbar pain was highlighted, but especially the importance of fascial therapy in treating people suffering from low back pain.

Of these articles, Casato G. in 2019, Schilder in 2013 and Langevin in 2011 focused only on the link between fascia and low back pain and showed that in people suffering from this condition, the thoracolumbar fascia has a light structure, it is modified and is tensed compared to healthy people [4, 5]. Casato G., Stecco C., and Busin R., in 2019 conducted a study on the link between low back pain and changes that may occur in the fascia, on a group of 5 subjects, 4 women and a man, aged between 40 and 62 years old. The inclusion criterion was the presence of low back pain. The exclusion criteria in this study were: low back pain of known cause, severe pathologies in the spine, surgery in the spine, affected nerve root, cardiorespiratory disorders, pregnancy. The treatment consisted in manipulating the tensest fascia, with the help of the therapist's elbow or fingers, with varying pressure depending on the patient's sensitivity, duration of 2 to 10 minutes. The evaluation focused on: analogue visual scale (VAS), active trunk flexion amplitude (ROM), inverted Schober test and Roland and Morris Disability questionnaire, which were performed before and after each treatment session, 3 and 6 months after intervention. The evaluation performed at 1 month, 3 months and 6 months showed the disappearance of symptoms and disability in 3 cases, in 1 subject no change was observed and in one subject the symptoms returned [4]. In 2013 Schilder published a study in which he aimed to highlight the role of the thoracolumbar fascia as a potential source of low back pain (LBP), which administered under ultrasound guidance to 12 healthy subjects' injections of isotonic saline (0.9%) or hypertonic saline (5.8%) in the erector spinae muscle and thoracolumbar fascia.

Subjects were asked to assess pain intensity, duration, quality, and irradiation. Hypertonic saline injections applied in the fascia had a significantly higher result in terms of pain intensity over time, compared to muscle injections ($P<0.001$). Pain irradiation and pain felt after the fascia injection exceeded those performed in the muscles ($P<0.01$). Descriptors of pain after fascia injection (burning and stinging) suggest innervation of both nociceptors with A and C fibers, which proves that the thoracolumbar fascia is the deep tissue of the back that is most sensitive to chemical stimulation, thus becoming the main element that contributes to nonspecific LBP, but not to localized pressure hyperalgesia [5].

Harper B., Steinbeck L., Aron A. in 2019 conducted a study comparing and evaluating the effects of fascial manipulation versus standard physical therapy (SPT) in patients with low back pain (LBP), in diagnosed cases. 102 subjects participated, which were divided into 2 groups, the FM (fascial manipulation) group which is treated by fascia manipulation and the SPT group which is treated by standard therapy. Inclusion criteria were low back pain with associated diagnosis, age between 18 and 70 years; and those of exclusion were: fever, severe immunosuppression, skin lesion in the lumbar region, thrombophlebitis or thrombosis, lymphedema (stage 3 or more), cancer, recent trauma, blood circulation disorders, corticosteroid or opioid therapy. The first group was subjected only to fascia manipulation therapy, whereas the second group was treated by standard therapy, being subjected to the following procedures: manual therapy (gradual mobilization, traction, manipulation and/or mobilization of soft tissues), coordination exercises of the torso/strengthening/endurance, balance exercises, neurodynamic exercises, increasing overall body strength and progressive aerobic exercises. Following consent, subjects underwent objective data measurements that included the Numerical Pain Rate Scale (NPRS), the Global Rating of Chance (GROC), and the Modified Oswestry Disability Index (ODI). The ODI score finally decreased by at least 1 category in 48.9% of the cases in group 2, while in 36.2% of the cases no change was observed. Within the group treated with fascial manipulation, in 60% of cases a decrease was observed and 38% did not change their category.

When the GROC values were analyzed, 44.7% of the participants in the SPT group had values at least 5 higher at discharge, compared to 92% of the participants in the FM group (p=0.0001).

Overall, 94% of subjects in the FM group decreased their NPRS by at least 2 points compared to 57.4% in the SPT group (p=0.0001) [6]. Authors Branchini M., at. all conducted a study in 2016 to compare the effectiveness of facial manipulation associated with a physiotherapy program following the instructions for CALBP (cronic aspecific low back pain) compared to a physiotherapy program alone. The study group consisted of 24 subjects, who were randomized into two groups, both undergoing eight treatment sessions for 4 weeks. The inclusion criteria were: diagnosis in chronic low back pain, chronic lumbosciatica pain, age between 20 and 60 years; and exclusion criteria: spinal nerve damage, continuous pharmacological treatment (non-steroidal) with anti-inflammatory drugs, corticosteroids, antidepressants, anxiolytics or neuroleptics, structurally observed lesions imaged, vascular lesions, rheumatological pathologies, previous operations. Fascial manipulation is performed by applying a deep friction on the areas where the fascia has been shown to be rigid on clinical palpation. The measurements were performed at the time of evaluation, at the end of the 8 treatment sessions, one month and 3 months after the cessation of treatment. Pain was measured with visual analog scale (VAS) and brief pain inventory (BPI), functionality with the Rolland-Morris Disability Questionnaire (RMDQ), patient status with the short form health survey (SF-36). The mean clinically important difference (MCID) was also measured. As a result, it was observed that patients receiving fascial manipulation showed statistically significant improvements at the end of treatment sessions in terms of all short-term, short-term (RMDQ, VAS, BPI) and medium-term parameters for VAS and BPI compared to manual therapy [7].

In 2017, Arguisuelas M. and colleagues looked at the differences between fascial therapy and the placebo effect. The study involved 54 subjects with CLBP of non-specific cause. They were randomly divided into 2 groups: the target group (27 subjects) who were treated with fascial therapy and a control group (27 subjects) who were treated with a false fascial therapy. Patients underwent 4 therapy sessions, each lasting 40 minutes. Pain parameters were measured using the McGill questionnaire and the VAS analog visual scale, and the degree of disability was measured using the Roland Morris questionnaire. Subjects who received fascial treatment showed significant improvements when talking about the results obtained by the McGill questionnaire (p=0.011), but no statistically significant improvement was observed in the measurements performed by the VAS scale. From the point of view of disability, through the measurements performed by the Roland Morris questionnaire, a significant decrease was observed in the target group compared to the control group ($p<0.05$). The authors concluded that fascial therapy produced a significant improvement in both pain reduction and disability [8].

From the articles studied, Lee J.H., Fousekis K. and Crothers A.L. performed scientific papers in 2016 using fascia manipulation therapy using IASTM tools. The results of these studies showed that this technique is very beneficial for reducing pain and increasing mobility, with the exception of an article by Crothers A.L. in which no statistically significant changes were observed [9]. One article even compared the IASTM technique with suction cups, with Fousekis concluding that the IASTM technique produced a significantly greater effect ($p<0.05$) in pain reduction and PPT compared to suction cups and the progressive pressure technique [10].

Most studies have been performed by manipulating the fascia with suction cups, this technique obtaining very good results in reducing pain, increasing the degree of functionality and range of motion. Hanan, S. A. and Eman, S. E. conducted a study in 2013 that aimed to evaluate the effectiveness of suction cup therapy (Al-Hijama) on the management of persistent

nonspecific low back pain and client disability. The study was conducted at the Islamic center of Al-Hijama. The study included 30 patients who were diagnosed with low back pain of non-specific cause, with the following inclusion criteria: non-specific low back pain of at least 4 weeks, age between 20 and 60 years; and the following exclusion criteria: vertebral pathology, progressive motor weakness, circulatory disorders, anticoagulant use, pregnancy. The patients underwent a suction treatment session which had the following procedure: the subjects were placed in a prone position, a small incision was made in the painful area of the back, suction cups were applied in that area, being heated initially with flame inside and were applied to the skin, when the air inside the suction cup began to cool, a vacuum was created through which the tissues were pulled inside and blood was drawn out through the incision. The parameters used in this study were the scores obtained by the visual analog scale (VAS), but also by the Oswerty questionnaire. Measurements were performed on subjects 3 weeks after cessation of treatment.

The results of the study suggest that wet suction cup therapy is associated with greater short-term clinical benefits than regular treatments. No adverse effects were reported by subjects after treatment. The results are statistically significant in terms of pain and disability for subjects who used suction cup therapy [11].

Lin M.L. in his 2012 article he demonstrated that even better results are obtained if suction fascial therapy is associated with laser therapy than when using fascial therapy alone [12].

In article published by Griefahn A., a study conducted in 2016, aimed to investigate the effect that Foam Rolling has on increasing the mobility of the thoracolumbar fascia. This randomized trial had as subjects 38 healthy men and women athletes. The inclusion criteria were: age between 18 and 30 years, to do sports at least 2 times a week. The exclusion criteria were: no acute pain in the spine, no musculoskeletal damage in the last 12 months, no treatment with foam rolling in the past. Subjects were randomly assigned to the following groups: target group (FMG), placebo group (PG), and control group (CG). Depending on the assigned group, the subjects underwent Foam Roll exercises, received a pseudo Foam Roll treatment or received no treatment. A total of three measurements were performed. The most important field of research was the mobility of the thoracolumbar fascia, which was determined using a sonographic evaluation. In addition, lumbar flexion and mechanical sensitivity of the paravertebral muscles were determined. After the intervention, the target group showed an average increase of 1.7915 mm for the mobility of the thoracolumbar fascia ($p<0.001$). In contrast, only a mean improvement of 0.1681 mm ($p=0.397$) was shown in the placebo group, while the control group showed a slight improvement of 0.0139 mm ($p=0.861$). However, no significant changes were observed in terms of lumbar flexion and mechanical sensitivity of the treated muscles. Thus, the use of Foam Roll exercises has been shown to significantly improve thoracolumbar fascia mobility in a healthy young population [13].

A study showed that in the case of people who work in the office and suffer from low back pain, better results are obtained if, in addition to fascial therapy, some changes are made regarding the organization of space at work. Balasubramaniam A. in 2014 included in his study a number of 40 subjects who were randomly divided into 2 groups. Both groups were treated with fascial therapy, but group B was suggested changes in the organization of the office in which they work. Pain measurements were performed using the visual analog scale (VAS) and the amplitude of movement using the modified Schober test. The results showed significant differences between the 2 groups. The study concluded that changes in the workplace along with fascial therapy were very effective in improving range of motion and reducing pain [14].

Conclusions

These studies have shown that fascia has structural changes in people with low back pain and that its treatment should be one of the main goals of therapists.

After the evaluations and measurements performed, it was shown that fascial therapy has positive effects in treating pain, degree of disability, but also in increasing the range of motion in patients suffering from low back pain.

Only one study showed that IASTM-assisted therapy did not show statistically significant changes in reduces low back pain.

Considering that, given the relatively small number of studies on this subject, more research should be carried out on this fascial therapy compared to the various therapies on the market in order to find the most effective remedy for treating this condition, namely low back pain- and which affects a very large percentage of the population, causing discomfort and preventing patients from carrying out various activities.

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Rehabilitation of the Patient with Shoulder Hemiarthroplasty

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Abstract

Nowadays, due to the progress of medicine and surgical techniques in the field of orthopedics, the prosthesis of the shoulder following cominutive fractures has become a modern treatment for traumatic injuries of the humeral surgical neck. Although shoulder arthroplasty is less common than in the knee or hip joint, it is just as important in relieving pain, regaining mobility, and restoring upper limb function.

The aim of the paper was to highlight the role of physical therapy in the rehabilitation of the patient with shoulder prosthesis and to emphasize the importance of functional rehabilitation after surgery.

The study included 3 male patients aged between 43 to 50 with severe humeral neck fractures who required shoulder hemiarthroplasty.

We performed joint assessment, muscle testing and pain testing at the beginning of the physical therapy programs, intermediate and at the final of the rehabilitation period. The methods of functional re-education of the affected upper limb consisted in passive mobilizations, active movements, resistive exercises and neuroproprioceptive facilitation techniques, performed in order to regain the ability of the affected limb to move correctly.

By comparing the initial, intermediate and final results obtained from the tests performed, this research demonstrated the effectiveness of the physical therapy programs used in the recovery of patients with shoulder hemiarthroplasty included in the study.

The conclusions of the paper emphasize the need to carry out recovery programs specific to the prosthetic shoulder in accordance with the particularities of each patient, in order to reintegrate them socio-professionally.

Keywords: joint testing, muscle testing, pain assessment, shoulder prosthesis

Introduction

Shoulder arthroplasty is currently a method of treating all forms of osteoarthritis, leading to pain relief, and if pre- and post-operative anatomical and biomechanical aspects are considered, it can provide improved to near normal shoulder function [1].

At the beginning, this surgery was addressed to patients with severe fractures of the upper humeral extremity, but over time the surgical indication has expanded for many other types of degenerative pathologies of the shoulder joint.

The proximal humerus fractures represent the seventh most common fracture in adults, its prevalence ranging from 4% to 10% of the number of fractures according to numerous studies conducted in different countries [2].

In patients over 40 years old, there is a linear increase in incidence and only fist and femoral neck fractures are more common in the elderly population (>65 years). The prevalence of humeral neck fractures is higher in older women, occurring more frequently in the winter months [2].

The number of arthroplasties performed on the shoulder has increased significantly in the last decade, with primary surgeries increasing by more than 200% [3-7] and revision procedures by more than 300% [3, 4], with a further increase in interventions, taking into account that the number of primary procedures is increasing, together with an increasingly active patient population [8].

Improved recovery programs determined a better standardization of care for patients with arthroplasty, which has been implemented by national health services, proving that they reduce mortality, length of hospitalization and the need for transfusions [9].

In order to carry out physiotherapy programs, specialists must have a good understanding of the anatomy of the shoulder, being necessary to know the precautions to preserve the structures affected by surgery. The experience of specialists in the use of manual maneuvers and specific mobilizations serve to optimize the recovery process and to minimize the occurrence of risks in shoulder healing. The physiotherapist must efficiently dose the recovery exercises from the passive movement, to the sitting active movement, then to the active exercises and culminating with the resistive ones [10].

In order to prevent shoulder stiffness, early movement and joint mobilization are encouraged to minimize the risk of adhesions between muscle groups. There is currently a significant diversity of post-surgical rehabilitation programs, especially regarding the onset of exercise, effort dosing, timing and magnitude of resistive movements [11].

It is known that physical therapy is a critical part of the post-shoulder hemiarthroplasty recovery period. Even if no formal comparative studies have been performed, the specialized practice shows that the programs structured by the physiotherapist help the patients by guiding them through the different recovery periods and accelerating the rehabilitation process improving their final functional possibilities [12].

Regarding the resumption of sports activity, in a meta-analysis performed in 2017 it was observed that patients can return after an average period of 5.4 months after surgery. Subjects with total shoulder arthroplasty return to sports activity in a percentage of 92.6%, compared to only 71.1% in the case of hemiarthroplasties and 74.9% in the case of reverse shoulder arthroplasty [13]. The same study points out that the resumption of sports activity at the same level was achieved in a number of 270 patients out of 368 (72.3%).

Most studies talk about structuring recovery programs under the guidance and supervision of specialists, but other authors have proposed treatment programs at home and analyzed their effectiveness over a period of 2 years. According to the results obtained, between 70% and 90% of patients maintained optimal mobility of the operated shoulder [14].

Physical therapy in shoulder hemiarthroplasty aims to strengthen surgical treatment in order to determine optimal functional results and return to sports activity where appropriate, without significant restrictions on the level of performance [15].

Material and method

The study was performed on a group of 3 male subjects aged between 43 to 50 years, with shoulder hemiarthroplasty following severe fractures of the humeral neck.

Fig. 1. S houlder-preoperative aspect

Fig. 2. Shoulder-postoperative aspect

The evaluations were performed through joint and manual muscle testining and pain was analyzed subjectively using the Visual Analogue Scale.

The recovery period lasted 4 months, and the means of functional recovery of the affected upper limb consisted of passive and active mobilizations, progressive resistance exercises and proprioceptive neuromuscular facilitation (PNF), performed to regain the ability of correct and coordinated movement of the affected limb.

Physiotherapy was performed in the first phase daily with a duration of 50-60 minutes and involved exercises of passive mobilization of the affected upper limb, active movements on all possible range of motion, pulley exercises, and isometry of the arm and forearm muscles.

After 8 weeks from surgical intervention, the rehabilitation program included stretching exercises, active and active assisted exercises. Also, during this period, patients began progressive resistance exercises, and starting with the tenth week, the frequency of physiotherapy sessions was 3 per week with a duration of 60 minutes.

Neuroproprioceptive facilitation techniques have been used to encourage or enhance motor response to selectively tone in upper limb muscles. For this purpose, we used slow reversal (SR) to increase the muscle tone of the arm and forearm, by performing rhythmic concentric contractions of both agonists and antagonists on the entire amplitude. As the muscle tone improved, we added the slow reversal with opposition (SRO). After each technique, in addition to the necessary break, free active exercises for active rest were performed. Alternative isometry (AIZ) and rhythmic stabilization (RS) were an integral part of functional shoulder re-education exercises.

At this stage in which progressive resistance exercises and proprioceptive neuromuscular facilitation techniques were introduced, the physiotherapy sessions were concluded by active stretching exercises consisting in prolonged stretching of the arm muscles, but also by passive stretching performed by the physiotherapist to maintain mobility, and to relax the upper limb muscles completely.

Results

In order to highlight the results obtained in the research we performed the graphic interpretation of the results obtained by the 3 patients following the initial, intermediate and final evaluations, presenting in the graphs that follow the values of the arithmetic mean.

In figure 3 and figure 4 we present the average values obtained by the 3 patients in the active joint testing (Fig. 3), and the average values of the muscle testing (Fig. 4) for the initial, intermediate and final evaluation.

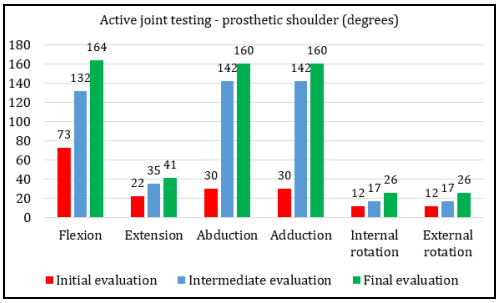

Fig. 3. Active mobility of prosthetic shoulder

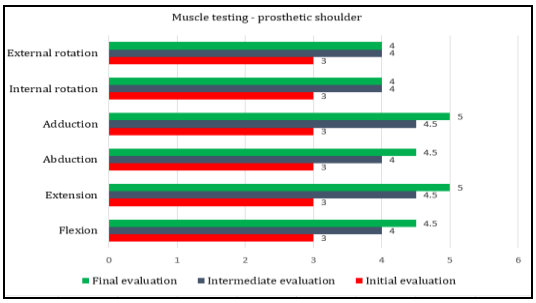

Fig. 4. Muscle testing for prosthetic shoulder

Figure 3 highlight that the mobility of the shoulder with hemiarthroplasty has improved considerably following the physiotherapy programs, the average values of the 3 patients reaching almost normal at the final evaluation, except for internal and external rotational movements.

According to figure 4, the strength of the prosthetic shoulder muscles registered a favorable evolution from the initial evaluation to the final evaluation. Thus, the extensor and adductor muscles reached the normal value rated with 5. The flexor and abductor muscles recorded a value of 4.5, which translates into a very good force, and the internal and external rotational movements recorded a final average value of 4 which it translates into good strength.

Figure 5 shows the average values of the subjective assessment of pain during movement, using the Analog Visual Scale.

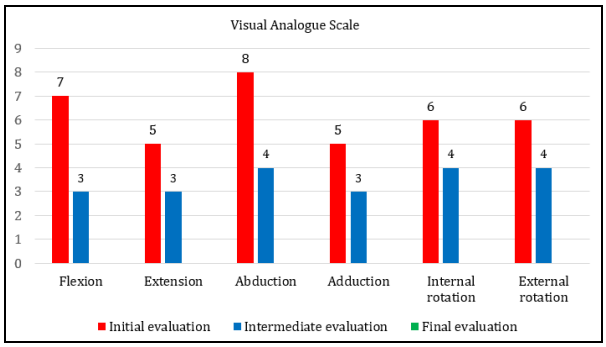

Fig. 5. Visual Analogue Scale for prosthetic shoulder

As can be seen in Figure 5, the pain at the initial assessment was significant, with the highest intensity being on the abduction movement (value 8 which means severe pain) and flexion (value 7, which means constant pain on which you are focused on). It should be noted that at the end of the 4 months of medical recovery the pain disappeared reaching values of 0 on the Visual Analogue Scale for all shoulder movements.

Discussions

Research performed after shoulder hemiarthroplasty shows that recovery through physical therapy is imperative for the functional re-education of the affected upper limb.

The possibilities of maximum recovery of shoulder function after partial prosthesis are closely related to the quality of the surgical process and the early and appropriate onset of physiotherapy protocols, long enough to achieve recovery and also patient's motivation in order to keep them in the rehabilitation process [16].

Due to the fact that the recovery period after partial prosthesis of the shoulder is long, boredom and lack of desire of the patient to continue the rehabilitation until the optimal recovery of the functionality of the shoulder and upper limb may occur.

Among the reasons listed by specialists regarding postoperative failure in the case of partial shoulder prosthesis are the technical problems encountered during the operation, the movement of the great trochanter, the late rupture of the rotator cuff, and poor patient motivation [17].

From the results obtained on the 3 patients, we can see that the physiotherapy treatment is effective and leads to relief and disappearance of pain, regaining joint mobility, re-education of muscle strength and joint stability, which ultimately give individuals the opportunity to perform daily activities and ensures their socio-professional reintegration.

The functional results are also conditioned by the healing quality of the lesser and greater trochanter of the humerus [18].

Following the research, we found that the main objective in the case of shoulder hemiarthroplasty is to restore mobility as soon as possible postoperatively. Passive mobilizations are an essential element, as in the case of the frozen shoulder. After regaining joint mobility, recovery focuses on the slow and progressive recovery of muscle strength, followed by re-education of movement coordination and increased muscle endurance, a goal that can be achieved through active resistive exercises and proprioceptive neuromuscular facilitation techniques.

Gentle and frequent exercises have proven to be much more effective than irregular strenuous efforts, the goal being to make steady progress in performing daily activities, with no pain episodes due to excessive movement.

In order to move from one recovery stage to another, we made sure that the movements could be performed comfortably and with the necessary number of repetitions, to avoid overloading or ineffectiveness of the exercises.

Particular attention was also paid to the re-education of the shoulder stability, being known that it is more predisposed to dislocation because it does not have a good joint congruence [19].

For socio-professional reintegration as soon as possible, it is necessary that the exercises be performed at home as highlighted by other research on recovery after shoulder arthroplasty [14].

Conclusions

This research emphasizes the need to perform individualized physiotherapy programs specific to the prosthetic shoulder in order to socio-professional reintegration of patients.

Rehabilitation after shoulder hemiarthroplasty must take into account the specific recovery stages and include exercises adapted to the patient's motor potential, without overloads that can slow down the recovery process.

Re-education of muscle strength, joint stability and coordination are important objectives of functional recovery, but they are achieved only after joint mobility has been regained.

In conclusion, we can state that the physiotherapy programs established early, taking into account the functional status of the patient, correctly staged, lead to the recovery of the functionality of the prosthetic shoulder and the affected upper limb.

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The Improvement in The Parameters of Hikite Technique by Applying Sports Massage, Trigger Points Therapy and Stretching

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Abstract

Karate is one of the most popular martial arts. Shotokan is considered to be the oldest karate style and it was made popular by Gichin Funakoshi 1922, whom is considered to be the modern founder of this branch.

Aim

The objectives of the presented study are: diminishing the angles between the trunk and the arm during the execution of the Hikite technique, raising up the articular amplitudes of shoulder extension, external rotation, depression and increasing the speed of execution of the technique.

Methods

For this study, there were selected a number of 5 karate Shotokan practitioners with ages between 16 and 18 years old. For a period of 2 months, twice a week, the athletes were subjected to sessions of sports massage and Trigger Points Therapy before the beginning of the training session. They have also done static active stretching exercises at the beginning and ending of the training session. The measurements of the progress were made with the goniometer, the ruler and the chronometer.

Results

The result shows a progress of all the elements that were tracked: the shoulder extension, external rotation, depression and the speed of execution evolved in a positive way, meaning that the performance of the technique was influenced.

Conclusion

The conclusion regarding the period of the study is that due to the applying of sports massage, Trigger Points Therapy and active static stretching the Hikite technique was enhanced, the objectives of the study being achieved.

Keywords: sports massage, Trigger Points Therapy, stretching, muscular contractures, Karate Shotokan

Introduction

Karate is a Japanese martial art that has become very popular. This word means “empty hand” being formed by the words “kara” = from/empty and “you” = hand. It describes the use of blows, attacks, and defense or blocking techniques without the use of weapons.

Shotokan is part of the karate styles, being among the oldest. This style flourished on the island of Okinawa in Japan more than 400 years ago. Gichin Funakoshi is considered to be the founder of modern Shotokan karate, refining this style and making it public in 1922. [1]

Massage has been used as a therapeutic method in most cultures and civilizations. It has a long tradition of use in sports. In the literature that focuses on the science of sports, are among the benefits of massage and improving the elasticity of muscle tendons, connective tissue and muscle relaxation. Because it is known that massage positively influences the increase in blood flow to the muscles and improves muscle spasticity, it is assumed that massage facilitates the recovery of muscles after intense exercise.

Muscle recovery and recovery from fatigue are partially influenced and even delayed by the accumulation of lactic acid. Being increased blood flow through massage, it implicitly facilitates the elimination of lactic acid, given that blood flow is considered a key element in removing acid by facilitating the process of oxidation and diffusion of muscle tissue. [2]

Sports massage uses techniques such as: effleurage, petrisage, friction, tappotament, traction.

These are classic movements that have been adapted to sports massage to promote the prevention of injuries by restoring to optimal body parameters following physical effort, training or competitions. This strategy is used in the treatment of sports injuries. [3]

High-intensity eccentric contractions cause a decrease in muscle performance and a delayed onset of muscle pain, these are delayed onset muscle soreness (DOMS). This results in muscle damage that is associated with muscle shortening, inflammation and loss of muscle strength.

Delayed onset muscle pain (DOMS) results from high-intensity exercise involving eccentric muscle contraction. [4]

Trigger points occur due to muscle overload, prolonged posture, sudden muscle contraction, muscle trauma, repetitive movements and even emotional stress. [5]

A Trigger Point (MTrP = “myofascial Trigger point”) is a discrete, hyper-irritable nodule in a wide band of skeletal muscle that is palpable and sensitive during physical examination. An active MTrP is clinically associated with spontaneous pain in the immediate surrounding tissue and/or at distant foci, in specific pain patterns. Strong digital pressure on an active MTrP aggravates the patient’s pain and mimics the patient’s familiar experience of pain. MTrPs can also be classified as latent, in which case MTrP is physically present but not associated with a spontaneous onset of pain. However, the pressure on the latent MTrP causes local pain at the node site. Both latent and active MTrPs can be associated with muscle dysfunction and limited range of motion. [6]

Regular stretching is important in preventing injuries, minimizing muscle fatigue and increasing the efficiency of physical activity. Increased joint flexibility improves muscle elasticity and range of motion. To be effective, stretching must be performed by athletes both as part of the warm-up and at the end of a workout. Active stretching is when the athlete is the one who moves his segment and keeps it stretched. Passive stretching is when another person moves the athlete’s segments in the stretch position and maintains it for a certain period of time. [7]

Stretching has many benefits for a karateka. An obvious benefit of heating is that it reduces the risk of injury. Improving muscle tension and increasing elasticity brought by stretching reduce the risk of injury or joint dislocation. The muscle relaxation that comes with it also causes mental relaxation. This kind of relaxation determines a body awareness that is vital for a diligent karateka.

Stretching is only beneficial if done properly. Karate practitioners need to incorporate stretching into their daily routines for proper results. It must be done slowly and gradually. [8]

Hikite is a basic technique used in most martial arts, such as Karate, Judo and Jiu Jitsu. The hand retracts at the level of the hip or above it during a blow, the other hand performs the attack or defense. Both limbs move in opposite directions during the execution of the technique.

Gichin Funakoshi, in his book "Karate Jutsu" defines Hikite as the hand that grabs the opponent's attacking hand and pulls it by rotating it and throwing off the opponent's stability.

Another theory is that the body works around a central pivot. Thus, the withdrawing hand serves to counterbalance the main tarpaulin. The faster the Hikite technique, the more you can see an increase in the speed and power of the main technique. [9]

Purpose and Objectives

The aim of the paper is to apply sports massage techniques, Trigger Poins therapy and stretching to karate athletes to improve the performance and efficiency of the technique.

Research objectives:

1. Monitoring the good functionality of the myoarthrokinetic apparatus by applying sports massage procedures, Trigger Points therapy and static active stretching;
2. Decreasing the angle between the trunk and the arm during the execution of the Hikite technique by increasing the amplitude of the external rotational movement of the scapulohumeral joint;
3. Increasing the amplitude of the extension movement at the level of the scapulo-humeral joint;
4. Increasing the speed of execution of the technique;
5. Keeping the shoulder lowered during the execution of the technique;

Methodology

Participants

A number of 5 athletes aged between 16 and 18 participated in this research, with an average age of 17 years. The athletes in the study participated in national competitions but also in a series of European championships and also did not show significant injuries that would affect their long-term performance during training or competitions.

Procedures applied

Sports massage

For starters, the smoothing of the back region was done with the whole palm by sliding movements from the cervical area to the hips, including the sides of the back. Then follow frictional movements focused on the cervical and thoracic area, the frictions become deeper using especially the thumbs and the tenor eminence.

The friction and smoothing movements are performed circularly, longitudinally and transversely. These frictional movements are combined with kneading on the upper trapezius (from the cervical area to the shoulders), the middle trapezius (from the thoracic spine to the shoulders) and the lower trapezius (upward movements from the thorax on the sides to the shoulders). On the area between the shoulder blades (along the muscle fibers of the rhomboids) work more deeply with the knots of the fingers with longitudinal and circular movements. For longer movements of the spinal erector muscle, apply friction to the forearm, knotted fingers or the entire palm.

Trigger Points Therapy

After applying the sports massage, the back is palpated to identify the Trigger points. Trigger points are dense knots, felt by palpation on which a few frictional movements are applied along the length of the muscle fibers for a better delimitation of the painful point followed by ischemic pressure. The pressure is applied directly to the point with the thumb, fingers, knuckles of the fingers or elbow, being maintained for a minimum of 15 seconds, a maximum of one minute, until a slight relaxation is felt or until the subject feels a decrease in pain intensity, the pressure applied remaining constant and unchanging. This process is resumed, and can be applied a maximum of 3 consecutive times on the affected area. All Trigger bridges detected at the level of the muscles that perform the Hikite movement are targeted.

Static active stretching exercises

The exercises were recommended to increase the elasticity of the affected muscle groups (trapezius muscles, posterior deltoid, rhomboids, supraspinatus, infraspinatus, subscapularis, latissimus) and to increase the amplitude of movements at the scapulohumeral joint. These were done both at the beginning of the training and at the end.

Research methods

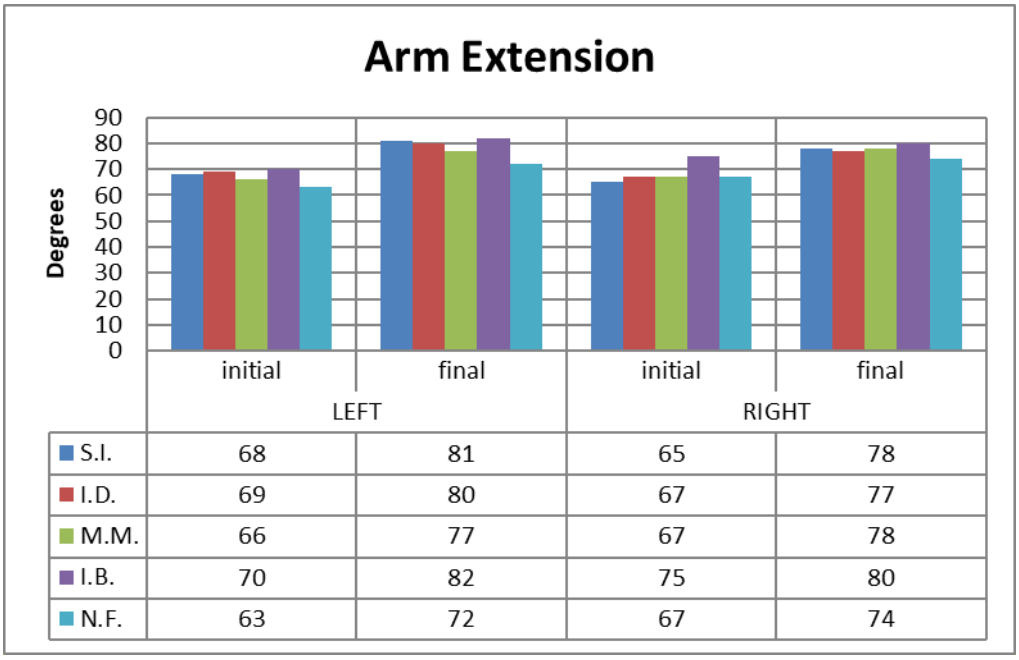
As research methods, we used the shoulder joint balance by measuring the amplitude of flexion movements, external rotation, shoulder lowering and timing of the execution time of the technique.

The goniometer was used to achieve the joint range of motion. At the flexion movement, the goniometer is positioned on the mid-axillary line of the subject at the level of the skin projection of the humeral head, and the mobile arm is positioned on the midline of the lateral face of the subject's arm. The external rotational movement of the shoulder is measured by positioning the subject in supine position, his arm in abduction of 90º, the elbow flexed at 90º, the goniometer axis at the olecranon, the fixed arm of the goniometer is perpendicular to the ground, and the mobile arm is positioned on the midline. lateral face of the forearm. To measure the descent of the shoulder, a ruler positioned parallel to the ground passing through the projection of the acromion and the sternoclavicular articulation and another ruler placed perpendicular to the previous one, located below it and measuring the descent of the acromion, are used.

The tests for the initial measurements of the athletes were performed before the application of the procedures, the calendar data varying for each athlete because the study took place over a period of one year (2019-2020). About a month after the initial testing, we performed the intermediate amplitude measurement, and another month after that, the final measurement will take place to observe the progress of the athletes. The time interval between the initial and the final test is two months for each athlete.

Results

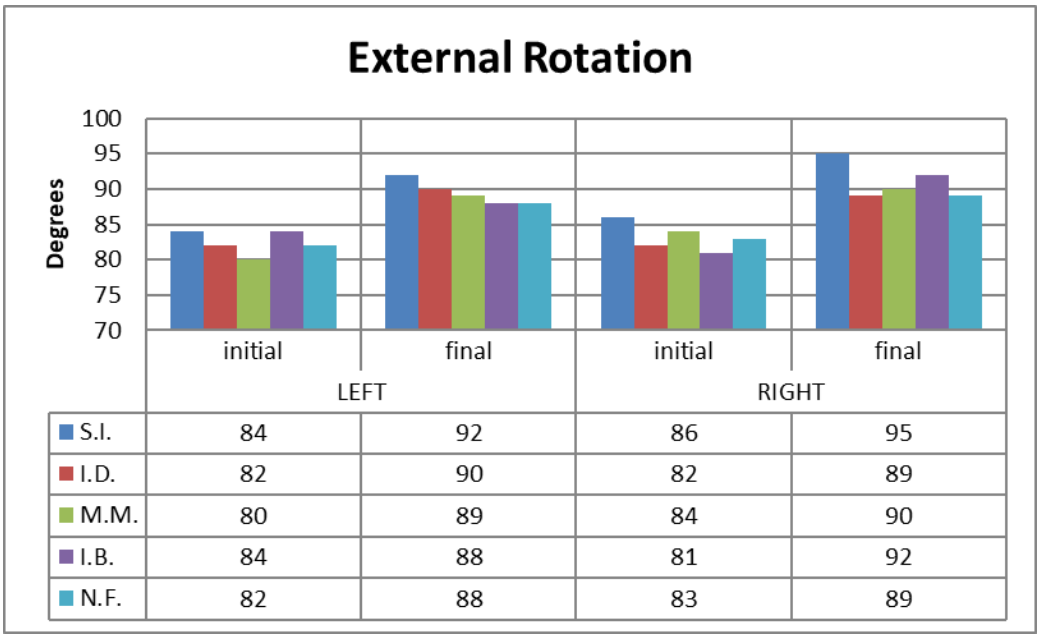
Figure 1 shows how the degree of amplitude of the shoulder extension increased in all subjects as noted, this being one of the objectives pursued. In this way, an aspect of the execution of the Hikite technique has been improved.



	LEFT initial	LEFT final	RIGHT initial	RIGHT final
S.I.	68	81	65	78
I.D.	69	80	67	77
M.M.	66	77	67	78
I.B.	70	82	75	80
N.F.	63	72	67	74

Fig. 1. Initial and final values of shoulder extension

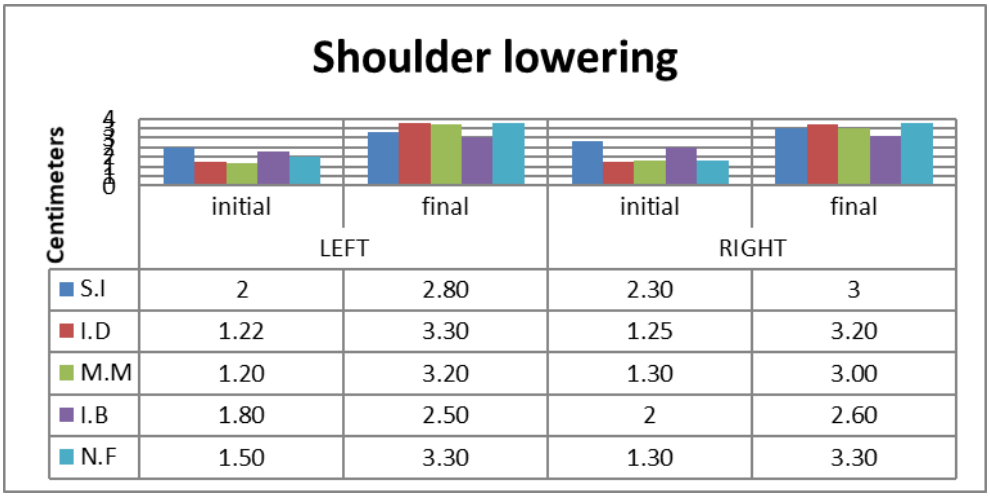
Figure 2 shows how the degree of amplitude of the external rotation of the arms increased in all subjects, this being one of the objectives pursued. In this way, an aspect of the execution of the Hikite technique has been improved.



	LEFT initial	LEFT final	RIGHT initial	RIGHT final
S.I.	84	92	86	95
I.D.	82	90	82	89
M.M.	80	89	84	90
I.B.	84	88	81	92
N.F.	82	88	83	89

Fig. 2. Initial and final values of shoulder external rotation

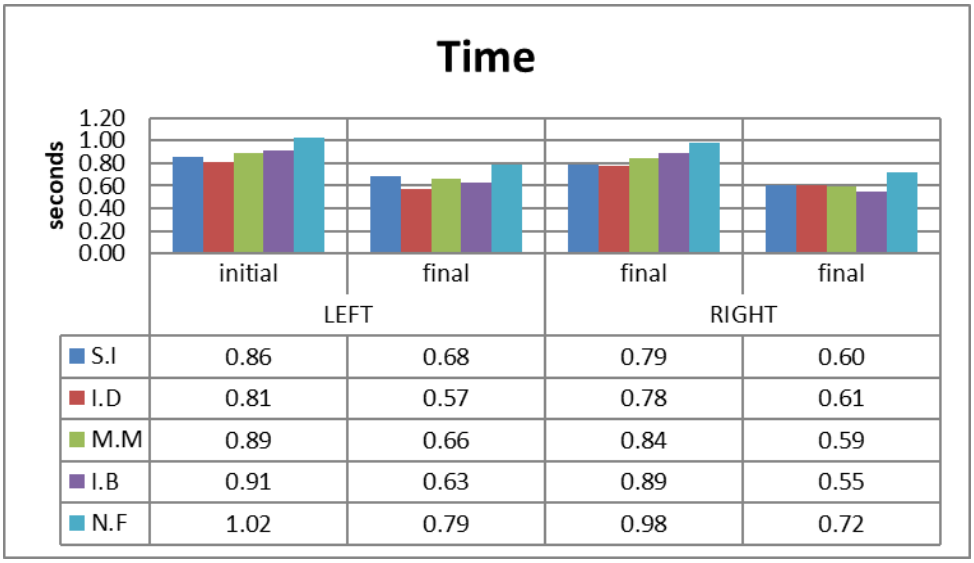
In figure 3, the level of lowering of the shoulders increased in all subjects, this being one of the objectives pursued. In this way, an aspect of the execution of the Hikite technique has been improved.



	LEFT initial	LEFT final	RIGHT initial	RIGHT final
S.I	2	2.80	2.30	3
I.D	1.22	3.30	1.25	3.20
M.M	1.20	3.20	1.30	3.00
I.B	1.80	2.50	2	2.60
N.F	1.50	3.30	1.30	3.30

Fig. 3. Initial and final values of shoulder lowering

Figure 4 shows that the execution time of the technique decreased in all subjects, this being one of the objectives pursued. Thus, the speed of execution of the technique is improved, implicitly, its performance is improved.



	LEFT initial	LEFT final	RIGHT final	RIGHT final
S.I	0.86	0.68	0.79	0.60
I.D	0.81	0.57	0.78	0.61
M.M	0.89	0.66	0.84	0.59
I.B	0.91	0.63	0.89	0.55
N.F	1.02	0.79	0.98	0.72

Fig. 4. Graphical representation of the initial and final values of the execution time of the technique

Discutions

Sports massage is a method that helps the competition preparing for an athlete, being an instrument of enhancement of the athletic performance, a facilitatory treatment in the recovery from physical effort or competitions and a manual therapeutic intervention for musculo-skeletal injury. [10] Beyleroglu M. presented the effects of applying sports massage before training and competitions to boxers, observing faster recovery and diminished fatigue at the superior segments of the boxers [11]. For the 5 karateka athletes similar results were noticed, the scapulohumeral flexibility being enhanced, this inducing a better and more correct execution of the studied technique.

Weerapong P. proved the effects of massage at a physiological, neurological and psychological level on 30 dancers, enuanciating the uprising growth of muscular tendons compliance and the improved amplitudes of articular movement, due to the application of massage. [12] Like so, this paper highlights the increased performance of the execution of the Hikite technique following the applied procedures of sports massage and Trigger Point therapy, to the athletes that participated in the study, reducing muscular contractures, which resulted in the growth of movement amplitudes and inproved execution time.

The study realised by Boguszewski D. shows that martial arts practicants (51 judo practicant, 34 aikido practicants and 30 taekwando practicants) choose as a training performance facilitatating therapy stretching movements combined associated with different massage techniques. All theese techniques and methods, applied to the athletes, lead to muscular compliance growth, reduced post-effort muscular fatigue and thus improving sports performance, fact also proven with the analised karateka athletes. [13] In this paper, stretching proved to be a method through which the athletes accomplished muscular relaxation, obtaining an improved execution of the Hikite technique. Also, during the research, the athletes did not encounter injury while trainning or cometing, stretching being a possible favoring factor.

Conclusions

The conclusions of this paper are positive. The data counted after the study period demonstrated the progress of the monitored parameters.

1. The research hypothesis was confirmed.
2. The application of sports massage improved the intensity of muscle pain accused by the subjects.
3. Trigger Points therapy has relaxed the muscles that limit the performance of the technique, which requires the muscles to be as intact as possible in order to perform a correct technique. Thus, the technique could be performed without muscle pain and without limitation.
4. The stretching performed by the athletes both at the beginning of the training and at the end of it, led to neuromuscular relaxation, which facilitated the increase of the amplitudes of the joint movements necessary in performing the technique.
5. Analyzing the average of the values recorded in the athletes studied, we notice: an improvement in the execution time of the Hikite technique by 0.23 “for the left arm and 0.25” for the right arm, an increase in the extension of the scapulo-humeral joint by 11, 2º for the left arm and 9.2º for the right arm, an increase in the amplitude of the external rotation of the shoulder by 7º for the left arm and 7.8º for the right arm and an increase in the level of lowering of the joint by 1.32cm for the left arm and 1, 23cm for the right arm.

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The Role of Physiotherapy in Posttraumatic Elbow Recovery

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Abstract

Introduction

Elbow fractures are an increasingly common pathology in recovery practice as a result of technological progress that has led to an increase number of injuries.

The aim of the paper was to highlight the role of physical therapy in post-traumatic elbow rehabilitation and to highlight the need for early joint mobilization.

Material and method

The study included 2 female patients (24 and 36 years old, respectively) with elbow injuries that required surgery to reduce the fracture.

The kinetotherapeutic intervention consisted in passive mobilization of the elbow, along with active exercises to regain mobility and resistive exercises, neuroproprioceptive facilitation techniques and stretching, to recover mobility and muscle strength.

Results

The research results demonstrated the effectiveness of physiotherapy programs used in post-traumatic elbow recovery and the need for early joint mobilization.

The conclusions of the paper emphasize the obligation to perform physiotherapy programs for functional recovery of the elbow, but especially to prevent joint stiffness.

Key words: mobility, stiffness, functionality, rehabilitation

Introduction

The elbow is the intermediate joint of the upper limb, which allows the position of the hand at different points in space and therefore any small functional limitation of this joint can significantly reduce the ability of the hand to achieve its goals [1].

Currently, the specialty literature does not present a concrete guide for rehabilitation of the post-traumatic elbow, the clinical trials and the recovery protocols being vaguely described without the possibility of transposition into practice.

The main objective of post-traumatic elbow surgery is to perform a fixation that ensures the possibility of resuming active movements as soon as possible [2].

From undefined reasons, the elbow joint tends to stiffen (stiffness in flexion-extension, rarely in prone-supination) after a trauma, whether we are talking about a simple contusion, minor trauma, a dislocation, a complete fracture or an incomplete one.

Posttraumatic stiffness of the elbow is a common complication of immobilization in fractures, whether treated conservatively or surgically [3], [4].

Some experts claim that the elbow joint cannot be re-educated, considering post-recovery stiffness, which is often easy to notice. It is also known that more than other joints, the elbow do not tolerate a recovery process which inlcudes a misdirected, brutal or painful approach, a situation that requires a long time to give the patient maximum chances in the recovery process.

Elbow stiffness is characterized by a decrease in range of motion that can interfere with the ability to perform daily activities [5], [6].

Given the fact that the elbow joint is very sensitive, the early initiation of the post-immobilization recovery process is one of the essential conditions which will influence the obtaining of satisfactory values regarding the functionality of the joint.

Physiotherapy, through passive movements, active exercises, stretching and neuroproprioceptive facilitation techniques can help prevent and remove the consequences of immobilization by helping the patient to return to the level of activity before the fracture [7], [8], [9], [10].

By starting early an individualized and well-structured therapeutic program, following an elbow fracture we can prevent joint stiffness, which often hides a number of complications such as: collagen organization following edema between sliding planes, musculotendinous retractions, post-traumatic arthritis, vicious callus, periarticular osteoma, retractile scar. All these complications can be caused by the delay of the recovery process, limiting the mobility of the elbow joint, the recovery process in these cases being much more difficult.

Even if some specialized studies claim that certain physiotheraputic techniques are more effective than others [11], it is certain that all of them highlight the need for rapid mobilization of the posttraumatic elbow.

An effective recovery of the elbow after a trauma is based on communication and collaboration between the therapist and the attending physician. Physiotherapists must take into account the stiffness of the bones, the stability of the ligaments and the condition of the other soft tissues surrounding the joint [12].

The vulnerability of the elbow joint is due to the anatomical complexity in which 3 distinct joints work together functionally, based on distinct active and passive stabilizing elements such as muscles, bone structures and ligaments [13].

Thus, it becomes clear that the timing of recovery sessions is very important and depends on the amount of time that will be allocated to regain joint amplitude, but also the possibility of obtaining the values that the patient had before the trauma.

Where possible the joint is fixed by a posterior splint, which allows the patient to suppress immobilization under controlled conditions and to achieve slight passive elbow mobilizations 3-5 times a day [14].

Along with early mobilization, it is important to know and apply the most appropriate techniques and methods of post-traumatic recovery adapted to each patient, in order to enhance an effective recovery.

Material and method

The study was performed on 2 female patients aged 24 years and 36 years, respectively, with the diagnosis of elbow fracture.

In both cases, the bleeding reduction of the fracture with osteosynthesis materials was practiced, followed by a period of immobilization for 21 days in a plaster splint.

The patients presented to our office after the removal of the immobilization by the orthopedic doctor 21 days postoperatively, who recommended the to begin specific physical therapy programs.

Functional assessment was performed by testing joint mobility using a goniometer, muscle strength through muscle testing and pain with Visual Analog Scale.

The physiotherapy program took place over a period of 12 weeks, in the first 4 the frequency of recovery sessions being 5 per week, later moving to a frequency of 3 sessions per week.

The rehabilitation program consisted in the first phase of passive mobilizations and joint manipulations that represented the main working technique in the first 2 weeks, aiming through them, the recovery of joint mobility. The working technique consisted of gentle mobilizations until the appearance of muscle tension and the limit of painful sensitivity. Mobilizations and manipulations were performed successively for all possible directions of movement at the elbow and forearm, so as not to appear defensive muscle contractions. These techniques were corroborated with free active exercises performed on the full range of motion and with active and passive stretching exercises from the first sessions of physicaltherapy.

Rehabilitation sessions were supplemented with neuroproprioceptive facilitation techniques in order to increase the range of motion in the first 2 weeks and then to increase muscle strength.

Active resistance exercises were introduced progressively after at least 50% of the physiological mobility of the elbow joint had been previously recovered and after the pain had been considerably reduced.

From proprioceptive neuromuscular facilitation techniques for regaining range of motion were used: hold relaxation, rhythmic initiation, rhythmic rotation, and for muscle strength recovery were used slow reversal and slow reversal with opposition, alternating isometry.

Active and active endurance exercises were performed till the limit of painful sensitivity.

Gravitational force and the association of levers, exercises with different weights or resistive elements were used as resistance elements.

During each treatment session, intermittent postures were performed to maintain the maximum extension position, postures that were progressively maintained depending on the reaction of the muscle contracture to tension. Thus, the posture maintenance time depended on the tendency of the muscle to contract and lasted from 1 minute to 15 minutes.

Results

In order to highlight the obtained results, we performed the graphic interpretation of the values obtained by the 2 subjects at the initial, intermediate and final evaluation.

The preoperative and postoperative X-rays illustrating the left humerus supraintercondylar fracture, for patient 1 aged 24 years, are presented in **Fig. 1** and **2.**

Fig. 1. Preoperative CT aspect

Fig. 2. Postoperative radiographic aspect

The range of motion values and muscle testing values are presented in **Fig. 3** and **4,** performed at the level of the affected elbow, for patient 1.

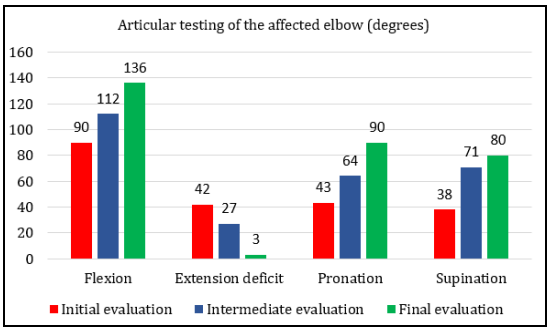

Fig. 3. Articular testing for the affected elbow

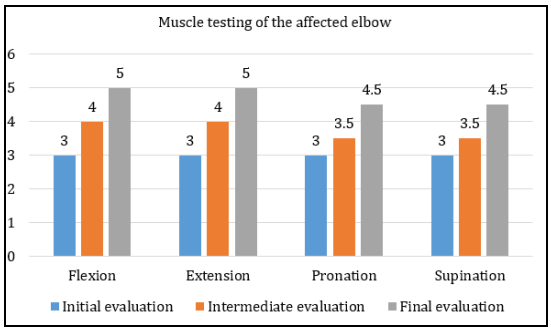

Fig. 4. Muscle testing for the affected elbow

As can be seen in Fig. 3 the mobility of the elbow joint has improved considerably both for the flexion and extension movement, as well as for the pronosupination movement, reaching close to normal physiological values.

In Fig. 4 we can observe that the strength of the flexor and extensor muscles, as well as the pronator and supinator muscles, have reached very good values, close to the normal limit.

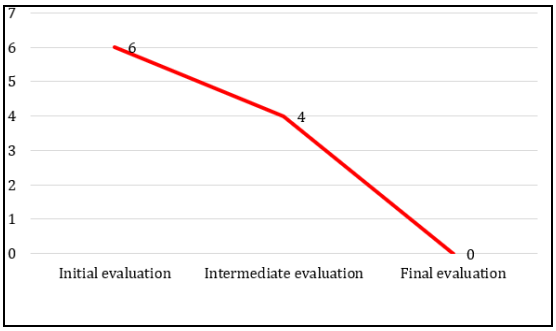

Fig. 5. Visual Analogue Scale – pain assessment (patient 1)

As the figure above shows, the intensity of pain decreased considerably in the intermediate evaluation until its disappearance in the final evaluation **(Fig. 5)**.

The preoperative and postoperative X-rays illustrating the olecranon fracture of the right elbow, for patient 2, aged 36 years, are presented in **Fig. 6** and **7**.

Fig. 6. Preoperative radiographic aspect

Fig. 7. Postperative radiographic aspect

The range of motion values and muscle testing values are presented in **Fig. 8** and **9**, performed at the level of the affected elbow, for patient 2.

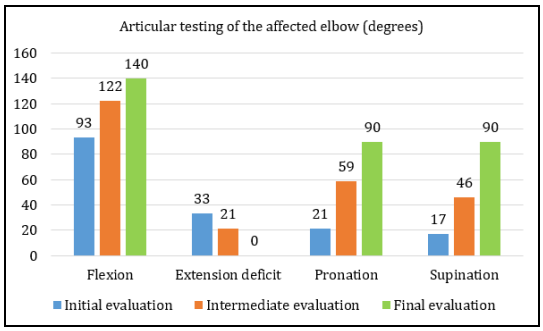

Fig. 8. Articular testing for the affected elbow

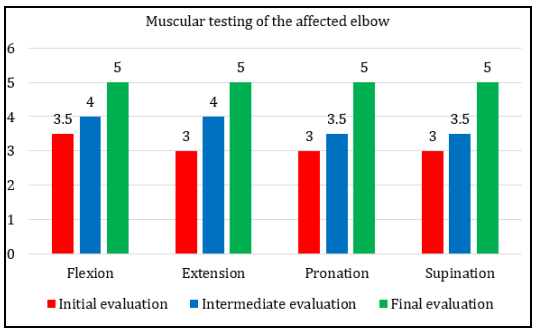

Fig. 9. Muscle testing for the affected elbow

According to figure 8, the mobility of the affected elbow has improved considerably from one assessment to another, finally reaching normal values of the amplitude of movement.

According to the figure 9, the strength of the flexor and extensor muscles, as well as the pronator and supinator muscles, reached normal values at the final evaluation.

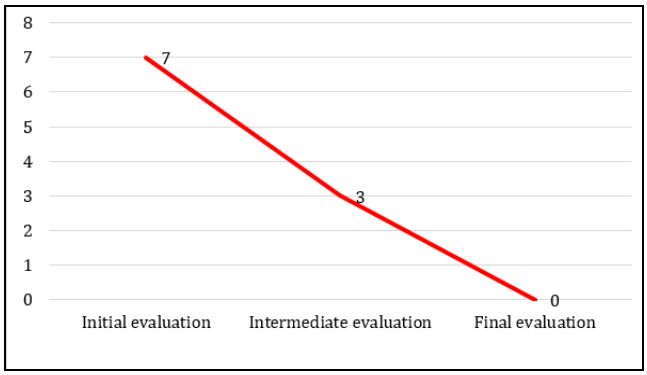

Fig. 10. Visual Analogue Scale – pain assessment (patient 2)

Although, the pain intensity was considerably increased at the initial assessment, it disappeared completely by the end of the recovery treatment reaching a value of 0, which means the total absence of pain **(Fig. 10)**.

Discussions

Following the research conducted on the 2 subjects, we can emphasize the obligation to design specialized physiotherapy programs adapted to each patient in order to heal pain, regain mobility and re-educate muscle strength.

Even if there were small differences regarding the values obtained by the 2 subjects during the evaluations, the realization of the recovery treatment is a mandatory condition for regaining the functionality of the elbow and the affected upper limb. The differences between the values obtained are justified by the type of fracture, its severity and the type of surgical protocol. For example, in the case of subject 1, a discrete extension deficit of 3 degrees was maintained due to the screw inserted at the olecranon. Also, in the case of subject 1, the muscular strength of the pronators and supinators reached final values of 4.5 compared to subject 2, which reached normal values of muscular strength (F5), due to the complexity of the fracture.

Research on the post-traumatic elbow highlights the need to establish a rehabilitation protocol that includes the type of exercise and its effective dosage and to establish the basic measures in monitoring the results [15], fractures causing loss of anatomical and functional integrity of the bones involved in the joint component [16].

Elbow rehabilitation should follow a progressive and sequential order of recovery steps to ensure that the tissues in the process of healing are not overworked. Through this study we consider that physical therapy programs should limit immobilization and achieve early re-education of elbow mobility, especially extension movement, as highlighted in other studies [17].

Through our study we emphasize that in the reabilitation process of the posttraumatic elbow, the exercises must target the entire kinetic chain movement of the upper limb, in order to regain full functionality and socio-professional reintegration of the patient. Other specialized studies performed in the field of posttraumatic elbow recovery emphasizes the same principle [6], [18].

Conclusions

The study complements the other research conducted in the specialty literature, which highlights the need for early establishment of physical therapy programs in the treatment of posttraumatic elbow.

The elements of medical rehabilitation complete the orthopedic-surgical treatment, by preventing the installation of complications or sequelae and by regaining the functionality of the affected limb.

Due to the increased degree of sensitivity of the elbow joint, passive mobilization must be performed with great care, respecting the degree of soft tissue elasticity so that muscle-tendon retractions do not occur as a result of the defensive reflex reaction.

In conclusion, the functional recovery of the posttraumatic elbow requires, in addition to the carefully designed physiotherapy programs, the work experience and manuality of the therapist.

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Kinesiophobia in Patients with Musculoskeletal Pain

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Abstract

Background

Chronic musculoskeletal pain is interfering with daily activities and have a negative impact on functionality and quality of life among patients. Kinesiophobia is related to the fear of movement and physical activity. The aim of this study was to assess the level of kinesiophobia in patients with musculoskeletal pain and the consequences on patients' functionality.

Material and methods

Thirty patients (50-82 years) with chronic musculoskeletal pain were included in the study.

Patients were evaluated using the Tampa Scale of Kinesiophobia (TSK), Visual Analogue Scale (VAS) for pain and Timed Up and Go Test (TUG).

Results

Patients with higher scores on TSK were older and with a higher VAS score for pain. They also needed a longer time to complete the TUG test than those with low scores on TSK. The TSK scores were correlated with the pain intensity and also with the TUG scores.

Conclusions

Musculoskeletal pain is associated with high levels of kinesiophobia and this correlation has a negative impact on functionality. Patients should be screen for fear of movement in order to adjust the rehabilitation program.

Keywords: kinesiophobia, fear of movement, avoidance, musculoskeletal pain

Introduction

Musculoskeletal pain is a disabling condition, interfering with daily activities and have a negative impact on functionality and quality of life of patients with musculoskeletal conditions.

Due to musculoskeletal pain, patients may experience different levels of disability, leading to a decrease in the quality and quantity of daily activities [1, 2]. There are different coping methods that patients develop in response to chronic pain, at a cognitive or behavioural level [3].

One of these models is the avoidance model. People with chronic pain will avoid activities, leading to disuse and disability [3, 4]. The pain-related fear in these patients will lead to safety-seeking behaviours [5]. Among other factors which influence the evolution of pain, the maladaptive psychological factors have an impact on the chronicity of pain [6].

The fear-of-movement or kinesiophobia was defined by Kori *et al*., [7] as ”an excessive, irrational and debilitating fear of physical movement and activity resulting from a feeling of vulnerability to painful injury or reinjury”. Patients with chronic musculoskeletal pain has been shown to avoid the prescribed movement exercises, due do kinesiophobia, and this will reduce the adherence to the physical therapy and also will lead to a more sedentary life style [6].

The aim of the present study was to assess the level of kinesiophobia in patients with musculoskeletal pain and the consequences on patients' functionality.

Material and Methods

The present study included thirty patients (50-82 years) with musculoskeletal pain, lasting for more than 6 months, due to musculoskeletal disorders. Patients with pain due to malignancy or severe neurological or cardiac diseases were not included in the study.

Demographic data, as well as the pain-generating musculoskeletal disorders were recorded for each patient.

The presence of kinesiophobia was evaluated with the Tampa Scale of Kinesiophobia (TSK).

The TSK is a widely used scale to assess the fear of movement or (re) injury in different pain conditions – chronic low back pain, osteoarthritis, fibromyalgia, neck pain, burn pain, with good psychometric properties [8]. The questionnaire contains 17 items, with answers scored on 4-point Likert scale, from “strongly disagree” to “strongly agree”. After inversion of the scores on items 4, 8, 12, 16, a total sum is calculated, ranging from 17 to 68. A higher TSK score indicate a higher level of kinesiophobia, with 37 being considered a cut-off value [5].

Pain intensity was evaluated on a 10-points visual analogue scale (VAS), with 10 being worst pain.

Functionality was assessed using the Timed-Up-and-Go Test (TUG). TUG is a simple tool that proved its efficacy in evaluated physical performance and functionality and in identifying people at risk of falls [9]. The patients stood up from a chair, walked 3m, turn around, walk 3 m back to the chair and sat down on the chair. The time was recorded. The longer was the time the patient needed to finish the test, the poorer the physical performance and functionality was.

The study was performed according to the Declaration of Helsinki. The participation in the study was voluntary and all participants signed an informed consent.

Statistical analysis was performed using the MedCalc software. Data are presented as mean and standard deviation. In order to compare the data, Student t-tests were used. The significance value was set at <0.05.

Results

Thirty patients (20 females and 10 males) with chronic musculoskeletal pain agreed to participate in the study. The mean age was 68.42±15.17 years. Osteoarthritis was the most frequent cause of chronic pain. The pain duration was between 7 months and 10 years.

The mean VAS score was 6.7±2.1. The TUG scores were 17.45±7.5 seconds. The mean TSK score was 47.58±6.7. Data are presented in Table 1.

Table 1. Patients' characteristics

Variables	Total (n=30)	TSK scores <37 (n=14)	TSK scores >37 (n=16)
Age (mean ± SD)	68.42±15.17	57.34±9.8	70.56±9.4
Males, n (%)	10 (16.67)	6 (42.86)	4 (25)
VAS (mean ± SD)	6.7±2.1	5.2±0.9	7.67±1.8
TSK (mean ± SD)	47.58±6.7	31.34±9.8	48.78±8.3
TUG (mean ± SD)	17.45±7.5	13.24±3.7	17.89±8.9

Patients with higher scores on TSK (scores higher than 37) were older and with a higher VAS score for pain. They also needed a longer time to complete the TUG test than those with low scores on TSK. A significant direct correlation was found between kinesiophobia and TUG ($r=0.23$, $p<0.05$).

Discussion

The aim of the present study was to assess the level of kinesiophobia in patients with musculoskeletal pain and the consequences on patients' functionality. Patients with chronic musculoskeletal pain presented high levels of kinesiophobia, as assessed with the Tampa Scale of Kinesiophobia. Higher levels of kinesiophobia were observed in older patients, with a higher pain intensity. These patients also reported a lower physical performance and functionality.

Our results showed that patients with chronic musculoskeletal pain due mainly to osteoarthritis are having high levels of kinesiophobia (higher than the cut-off of 37, as reported in previous studies). This is in accordance with previous results [5, 10, 11]. Milenkovic *et al*., [10] observed higher degrees of kinesiophobia in 63% of older institutionalized people with chronic pain. Lundberg *et al*., [11] reported higher degree of kinesiophobia in 54% of the patients referred to a physiotherapy department.

The present results also showed that older people with a higher intensity of pain reported higher levels of kinesiophobia. Similar results were also reported by Koho *et al*., [12], who showed that older age group had higher TSK scores than younger ones, the presence of kinesiophobia being associated not only with age and musculoskeletal pain, but also with lower level of physical activity. Pain intensity was also correlated with higher level of kinesiophobia in Branstrom *et al*., study [5] in both women and men with musculoskeletal pain. In their study, they found that younger women had higher kinesiophobia, results that are not in accordance with ours. Perrot *et al*., [13] also reported a direct relationship between kinesiophobia and pain intensity, with older patients presenting higher levels of kinesiophobia. Similar results were also reported by Arun *et al*., [14].

Chronic musculoskeletal pain is known to be a factor with a negative impact on physical performance and functionality in people with different degenerative or inflammatory conditions, along with other factors like bone mineral density, body composition, phychosocial factors and others [15-19]. Impaired functionality is frequently reported in individuals with chronic degenerative diseases and associated chronic pain [20-23].

The present results showed that patients with chronic musculoskeletal pain had an impaired functionality, as assessed with TUG. The impairment was more significant in individuals with higher levels of kinesiophobia. Similar results were reported by da Silva *et al*., [24] in a group of elderly females with chronic musculoskeletal pain. Ishak *et al*., [25] found that kinesiophobia

was associated with mobility and balance, but not with lower limb function in older people with low back pain.

Exercises and a physical therapy programme are beneficial in people with chronic pain in order to reduce pain. Because the adherence, satisfaction and outcomes of the physical therapy programme could be impaired by the presence of kinesiophobia in patients with chronic musculoskeletal pain. Cognitive and psychological factors like fear-avoidance and pain catastrophizing have been demonstrated to be associated with chronic pain and disability, interfering with rehabilitation outcomes [26].

Conclusion

Musculoskeletal pain is associated with high levels of kinesiophobia and this correlation has a negative impact on functionality. Patients should be screen for fear of movement in order to adjust the rehabilitation program.

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Pilot Study: Does the High Intensity Focused Electromagnetic Field Have a Better Effect than Classical Electrotherapy in the Treatment of Supraspinatus Calcific Tendinopathy?

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Abstract

Supraspinatus calcific tendinopathy is a disabling condition, with a significant negative impact on the quality of life of these patients, due to the high level of pain and dysfunction in exacerbations, which severely limits the activities of daily living (ADL), work and sports. The aim of this paper is to evaluate the effects of high intensity focused electromagnetic field (S.I.S. – super inductive system), used as a therapeutic alternative to classical electrotherapy, along with a complex individualized physical therapy program, in improving the symptoms and functionality of these patients. A prospective longitudinal pair-wise study was carried out on 19 subjects (10 males, 9 females, aged 33 to 70) with supraspinatus calcific tendinopathy, divided into two groups. Group A was treated using classical electrotherapy, along with a complex individualized physical therapy program, the therapeutical approach of group B associating only the innovative S.I.S. therapy with a program of physical exercises similar to those used for group A. Each patient underwent a number of 4 evaluations, 2 at each therapeutic time (before and after a 10-day complex treatment cycle), at two distinct therapeutic moments. The visual analogue scale (VAS) and the shoulder pain and disability index (SPADI) were used to observe the comparative evolution of patients under the treatment.

Close average values of pre-therapeutic scores were observed at the first evaluation/diagnosis (SPADI = 63.22%, respectively VAS = 8), and at the recurrence of hyperalgesic episodes (60.90%, respectively 7.75) of the 19 mentioned subjects. After the treatment, evolution shows a better situation among group B, after the first cycle (SPADI = 16.95%, respectively VAS = 2.5), but especially after the second one, at 6 months (10.9%, respectively 2), compared to those from group A (SPADI = 30.7%, respectively VAS = 3.5, after the first course and 20.1%, respectively 3, after the course from 6 months). Subjects treated with SIS therapy presented a faster and more consistent improvement of the pain felt, as well as of the functionality of their shoulder joint.

Keywords: supraspinatus calcific tendinopathy, pain, functionality, super inductive system

Introduction

Shoulder pain is a common and recurrent complaint from patients of all ages, affecting approximately one-third of individuals during their lifetime [1], which send them to seek specialized medical assistance, due to the high level of pain felt and important degree of

impairment of shoulder joint function. Shoulder impingement syndrome, defined as the compression of the rotator cuff and the subacromial bursa, seems to be one of the most common causes of shoulder pain and may be cited as a contributing factor to shoulder pain in up to 65% of cases. Frequently, patients suffering from this pathology are over 30 years old. Starting from a conical inflammation with repeated episodes of exacerbation, due to perpetual overload, the rotator cuff can develop histomorphological changes, such as fibrosis and thickening of the supraspinatus, the long biceps tendon, and subacromial bursae, leading eventually to tears of the rotatory cuff, rupture of the bicep's tendon, bony changes (calcific tendinopathy) and impingement syndrome [2]. As a frequency, females are more affected than males. As a percentage, at the level of the rotator cuff, the most affected is the supraspinatus tendon (63%), followed by the subscapularis tendon (20%) and the infraspinatus tendon (7%) [3, 4]. The condition proves to be disabling, causing a high level of pain and dysfunctionality, especially in exacerbations. Thus, in those moments, patients can no longer exercise their usual activities of daily living (ADL), relaxation and sports activities, which significantly diminishes their quality of life. The main goals in treating this kind of patients, are to relieve their felt pain and to solve the mechanical problem causing the shoulder functional impairment. The treatment strategy may vary according to disease stage, the particularities of the patient and the clinical experience of the team that manages the case [5]. Thus, investigators have reported many beneficial nonoperative treatment methods, from a specific physical therapy program, that includes concentric and eccentric exercises for the scapula stabilizers and dynamic humeral centering and scapular stabilization exercises [6, 7, 8], to a number of electrotherapy procedures, such as pulsed electromagnetic field therapy [9, 10], interferential current – IFC, transcutaneous electrical nerve stimulation – TENS [11, 12], ultrasound therapy – ULS, low-level laser therapy [13], radial extracorporeal shockwave therapy [14] and many others. However, as Dong *et al*., said [5], the abundance of treatment choices does not necessarily facilitate the physician's decision making but rather indicates that no consensus exists regarding which treatment options are best suitable [5]. The frequency with which such condition occur, as well as the degree of impairment in work capacity and quality of life of the affected patients, associated with worsening symptoms and increasing frequency of recurrences, as changes in biomechanics become permanent [2, 4], and the lack of consensus and limitations of the existing reviews regarding the treatment options [5] shows the prominent need to identify and use new therapeutic alternatives, as well as to adapt and individualize treatment protocols, to generate better results compared to the therapies currently used. Among the electrotherapy procedures, the application of ultrasound, IFC and TENS in addition to exercise therapy in shoulder impingement syndrome treatment had similar improvements in terms of pain, function and physical component of quality of life [12]. The pulsed electromagnetic field therapy (PEMF), also, in some clinical trials, have shown positive results [15, 16], while in others, it did not show the same effects [17, 18]. Therefore, *the main purpose of this study* was to evaluate the effectiveness of PEMF combined with specific physical exercises in reducing pain and improving functionality in patients with calcific supraspinatus tendinopathy, in pair-wise comparison with the effectiveness of "classical" electrotherapy procedures (TENS, IFC, ULS, etc.), associated with a similar physical therapy program, on that mentioned pathology. We hypothesized that the patients who received PEMF programme from an innovative platform (S.I.S. – super inductive system) and exercises would demonstrate significantly better results when compared with those who received "classical" electrotherapy procedures (TENS, IFC, ULS) and exercises. Also, the study follows the particularities in the

post-therapeutic evolution regarding the aforementioned parameters, depending on the belonging to one of the two age categories, respectively under and over 50 years old.

Methodology

In this prospective randomized controlled study, 20 volunteers who had a shoulder pain complaint lasting for at least 4 weeks and were diagnosed with calcific supraspinatus tendinopathy by clinical examinations and MRIs were selected. The selection criteria were as follows: 1) patients aged over 30 years old, 2) have continuous unilateral shoulder symptoms, 3) haven't undergone any type of treatment for the affected shoulder in the past year at least.

Patients who had adhesive capsulitis or major rotator cuff tears, sensory and muscular deficits due to neurological ore inflammatory joint diseases, previous history of shoulder surgery, ore have had steroid injections during the past six months were excluded. The patients were informed about the study and their written informed consent was obtained, the data obtained regarding statistics, as well as photographic materials being used only for scientific purposes.

This study was conducted in accordance with the rules of the Declaration of Helsinki. One of the 20 subjects dropped out of the study due to personal reasons. The 19 remaining patients (10 males, 9 females, aged 33 to 70) with supraspinatus calcific tendinopathy, were randomly divided into two groups. Group A was treated using classical electrotherapy procedures (TENS, IFC, ultrasound therapy), along with a complex individualized physical exercises therapy program. The therapeutical approach of group B associated only the innovative S.I.S. therapy with a program of physical exercises similar to those used for group A. The patients were told not to use any pain-killing drugs during the treatment. Patients demographic data, previous treatments and occupation were asked. Each patient underwent a number of 4 evaluations, 2 at each therapeutic time (before and after a 10-day complex treatment cycle), at two distinct therapeutic moments (at the first presentation/when first establishing the diagnosis, and after about 6 months, at the recurrence of the hyperalgesic episode), regarding the level of pain and the degree of impairment of their shoulder joint function. In the assessment of the pain, visual analog scale (VAS) was used, patients being asked to place a vertical mark along a horizontal line indicating their current degree of felt pain at rest and during activity, where 0 points indicated 'no pain' and 10 points indicated 'worst pain' [19, 20]. The shoulder pain and disability index (SPADI) were also used in the evaluation, to assess the patient's functional status. Each question quantifies the pain felt and the degree of disability perceived at a certain movement/in carrying out a certain activity, through a numerical representation between 0 and 10, similar to completing the VAS scale. The final score is collected, being subsequently divided by the number of questions and the final percentage result (%) represents the existing level of pain and functional disability. The higher the score, the greater the pain and functional impairment is present [21, 22, 23, 24]. Each of the two 10-day complex treatment cycle, for each patient, contained daily physical exercises. A standardized physical exercises program, performed under the supervision of an experienced physiotherapist, was applied to both groups, including passive range of motion exercises, Codman exercises, isometric and resistive exercises of the shoulder girdle [25, 26], the exercises being adjusted according to the patient's tolerance.

The isometric exercises were used during the painful period, and the resistance exercises were added after the pain began to relieve. In addition to the daily exercise program, different electrotherapy modalities were used for the 2 groups. Group A patients were given, daily, IFC at 50-120 Hz frequency, for 15 min, around the affected shoulder, in bipolar application, along with

TENS in conventional mode, symmetric biphasic, 90 Hz, for 20 min and a 1 MHz ULS at an intensity of 1 W/cm2, applied continuously, for 3 min. All classical electrotherapy applications were performed using the Chattanooga Intelect Neo combined device. Group B benefited daily, in addition to the specific physiotherapy program, of a daily PEMF magnetotherapy program, interspersing, every two days, the analgesia program with the one for calcifications (5 sessions for each program, during each complex 10-day course). All magnetotherapy program applications were performed using the BTL-6000 SIS Elite. Following the collection of the aforementioned data, the information was processed using the Microsoft Excel spreadsheet program, highlighting the evolution of the results of the two scales during the study. P-values of <0.05 was considered statistically significant. The repeated measures ANOVA test was used in comparison of the means of the repeated measures.

Results

We treated and monitored only patients from urban areas, but from all socio-professional categories. The entire studied group, comprising both persons with a less physicaly demanding activity such as retireds, economists, programmers, cooks and more active people, who have more physical demands (tenis trainers, construction workers or commercial workers). As we first mentioned, the study was carried out on 19 subjects (10 males, 9 females, aged 33 to 70) with supraspinatus calcific tendinopathy, devided on two groups, A (33 to 70 years old, equaly distributed – 5 males, 5 females) and B (aged 35 to 67, 5 males and 4 females). To simplify the presentation of the obtained data and to make the results easier to understand, we used a coding system, in which 0.0 represents the average value of the monitored index/scale at the first presentation/when we where first establishing the diagnosis (time 0), before 10 days of treatment (1), and 0.1 is the value of that score after the 10-day complex treatment cycle (1). According to the same pattern, 1.0 means the average value of the monitored index/scale after about 6 months – at the recurrence of the hyperalgesic episode (moment 1), before the 10-day treatment course (0), 1.1 meaning the value of that score after 6 months (time 1) and after 10 days cycle of complex treatment (1). For a more detailed approach to the results, depending on the type of electrotherapy modalities associated with the physical therapy (groups A and B), and on the belonging to one of the two age categories, respectively subjects between 30 and 50 years old (1) and above 50 years old (2), we divided the two groups in 4 subgroups. The subgroups were coded as A1 (5 patients – 3 males, 2 females – under 50 years, receiving classical electrotherapy procedures), A2 (5 subjects – 2 males, 3 females – over 50 years, who benefit the same classical electrotherapy treatment), B1 (5 patients – 3 males, 2 females – under 50 years of age, receiving magnetotherapy) and B2 (4 subjects – 2 males, 2 females – over 50, who benefit magnetotherapy). When we compared the level of pain at rest and felt during regular physical activity monitored by VAS and the functional impairment of shoulder quantified via SPADI among patients from the 4 subgroups, the results showed significant differences before and after the treatment, both at the time of the first presentation and at the time of recurrence of the painful episode ($p<0.05$), the decrease in the mean values of both scales used for monitoring as well as the statistically significant differences on the subgroups being found in the table below (Tab. 1).

Tab. 1. The evolution of the average values of the SPADI and VAS scores, during the 4 evaluations (0.0, 0.1, 1.0, 1.1) in the 4 subgroups (A1, A2, B1, B2), along with values of ANOVA repeated mesure tests for VAS and SPADI in all 4 subgroups

	VAS 0.0	**VAS 0.1**	**VAS 1.0**	**VAS 1.1**	**ANOVA Repeated Mesures for VAS**	**SPADI (%) 0.0**	**SPADI (%) 0.1**	**SPADI (%) 1.0**	**SPADI (%) 1.1**	**ANOVA Repeated Mesures for SPADI**
A1	8	3	7	2	F (1,522,6,087) =145,1; **p<0,0001**	63,1	24,9	59,2	13,8	F (1,257,5,029) =90,52; **p=0,0002**
A2	8	4	8	4	F (1,435,5,741) =53,07; **p=0,0003**	63,3	36,5	62,8	26,4	F (1,144,4,577) =18,21; **p=0,0090**
B1	8	2	8	1	F (1,623,6,494)= 328,0; **p<0,0001**	63,2	10,2	61,3	8,0	F (1,713,6,852) =238,9; **p<0,0001**
B2	8	3	8	3	F (2,136,6,408) = 57,32; **p<0,0001**	63,3	23,7	60,3	13,8	F (1,832,5,495) = 21,54; **p=0,0027**

Discussions

There was no permanent perfect concordance between the decreasing patterns of the mean values of the two scales (VAS and SPADI). However, at the end of the treatment and monitoring period, patients experienced a lower level of pain and noticed better functionality. Even if we started from some relatively equal average values of SPADI and VAS, at the first and second evaluation, before the complex therapeutic cycle, the way in which the scores decreased post-therapeutically is slightly different. Along VAS, the shoulder pain and disability index (SPADI), also used in the evaluation, was one of the easiest ways to obtain information on the patient's functional status. This scale proved to be a valid method of assessing, through the multitude and relevance of the questions, the pain and the functional disability of the scapulohumeral joint, measuring quite accurately the degree of impairment of ADLs and thus the quality of life of those patients. The questionnaires used were easy to apply and proved to be a valid tool in assessing this category of patients. The results obtained, which show the superiority of the innovative PEMF S.I.S. therapy in reducing the pain and improving the functionality in patients undergoing monitoring, require validation in a study conducted over a longer period of time, on a larger group of patients with homogeneity in terms of the living environment of the subjects (both urban and rural).

Conclusion

Supraspinatus calcific tendinopathy is a common pathology, both in young and elderly, which severely affects their quality of life, limiting almost entirely their ability to work, do sports and recreational activities, and even the performance of daily activities at an intensity considered normal. All patients had a favorable evolution, with a considerable improvement in symptoms, which results from a decrease in the mean values of both scales used for monitoring (VAS and SPADI), both after the first and after secod complex 10-days treatment cycle. The best evolution of the VAS and SPADI index is observed in the B1 subgroup (patients under 50, who received SIS therapy), which reveals the most consistent reduction of pain and the most important improvement in functionality and quality of life. The post-therapeutic results of the A1 sublot and those of the B2 subgroups are approximately similar. However, even if the evolution of SPADI reflects a rather similar increase in their quality of life, the VAS scale level of post-therapeutic pain in the two subgroups shows a better evolution in the subjects of A1 (under 50

years, who received classical electrotherapy procedures). On the other hand, the least favorable evolution was observed in the A2 sublot (patients over 50 years of age, classical electrotherapy), in whom the decrease in the mean SPADI and VAS values was slower and smaller, which may correlate with a less significant improvement in symptomatology and functionality than the rest of the sublots.

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Indications for Kinetotherapy in a Multidisciplinary Context of Rehabilitation of Patients with Rare Genetic Diseases – Cases Presentation

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Abstract

Identifying the most appropriate physical therapy procedures that can be applied to genetic diseases to facilitate patients' rehabilitation.

Methods

In a 5-year retrospective study (2015-2019) we identified types of rare genetic diseases in which a method of physical therapy was recommended during the post-test genetic consultation.

Results

The general indications and kinetotherapy procedures are presented, as personalized recommendations to patients with the mentioned genetic diseases.

Conclusion

In the absence of contraindications, physical therapy is useful in all cases in which it can be performed, with a both physical and mental benefit.

Keywords: physical therapy, genetic diseases, personalized recommendations

Introduction

Therapeutic approaches for genetic diseases include different types of rehabilitation therapies.

Physical activity is described as "a set of bodily movements produced by the activation of skeletal muscles and resulting in increased energy expenditure above resting metabolism" [1].

Rehabilitation supports patients to maintain their health in order to remain as independent as possible, to participate in education, to be economically productive and to have the best possible quality of life. Sustainable Development Goal (SDG) 3: "Ensure healthy lives and promote well-being for all at all ages" [2]. Demand for rehabilitation services is expected to continue to grow due to global trends in improving health, quality of life and demographics, which refers to the aging population and the growing number of people living with the consequences of disease and injury. We aimed to identifying the most appropriate physical therapy procedures that can be recommended to subjects with genetic disorders, to facilitate patients' rehabilitation. The paper presents several cases with rare genetic diseases in which medical rehabilitation, as part of a multidisciplinary approach, was performed.

Methodology

In a 5-year retrospective study (2015-2019) we identified rare genetic diseases in which kinetotherapy was indicated in the post-test genetic consultation. Data about kinetotherapy were collected from medical records. The indication for kinetotherapy was made for several diseases, as follows: Osteogenesis imperfecta, CHARGE syndrome, Velo-cardio-facial syndrome, Gitelman Syndrome, Ambras Syndrome, Trisomy 21, Autism spectrum disorders and Arterial hypertension. Patients were followed and evaluated for one year with a 3-month evaluation by the same geneticist who consulted them initially. We present several clinical cases in which genetic tests have determined the diagnosis of these rare genetic diseases. In all situations the objectives of rehabilitation and the results obtained after one year of follow-up are presented.

Results

The patients were diagnosed with extremely diverse genetic diseases, therefore unitary rehabilitation methods could not be applied. We present the rehabilitation objectives for each diagnosis and the indicated rehabilitation methods.

1. ***Osteogenesis imperfecta.*** Osteogenesis imperfecta (OI) type I is a mild type of osteogenesis imperfecta, a genetic disorder characterized by increased bone fragility, low bone mass and susceptibility to bone fractures, blue sclera and hearing loss [3]. Available methods for the treatment are of three types: medical rehabilitation, surgical treatment and pharmacological treatment (bisphosphonates or growth hormone) [4]. Medical rehabilitation aims to prevent bone loss induced by immobility, overall strengthening of the body, to optimize functional independence, ensure autonomy, socialization and respiratory management: In moderate to severe forms, marked by thoracic deformity, kyphoscoliosis, or a short thorax, there may be an impact on respiratory capacity. Our patient suffered 60 fractures up to the age of 30 for which he underwent as many open surgeries or fracture reductions. The genetic consultation was made due to the urgency of the family, as his wife was pregnant and they wanted to know the risk for their descendents. The patient was identified to have a mutation in the COL1A1 gene. Prenatal diagnosis was then performed by amniocentesis followed by testing of the fetus, which did not carry the father's mutation [5]. In Romania, the invasive prenatal diagnosis has been made since 2002 [6, 7]. The patient underwent bisphosphonate therapy and did not have more fractures. Kinetotherapy was recommended with the following objectives: to reduce the number of fractures and their complications, maintain optimal mobility and manage pain; to optimize growth and adult height; to improve the quality of life of the patient and his family. Other goals of the patient's care were to diagnose and manage the complications and comorbidities, in particular deafness, dental complications, and possible cardiac damage; optimize the care of fractures by the family and emergency facilities through training and education; and optimize social, educational, and professional integration. In the meantime, our patient became a father and a year after the first consultation, when he was very anxious, he appeared to be very happy that he had a healthy little girl and he feeled much more confident about him. For each case a multidisciplinary follow-up plan should be based on the severity of the disease and the patient's symptoms.
2. ***CHARGE syndrome.*** The presence of the main characteristic signs (coloboma, cardiac malformation, choanal atresia, etc.) suggests CHARGE syndrome and prompts the doctor to continue the investigations. The early detection of any visual disturbances makes possible the

set up of specialized orthoptic care for the rehabilitation of vision disturbances. The visual system, the vestibular system and the somatosensory system are impaired, therefore balance will be affected. The objectives of kinetotherapy during small childhood are: to maintain balance, by enhancing sensory experience and practice motor responses; helping to hold the head; to learn and practice to turn around and sit; to facilitate the acquisition of walking. In adult patients, it helps limit deformities of the spine and maintain range of motion. Finally, to facilitate language acquisition, early treatment by a speech therapist is essential. Our patient is a child with left facial paralysis and Marcus-Gun synkinesia, plurimalformed, deaf, who could not maintain orthostatism and had a pronounced retroflexion of the head. The child was first evaluated at the age of 1 year and 4 months. The diagnosis of atypical CHARGE syndrome was confirmed by genetic testing [8]. Rehabilitation management included age-appropriate kinetotherapy that was performed for 2 hours/day, continuously. After 6 months the child could walk with support, could open the left eye and cooperate nonverbally very well. During the follow-up year, a cochlear implant was performed, speech therapy was started and kinetotherapy was continued. Parents are very satisfied with the child's evolution and will continue to diversify rehabilitation methods.

3. ***Velo-cardio-facial syndrome.*** This syndrome is characterized by congenital malformations such as cardiac defects, palatal abnormalities, facial dysmorphism, developmental delay and immune deficiency and is caused by a chromosomal abnormality, a deletion 22q11.2. The monitoring of these patients is multidisciplinary and the treatment depends on the combination of clinical abnormalities present in each patient. The prognosis is variable and depends on the severity of the symptoms. Methods used in rehabilitation target: defects of the palate, requiring nasogastric feeding; learning disabilities requiring speech therapy; psychiatric and neurological disorders that may require drug treatment and/or management by child or adult psychiatrists; monitoring of serum calcium (to adapt calcium supplementation) and thyroid function are necessary throughout life; motor disorders can cause awkwardness in the execution of movements; hypotonia may cause a slight developmental delay and slowness; immunodeficiency requires continuous monitoring and antibiotic therapy as needed [9]. Our patient was plurimalformed with cleft lip and palate, complex cyanogenic heart malformation and facial dysmorphia. Clinical evaluation was followed by karyotyping and FISH analysis that revealed the cause of the disease, an unbalanced de novo translocation t (15; 22) with 22q11 deletion [10]. The child was continuously hospitalized throughout his life being under continuous medical supervision. He needed feeding with the nasogastric tube during the first year of life, then speech therapy and kinetotherapy but died at the age of 2, due to the heart malformation, before he was able to walk.
4. ***Gitelman syndrome.*** This a rare disease in which the reabsorption of salt (NaCl, sodium chloride) in a segment of the renal tubule, known as the distal convoluted tube, is defective. This segment recovers 7% of the filtered salt; the increased loss of salt in the urine is responsible for a state of moderate chronic dehydration and abnormalities of several electrolytes in the blood and urine (not enough potassium and magnesium in the blood, low calcium in the urine). Methods used in recovery target are: potassium supplementation of all patients, even if asymptomatic, with a reasonable goal of achieving a serum potassium level of 3.0-3.5 mmol/L [11]; use of diuretics that limit the loss of potassium may be useful (spironolactone) if symptomatic hypokalemia persists despite well-monitored supplementation, or when this is poorly tolerated; for patients suffering from chronic fatigue

syndrome, cognitive and behavioral therapy, sometimes gradual, limited exercise to avoid rolling back are recommended, as well as drugs for depression, sleep, or pain if indicated. Our patient was a 28-year-old woman with chronic and significant fatigue but uninvestigated and undiagnosed. In the context of a laboratory evaluation of a car accident without serious consequences, severe hypokalemia was discovered and a renal tubulopathy of genetic cause was suspected. The genetic testing identified a pathogenic mutation, in homozygosity, in the SCL12A3 gene that is associated with Gitelman syndrome. Establishing the precise diagnosis allowed a personalized drug treatment with high doses of potassium that stabilized at the desired level. The patient experienced a state of well-being and an increase in energy which allowed her to start an exercise program that increased her muscle and mental tone, as well as her quality of life. The following year she got married and said she was happy [12].

5. ***Ambras Syndrome.*** It is characterized by the presence of long, fluffy hairs all over the face and body, sometimes accompanied by abnormalities in the shape of the face and teeth [13]. Those affected are not in physical pain. They suffer mentally because of their appearance. The therapy includes several methods to remove the hair, including shaving, waxing, lightening the hair, electric or laser hair removal, etc. Temporary suppression and a temporary reduction of the excessive hair will be of little help. Electrolysis acts on the hair follicle. A needle is inserted into it, delivering a weak electric current. The goal is to destroy or damage the follicle. There are 3 electrolysis techniques: galvanic electrolysis, thermolysis, and the combination of the two. Our patients were two school-age sisters, both with a clinical diagnosis of Ambras syndrome. They were consulted and evaluated by the pediatric psychiatrist and it was decided to perform psychotherapy, to be included in a rhythmic gymnastics group and to apply a laser therapy. After a year, the hair became thinner and mentally they were both, less introverted and depressed and more concerned with integration into the group of friends [14, 15].
6. ***Autism spectrum disorders.*** According to the *Diagnostic and Statistical Manual of Mental Disorder* (*DSM-5*) [16], a guide created by the American Psychiatric Association used to diagnose mental disorders, people with ASD have: Difficulty with communication and interaction with other people, restricted interests and repetitive behaviors, symptoms that hurt the person's ability to function properly in school, work, and other areas of life. Kinetotherapy generates many benefits such as: development of the musculoskeletal system; improvement of the cardiovascular endurance; developing neuromuscular awareness, i.e., coordination and control of movements; fighting obesity; improve mental health, especially anxiety and depression; improve social participation by improving self-confidence, interactions, and therefore social integration. Our patient was a preschool child, who was sent for evaluation because she did not speak at the age of 1 year and 7 months. Clinically, she was already being monitored for a noncyanogenic congenital malformation that did not require surgery. Genetic analyzes performed, karyotype, CGH array and FISH analysis revealed the existence of an 8p21-23 duplication, de novo, with the translocation of the additional material on the 4q chromosome. In the context of neuropsychiatric evaluation, elements from the autism spectrum were identified for which specific therapies such as ABA therapy were indicated. The reassessment after a year showed that he began to speak and interact with those around her, verbally and nonverbally. We mention that she benefited from an integration in a group of 7 children in kindergarten and the educator had psychology studies [17].

7. ***Trisomy 21.*** Trisomy 21, also known as Down syndrome, is the most common chromosomal anomaly in humans, caused by an extra chromosome 21. Many pregnancies with fetuses having chromosomal abnormalities stop evolving but most of those with trisomy 21 reach term and are diagnosed postnatal [18]. Children and adults with Down's syndrome present with axial hypotonia and very often developmental delay, difficulties in writing and in using scissors, so it is important to undergo kinetotherapy sessions to help them improve their development [19]. In these patients there are often anatomical variations in the muscles that cause additional difficulties in obtaining expected results [20, 21]. They fatigue after walking an average distance. We present the case of a patient with a typical facial dysmorphism for Down syndrome and marked hypotonia, speech apraxia, in which a sweat test with abnormal values was registered, suggestive for another genetic disease, namely cystic fibrosis. A karyotype confirming trisomy 21 and testing for cystic fibrosis, which ruled out a second disease, were performed [22]. The patient was rehabilitated through kinetotherapy sessions, speech therapy and behavioral therapy, so that after one year the speech improved and developmental disabilities have been partially reduced.
8. ***Arterial hypertension.*** Patients genetically tested for polymorphisms in the ACE, AGT, and ATR-1 genes that have been shown to have a genetic component in hypertension were considered. This is the primary high blood pressure [23, 24]. The goal of physical therapy is to lose weight, reduce stress and maintain a healthy heart. The exercises that succeed in fulfilling these goals are: cardiovascular training and static and dynamic breathing performed through yoga and pilates exercises. To them, exercise rehabilitation provides clinically relevant improvements in exercise capacity. Exercise has not been associated with any serious side effects. However, it is important to note that isometric exercises are contraindicated.

Discussion

Genetic diseases are generally rare diseases and depending on the specific manifestations each case requires a particularization of the treatment and medical rehabilitation methods [25, 26].

Disorders and deficits can be at the origin of a disability affecting cognitive abilities, learning, gross motor skills, communication, autonomy in daily life activity. There are consequences in domestic, daily, social, school, and professional life. Physical and rehabilitation medicine aims to improve the functional capacities of children and adults with genetic diseases. Ideally, kinetotherapy sessions should not exceed two or even three sessions per week. A day with exercises must always be followed by a day of rest to avoid any risk of injury by giving the muscles plenty of time to recover. Medical rehabilitation is recommended in all forms of osteogenesis imperfecta and is the only treatment in mild forms. A multidisciplinary follow-up plan will be based on the severity of the disease and the patient's symptoms. In general, there is a decrease in the incidence of fractures after the end of puberty, with some stabilization of the disease in early adulthood. The risk of fractures reappears at the age of menopause when new fractures can occur. Their orthopedic management remains that of non-OI fractures, emphasizing the need for light immobilization, early mobilization for non-immobilized segments, and the fractured limb. Respiratory assessment and management can take an especially important place, in children as well as in adults [27]. There is no specific treatment for CHARGE syndrome. The management is multidisciplinary, it involves the intervention of various health professionals (dietitians, gastroenterologists, endocrinologists, cardiologists, physiotherapists, occupational

therapists) [5]. 22q11.2 deletion syndrome is a congenital chromosomal abnormality, most commonly characterized by heart and palatal malformations, facial dysmorphia, developmental delay, and immunodeficiency [6]. Functional rehabilitation, improvements to housing, vehicles, certain technical aids can help to alleviate these disabling situations. Cognitive and behavioral psychotherapies, relaxation methods can help people with psychopathological disorders. Medico-socio-educational care must be early to avoid any developmental delay linked to motor impairment, hearing impairment, oral and facial abnormalities, etc. It must also be followed throughout life. It involves a multidisciplinary team to promote the physical, cognitive, emotional, and social development of the child and, later, of the adult. Learning with paramedical/medico-social professional support (speech therapist, psychomotor therapist, occupational therapist, hearing aid specialist, psychologist, etc.), and technical aids (hearing aids, computer, tablet, etc.) improve care. Genetic disorders can be caused by mutations that affect the genes or the chromosomes, but genetic factors are also involved in the pathogenesis of complex diseases [28]. Several genetic defects have been correlated with structural and functional changes of the intervertebral disks. Improving our understanding of the mechanisms of intervertebral disk degeneration will lead to more effective treatments [29-31]. High blood pressure (hypertension) is a common disease. It is estimated that 30% of the population aged 18 and over has it. The proportion rises to 60% for people aged 60 or over. In severe cases, daily movement, even light, only with the upper limbs helps to control blood pressure more effectively [21, 23, 24].

Prophylaxis of genetic diseases is enabled by invasive or noninvasive prenatal diagnosis [5, 6, 7, 32]. Once we have a definite diagnosis in a child or adult, we must use all available methods, including kinetotherapy, to improve the patient's quality of life.

Conclusion

In genetic diseases, care is multidisciplinary, involving the intervention of various health professionals. The contribution of the kinetotherapist is often indispensable. Rehabilitation management must be customized as we presented in our cases. The beneficial effect of rehabilitation can be seen in improving patient performance and increasing quality of life. In general, the beneficial effects observed after a short period increase patients' long-term compliance.

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The Impact of Daily Multiple Physical Exercise Sessions on Arterial Stiffness at Sedentary Subjects with Metabolic Syndrome

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Abstract

The modification in life style has an important role in changing the risk factors effect for Metabolic Syndrome prevention. Taking into consideration this aspect, the systematic implementation of physical exercise in association with an antiatherogenic diet represents the first method for syndrome metabolic prevention. The aim of our study was to research the effects of daily multiple submaximal exercises intervention on lipid profile and arterial stiffness at young subjects diagnosed with Metabolic Syndrome.

Material and Method

The research has been developed during 12 weeks and included 30 subjects (10 male, 20 female subjects), (21±2.7) years aged, without regular physical activity, diagnosed with Metabolic Syndrome. At baseline and after 12 week of physical exercises intervention (three daily sessions of submaximal exercise on a cycle ergometer, during 10 minutes, at 80-85% Maximal Heart Rate intensity, 5 days/week), the subjects underwent anthropometrical, biochemical and arteriography measurements.

Results

At the end of the study, the recorded values have shown significant improvements of all endothelial parameters in correlation with the evolution of the anthropometric and lipid serum values ($p \leq 0,05$) for Diastolic Blood Pressure (Dis) (mmHg), Pulse Wave Velocity in the aorta (PWVao) and Systolic Blood Pressure in central aorta from emerging (SBPao); $p<0,001$ for Augmentation Index (Aix) and Systolic Blood Pressure (Sys).

Conclusion

Taking into consideration these results, multiple and short daily sessions, which are less monotonous, may be more appropriate for the young subjects Metabolic Syndrome.

Keywords: sedentarism, endothelial function, physical exercise

Introduction

Metabolic Syndrome is a morbid collection of several disorders that includes insulin resistance, central obesity, elevated blood pressure, and atherogenic dyslipidemia. These

metabolic perturbations are associated with prothrombotic state, endothelial dysfunction and a pro-inflammatory state.

The etiology and the pathophysiology of the metabolic syndrome are very complex and not yet completely elucidated. The most cited risk factors are adipose tissue dysfunction and insulin resistance. Others factors are cigarette smoking, hypertension, elevated LDL cholesterol and triglycerides, low HDL cholesterol, family history of coronary heart disease and diabetes, proinflammatory and prothrombotic state, sedentary life style, atherogenic diet.

Metabolic Syndrome is frequently associated with the cardiovascular disease, the arterial stiffness being considered a strong predictor of the cardiovascular events. It seems that there is a correlation between central obesity, as major component of Metabolic Syndrome, and aortic stiffness, measured by aortic pulse wave velocity (AoPWV) [1].

The protocol used in diagnosing the metabolic syndrome includes the criterion of Adult Treatment Panel III (ATP-III) of the National Cholesterol Education Program (2005) and International Diabetes Federation (2005), respectively abdominal obesity (waist circumference >94cm for male subjects and >80 cm for female subjects) and at least two of the following criteria: fasting plasma glucose ≥6.1mmol/L or therapy for type 2 diabetes mellitus; serum triglycerides ≥1.7mmol/L or therapy for triglyceridemia; HDL-cholesterol level <1.00mmol/L in males and <1.30mmol/L in females; blood pressure ≥130mmHg systolic and ≥85mmHg diastolic or drugs treatment [2].

Taking into consideration these aspects, it is generally recognized that the modification in life style has an important role in changing the risk factors effect for metabolic syndrome development and, together with diet antiatherogenic diet, the first method for prevention. Also, the researches during the last years implied the need for a global involvement in the prevention and the management of metabolic syndrome, the reduction of body weight, with the systematic implementation of the physical exercise programs [3].

The aim of our study was to research the effect of daily multiple physical exercise intervention on lipid profile and endothelial function at sedentary subjects diagnosed with Metabolic Syndrome.

Material and Method

The study has been developed during 12 weeks and included 30 subjects (10 male, 20 female subjects), aged between 18-23 years (21±2.7years), without regular physical activity, diagnosed with Metabolic Syndrome.

Following the medical screening to rule out any conditions that might have precluded their participation, all subjects provided written informed consent. Rejection criteria were: smokers, hepatic, renal, thyroid dysfunction, osteoarticular, pulmonary, cardiovascular and neurological diseases, recent surgical operations, antilipidemic medication.

The subjects were instructed to maintain their accustomed dietary habits throughout the research. At baseline and after 12-week follow-up, patients underwent anthropometrical, biochemical and arteriographic assessment.

The physical exercise programs

During 12 weeks, all subjects performed three daily sessions of submaximal exercise on a cycle ergometer, during 10 minutes, at 80-85% Maximal Heart Rate (MHR) intensity, 5 days/week. Each exercise session was preceded by 5 minutes of warm up at 60-70%MRH.

During the physical exercise, heart rates were monitored by Suunto Pro Team Pack.

Anthropometric measurements

Anthropometric measurements were taken in the morning under basal conditions. The height and weight were measured in light clothing without shoes using a stadiometer for height (to the nearest 0.1 cm) and an electronic weight scale for weight (to the nearest 0.1 kg). Abdominal circumference was measured, using a metal tape measure, to the nearest millimeter, in a horizontal plane at the midpoint between the iliac crest and lower costal margin (palpated in the mid axillary line). Body Mass Index (BMI) was calculated by dividing the weight in kilograms by the square of height in meters. A BMI varying of 30 or over this value was characteristic to obesity.

Biochemical measurements

Serum triglyceride (TG), total cholesterol (TC), low-density cholesterol l (LDL-C) and high-density cholesterol (HDL-C) were determined quantitatively by enzymatic colorimetric kits with an auto analyzer device (Technic on RAXT, Ireland). The determination of cholesterol and triglyceride used an enzymatic colorimetric method. High-density lipoprotein cholesterol and very low-density lipoprotein cholesterol were calculated according to the formula of Friedewald *et al*., (1972): LDL-C = TC − [HDL-C + (0.46×TG)] [4].

Arteriographic measurements

Endothelial function was evaluated with TensioMed^{TM} arteriography (TensioMed, Hungary) by measurement of the augmentation index (Aix), Pulse Wave Velocity in the aorta (PWVao) and Systolic Blood Pressure (mmHg) in central aorta from emerging (SBPao).

Statistical analyses

Were done using the statistical package for the social sciences (SPSS) version 11.5-descriptive statistics. The results are reported as means (± standard deviation of the mean) (SD).

The changes of anthropometrical, metabolic and endothelial parameters were calculated and compared between initial and final values using *t*-Test: Paired Two Sample for Means. The level of statistical significance was set at $p \leq 0.05$.

Results

The recorded values have shown significant improvements for all anthropometrical and biochemical results at the end of exercises program (Table 1).

Table 1. The differences between anthropometrical and biochemical parameters values before and after application of physical exercise program

Biochemical parameters	**Parameters differences**	***P***
BW (Kg)	-5.5	0.001
BMI (Kg/m^2)	-3.15	0.01
WC (cm)	-7.07	0.05
Serum total cholesterol (mmol/l)	-0.58	<0.001
LDL-C (mmol/l)	-0.83	<0.05
HDL-C (mmol/l)	-0.23	<0.05
TG (mmol/l)	-0.86	<0.05

BW – Body weight; BMI – Body mass index; WC – Waist circumference; TC – Serum total Cholesterol; LDL-C – Serum LDL Cholesterol; HDL-C – Serum HDL Cholesterol; TG – Serum Triglycerides

Statistical significance of parameters variation was: p=0.001 for the body weight, p=0.01 for body mass index, p=0.05 for waist circumference. P-value was <0.001 for serum total cholesterol, LDL cholesterol, HDL cholesterol, and <0.05 for serum triglycerides.

The results of endothelial function evolution upon physical exercise program are presented in Table 2. All investigated parameters showed significant evolution: p≤0,05 for Diastolic Blood Pressure (Dis) (mmHg), Pulse Wave Velocity in the aorta (PWVao) and Systolic Blood Pressure in central aorta from emerging (SBPao); p<0,001 for Augmentation Index (Aix) and Systolic Blood Pressure (Sys).

Table 2. The differences between hemodynamic parameters values before and after application of physical exercise program

Hemodynamic parameters	**Parameters differences**	***p***
Sys (mmHg)	-12.2	<0.001
Dis (mmHg)	-11.9	<0.05
PWVao (m/s)	- 1.16	<0.05
SBPao (mmHg)	-14.35	<0.05
Aix (%)	-25.52	<0.001

Sys – Systolic Blood Pressure; Dis – Diastolic Blood Pressure PWVao – Pulse WaveVelocity in aorta; SBPao – Systolic Blood Pressure in central aorta; Aix – Augmentation Index.

Conclusion

Nowadays, it is generally recognized that physical activity has an important role in changing the risk factors for cardiovascular diseases and Metabolic Syndrome.

The researches during the last years implied the need for a global involvement in the management of Metabolic Syndrome with the systematic implementation of physical exercise programs. The specialized literature has brought forward proof regarding the positive influence of regular physical training on the glucose tolerance and insulin sensitivity, serum lipids constants, parameters of cardiovascular function and fibrinolytic activity on persons diagnosed with insulin resistance [5-6].

Our research provided evidences that multiples daily high-intensity interval sessions are a potential exercise modality for subjects with Metabolic Syndrome with effective results in improving the anthropometrical and lipid profile and, very important, endothelial function.

The results we have obtained confirm the previous studies and prove that there is a major effect of daily multiple session of maximal exercise on lipid profile and arterial stiffness at subjects with Metabolic Syndrome [6, 7, 8].

As a general rule, obese subjects do not closely adhere to training programs probably because of the monotony of the continuous exercise that is frequently proposed. Taking into consideration this aspect, multiple and short daily sessions of submaximal exercise, which are less monotonous as a daily continous aerobic session, may be more appropriate for these people.

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Shockwave Therapy – A Modern and Revolutionary Method in Recovery of Plantar Fasciitis

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Abstract

Shockwave therapy is a non-invasive, mildly painful therapy reducing the treatment duration; results can be seen from the first sessions. It may be used immediately after a trauma, with quick effect and high pain mitigation rates. The purpose of the paper is to improve, optimise, and use this revolutionary method in order to reduce discomfort, pain, and the adverse effects of a trauma. Two patients were the subjects of our research; they had been diagnosed with anterior and posterior plantar fasciitis. After applying the Shockwave therapy and the kinesiotherapy program, the two patients recovered favourably. Following the clinical and imaging exams, we have noticed a favourable recovery, in a shorter timeframe, in case of the two patients. The present research confirms the efficiency of the Shockwave therapy as an adjuvant of kinesiotherapy, which completes the recovery picture perfectly. Whereas this technology is beneficial and has visible results, its use without kinesiotherapy can create a "boomerang effect."

Keywords: health, recovery, therapy, shockwave

Introduction

This new recovery method – discovered by accident – is helpful and can be used to treat diseases in the following areas: orthopaedics, rehabilitation, sports medicine, aesthetic medicine.

Patients need a non-surgical procedure, in order to reduce significantly the duration of the recovery period, to speed up the healing process, all meant to reprise their normal schedule as rapidly as possible.

Shockwave therapy is a non-invasive treatment, easy to apply by the specialists, with wide applicability in orthopaedics, physiotherapy, sports medicine, and urology. The main effects are represented by rapid pain mitigation and by joint mobility regain, given the improvement of metabolic processes at tissue level. To these effects, we add the fact that it is not surgical and that it does not require analgesics. All the aforementioned aspects make shockwave therapy an ideal type of therapy for speeding up the healing process and for treating acute or chronic pain symptoms.

We should never ignore the health of the lower limbs; on the contrary, we should always make sure they are in good shape. It is recommended to prevent the emergence of traumas/lesions in the orthopaedic area. A consult at an orthopaedist can save a patient from potential complications due to conditions that are already present, but without symptoms.

Without a good shape of the lower limbs, daily activity is totally compromised, leading to an incapacitated body. Therefore, it is best to prevent the emergence of various diseases by taking care of our health, because daily life activities are thus possible.

The fact that pain mitigates is due to shockwaves creating pressure on the impaired tissues: the immediate effect is anaesthetic hyperstimulation. In other words, the nerves in the area on which the shockwaves act are overstimulated and they decrease the pain-transmitting activity.

This is a temporary effect and it emerges from the first sessions.

Shaden, M.D., is a world-renowned specialist; he is known as the pioneer of shockwaves treatment; he is also a supporter of this type of revolutionary therapy in the world of medicine and recovery.

The contraindications of the Shockwave therapy: pregnant women; persons suffering from diabetes, vascular diseases; persons wearing a pacemaker; persons with haematological or neurological conditions; persons with local infections [1], [2], [3], [4].

Upon using the shockwave treatment, it may be stated that this is an effective method for rapid recovery. This unique technology uses shockwaves in very short and highly efficient sessions, featuring a series of advantages: the treatment may be applied in an outpatient setting and it does not involve pain.

The Shockwave therapy device Impactis M+ Star has four shockwave emission modes: single, continuous, burst, and interval. It is capable of accessing, storing, and editing the individual program for a patient. The therapy duration for a shockwave therapy session is 10 minutes, without any adverse effects. On the impaired area, we apply a conductive gel for ultra-short waves; we use and place the treatment applicator featuring a titanium transmitter and – depending on the types of treatment required for the patient – we apply between 500 and 3,000 shockwave impulses. We recommend 3-4 treatment sessions, with at least one-week breaks in between [2].

Material and methods

In what concerns the symptomatology of the patients who came in for recovery, we considered the type of pain: inflammatory; the duration of morning or nocturnal stiffness – which may determine lack of sleep, physical astheny, motor deficit, low mobility, and high degree of dependence.

In order to document this study, we have also used information obtained through anamnesis: age; duration of illness; presence of comorbidities and of articular manifestations; recommended medication; and physical-kinetic-balneary treatment.

In order to formulate the diagnosis correctly, we also took into consideration the clinical and paraclinical investigations: medical lab works (ESR, rheumatoid factor, c-reactive protein, fibrinogen); imaging exams: radiologic exam.

The objective of this study we started from the premise that by applying the recovery protocol of the two patients, through kinetotherapy, associated with shockwave therapy favorable results can be obtained that confirm the research objective.

Devices used: the treatment sessions took place in the kinesiotherapy practice, using kinesiotherapy as basic means, supported by the device called Shockwave Star Impactis M+ [2].

In this study, we have started from the assumption that the use of Shockwave therapy can help kinesiotherapy, not replace it.

This therapy has numerous advantages: short duration of treatment; decrease in stiffness and increase in mobility; improvement of blood flow; contribution to the dissolution of calcium fibroblasts; improvement of metabolism and microcirculation; reduction of tissue stiffness; analgesic effect.

Shockwave therapy – consisting in the use of shockwaves – is the most effective treatment method for musculoskeletal pain. This is a non-invasive type of treatment and it improves considerably patients' health [1], [2], [3], [4].

This therapy is almost pain-free and it takes little time to apply, namely 2-3-5-8-15 minutes, while sessions take several weeks. 3-4 treatment sessions are necessary, while for some conditions, we may recommend 5-6 treatment sessions. Between the treatment sessions, it is indicated to let the area in question rest [2], [4].

We have put together the kinetic program (comprising active mobilisations, active-passive mobilisations, exercises with a cane, exercises with objects – thorn ball, wooden blocks, plastic blocks, plastic ring, playdough, occupational therapy), shockwave.

Experimental design

Participants: 2 patients who came to the kinesiotherapy practice within the Integrated Outpatient Service of the Military Hospital "Dr. Alexandru Popescu", U.M. 02417, Focșani, Vrancea.

Participants: 2 patients aged 45 and 49 years old, respectively from may 2020 untill september 2020.

The first patient – C. Z., 45, female – suffered from intense, persistent pain; she could not fully use both limbs for support while moving; upon performing an X-ray, an orthopaedist set the diagnosis of posterior plantar fasciitis. She was recommended kinesiotherapy, plantar support, physical rest, and shockwave therapy.

The second patient – I. I., 49, female – suffered from intense pain only in the morning, in the area of the heels, bilaterally, with a decreasing intensity throughout the day. An orthopaedist set the diagnosis of anterior plantar fasciitis, given the bilateral heel X-ray and the lab works, showing an inflammatory process, with altered values. The physician recommended anti-inflammatory medication, kinesiotherapy, plantar support, physiotherapy – shockwave therapy, and physical rest.

Plantar fasciitis – the calcanean spur emerges under the heel or behind the heel and it is due to a long-term inflammation of the plantar fascia or of Achilles' tendon, where they join the calcaneus.

For the bilateral anterior calcanean spur, the parameters of the treatment applied were as follows: pressure 3.0 Bar, frequency 12Hz, number of impulses 3,000, titanium shockwave transmitter. The patient was placed in ventral decubitus, with a roll in the area of the ankle joint (the roll measured around 15 cm). The treatment comprised two phases: one phase was carried out easily, with linear motions; the therapist applied the therapy on the surface of the plantar aponeurosis. The second phase of the treatment concerned the area around the calcanean spur. If the patient experiences discomfort, the value of the frequency will be adjusted, as well as the number of impulses crossing the area in question. The duration of the treatment is at least four sessions, but we can extend it to eight; this patient benefitted from five sessions. The break between the sessions counted seven days; this duration extended from one recovery session to

another. The use of the titanium transmitter leads to a slight stiffness during treatment, but on the long term, the pressure drops by 30%, which is beneficial for the patient.

In case of the second patient, for anterior plantar fasciitis, the shockwave treatment was set up as follows: the titanium transmitter; the patient was placed in ventral decubitus, both heels hanging from the consultation bed; the treatment comprised two phases. In phase 1, the therapist used linear motions along the Achillean tendon, even slightly on the gastrocnemius muscle; the second phase included easy, circular motions, focusing on the localised plantar fasciitis. In order to mitigate the exiting tension, the therapist insisted on the area of the plantar aponeurosis, too.

The treatment for this type of condition takes 4-8 sessions; this patient benefitted from six sessions. The shockwave therapy was applied every seven days; the frequency increased with each visit for recovery. The use of the titanium transmitter leads to a slight stiffness during treatment, but on the long term, the pressure drops by 30%, which really helps the patient.

The physician's prognostic regarding recovery was 2-4 months.

The two patients were present daily in the kinesiotherapy practice; they observed strictly the recovery program, executed 3 times a day, once at the kinesiotherapy hall, twice at home, Shockwave therapy at the hospital, bike for the legs – 15-20 minutes a day, swimming, 5 sessions with a brake of 7 days between them.

Results

The two patients who came to the kinesiotherapy practice observed the recovery schedule strictly; they benefitted from shockwave therapy and they came for all the appointments; they also followed all the indications; at the end of the treatment, the result was optimal.

The consequence of using the shockwave therapy can be noticed from the first application; the patients benefits from a unique combination between the therapeutic effect per se and the relaxation provided by the massage, due to the kinesiotherapist's hands-on technique.

We have combined shockwave with kinesiotherapy, active mobilisations, manual massage techniques, leading to the following effects: better mobility, significant pain reduction while moving, rapid recovery, minimum discomfort, as well as immediate reprisal of normal activities.

Discussions

Another study (Narin *et al*.,) had the purpose of comparing the frequency applied in Shockwave therapy and the density of shockwaves. A total number of 41 patients with the diagnosis of plantar fasciitis benefitted from this therapy. They were divided into two groups: group 1 with a frequency of 15 Hz f, pressure 3.0. Bar, and 2,000 impulses, while group 2 with a frequency of 10 Hz, pressure 2.0. bar, and 2,000 impulses. The entire course of treatment took 12 weeks. The conclusion of this study concerning a comparison between the application technique and the density of shockwaves was the lack of any significant difference [5].

The effects of the Shockwave therapy in the treatment of plantar fasciitis is rather controversial, according to the article penned by Gollwitzer and his colleagues. The objective set by the authors of this research was to test and analyse whether Shockwave therapy has the effect of mitigating chronic stiffness caused by plantar fasciitis. The research study comprised 250 patients and it meant to determine whether the effect existed or it was only placebo. The 250 patients were divided into two groups: 69.2% underwent therapy, while 34.5% benefitted from placebo. The duration of the treatment was three sessions with 2,000 impulses each. They

demonstrated on the visual analogue scale that stiffness decreased after the 12 weeks of treatment, with a real significant gain for the group benefitting from Shockwave therapy [6].

A new article from 2017 analyses the efficiency of shockwave therapy in the treatment of plantar fasciitis without local anaesthetic versus the placebo effect in the treatment of plantar fasciitis. Upon comparing the treatment with the placebo effect, the rate of stiffness reduction at the level of plantar fasciitis improved – initially, the VAS was 60% during the first steps taken in the morning and during daily activities – from good to excellent; stiffness mitigated after the first treatment session, according to Lou and his collaborators. [7].

A new therapy – present and used in many countries in Western Europe – is the main treatment recommended in the diseases and pathologies concerning the concept of health. In Romania, this revolutionary therapy is very little known among physicians/ specialists, given that they still use classic methods: anti-inflammatories – tablets; hot-cold compresses; balneal and climacteric resorts.

Dedes and his collaborators have used shockwave therapy in a study applied on 384 patients diagnosed with tendinopathy. A questionnaire was developed at the University of Peloponnese on Pain, Functionality, and Quality of Life, where pain intensity, functionality, and the quality of life were evaluated intensely before beginning the treatment, as well as right after the end of the therapy sessions. The purpose of their study was to reduce stiffness, to improve mobility, to optimise the quality of life in the context of tendinopathy; they found shockwave to be the unique and main treatment method with an immediate and certain result [8].

Schmitz *et al*., demonstrate in a study that shockwave therapy is a non-invasive treatment method for tendon traumas, as well as for pathologies at the level of the musculoskeletal system.

Shockwave therapy is a safe and effective therapy. An optimal treatment protocol would comprise three shockwave therapy sessions in the first week, with 2,000 impulses per session, using the maximum intensity that a patient may endure. This therapy is as efficient as those using only physical exercises, traditional physical therapy, injecting thrombocyte-rich plasma, even surgical interventions [9].

In 2018, Wang and his colleagues have highlighted that shockwave has a vast application field; it had been introduced successfully in medicine more than 30 years prior, in the area of non-invasive medical interventions. It has a significant effect on the tissues; it increases the biological and cellular contribution. It represents a neutral, non-invasive system; it has regeneration properties even in the field of medicine, which have been acknowledged worldwide by the medical system. An extension of shockwave use may improve the management of multiple existing pathologies, for approaching a patient's quality of life, thus reducing the global recovery costs [10].

Conclusions

The treatement effectiveness depends on the choice of parameters to the current patient's condition. The patient's condition changes over time. Its observation abd assessment should take place before, during and after therapy. Such an action is necessary for changing the parameters in order to adapt them to the actual condition of the pacient. While performing the treatment, special attention should be paid to the level of patient's pain sensation – settings and intensity of treatement must be adapted to the current feelings.

At the end of the recovery treatment round of kinesiotherapy – accompanied by therapy through shockwave therapy – the two patients were assessed through imaging at the end of the period, thus observing the discomfort and pain while walking disappeared.

Both patients recovered very well, the stiffness, discomfort and embarrassment while walking disappeared, following the instructions of the doctor and the physiotherapist. Among the advantages of this therapy are: elimination of pain; short duration of the treatment session, rapid recovery, with immediate resumption of the normal program; improving mobility, resuming daily activities without interruption. It has proven highly successful in mitigating stiffness at the level of knee joint – patellar and quadricipital tendonitis; at the level of hip joint; at the level of shoulder joint – traumas of the rotator cuffs, with or without calcification areas; at the level of the back area, with paravertebral muscular stiffness; stiffness at the level of the Achillean tendon; plantar fasciitis; stress-induced fractures; bone consolidation delays.

At the level of the foot, tense ligaments can pull the heel, and as bone repair occurs, a calcaneal spur (osteophyte) can form. This repeated aggression is found especially in athletes, dancers, overweight and women who wear inappropriate shoes, especially high-heeled shoes.

Shockwave or pain therapy is the new method based on high energy generation in a very short time, with a speed exceeding the speed of sound.

These technologies, however – as miraculous as they are, presented as wonders – cannot hold on or succeed without support from recovery exercises; the effect is yoyo.

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Effects of Two Physical Exercise Programs on Intra-Abdominal Obesity and Lipid Profile

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Abstract

The purpose of our study was to evaluate the effects of two physical exercise programs, continuous and moderate intensity exercise versus maximal and intermittent exercise, on abdominal adiposity and the correlations between the abdominal adiposity variations and lipid profile changes upon physical exercise intervention. The research subjects were included and randomized to one of the following groups: – group I (n=10, age=17±1.7years), has performed 45min of continuous exercise x 5 days/week, at moderate intensity, 70-75% Maximal Heart Rate; – group II (n=10, age=17±0.9 years) has undertaken 45min of intermittent submaximal exercise x 5 sessions/week. After 16 weeks of performing physical exercise programs, we observed an improvement of anthropometric characteristics and serum lipid parameters in both groups, but the correlations between variations of the serum lipid parameters and abdominal adiposity were better at the end of the submaximal and intermittent physical exercise program comparative with continuous and moderate intensity exercise program (r=0.811 in relation to the TC, r=-0.903 in relation to the HDLC, r=0.805 for LDLC and r=0.895 *vs* r=0.812 in relation to the TC, r=-0.814 in relation to the HDLC, r=0.713 for LDLC and r=0.879). Taking into consideration these results, multiple and short daily sessions, which are less monotonous, may be more appropriate for the young subjects Metabolic Syndrome.

Keywords: abdominal adiposity, physical exercise, lipid profile

Introduction

Abdominal obesity is now recognized as a major factor that holds a central place in the etiology of type 2 diabetes mellitus, hypertensive disease, atherosclerosis and coronary heart disease [1, 2]. The abdominal adiposity accumulation is frequently accompanied by the alteration of the glucose and lipid metabolism particularly expressed by means of increasing the serum concentration of triglycerides and LDL cholesterol (LDL-C) and decreasing the concentration of HDL cholesterol (HDL-C) due to the negative influence the insulin resistance exercises on the plasmatic transport of fats. Current opinion is that there is a clear difference of the risks related to the process of cumulating adipose tissue in different areas of the body (subcutaneous, visceral, abdominal), and is evident that the physiopathology at obese or overweight persons is related to the visceral accumulation of the body fat rather than to the total amount of excessive overweight.

And, more important, even if the body mass index is kept within normal values, the excess of visceral fatness represent a risk factor for metabolic and cardiovascular pathology [3]. Moreover, even in conditions in which body mass index is kept within normal limits, excess of visceral adiposity remains a risk factor for type 2 diabetes and cardio-vascular pathology [4]. In this context, it is generally recognized that that regular physical training has a positive influence on adiposity, the glucose tolerance, insulin sensitivity and serum lipids parameters [5]. Aerobic efforts (moderate intensity and prolonged) have proved to be efficient regarding the insulin resistance and serum lipids' profile, even if these effects haven't been accompanied by significant changes of the maximum oxygen consumption (VO_2max). Taking into consideration these aspects, the identification on younger subjects of a VO_2max decrease which precedes the installation of specific insulin resistance manifestations, has led to the idea that the physical condition's alteration by diminishing the physical activity of certain subjects is an important factor in triggering the specific pathological manifestations [6]. The purpose of our study was to evaluate the effects of two physical exercise programs, continuous and moderate intensity exercise to those of maximal and intermittent exercise, on abdominal adiposity and the correlations between the abdominal adiposity variations and lipid profile changes upon physical exercise intervention.

Material and Methods

The study has been carried out for a period of 16 weeks and included 20 male young subjects diagnosed with obesity or overweight by using Body Mass Index (BMI) values. Following the medical screening to rule out any conditions that might have precluded their participation, all subjects provided written informed consent and were instructed to maintain their accustomed dietary habits during the research. The rejection criteria were: antilipidemic medication, renal or thyroid dysfunction, hepatic inflammatory diseases, recent surgical interventions, cardiovascular or neurological diseases. The measurements took place in the first week (baseline values) for all subjects before starting training, and after 16 weeks of training, in week 24 (post-training values).

Physical exercise programs. The research subjects were included and randomized to one of the following groups: – group I (n=10, age=17±1,7years), has performed 30min of continuous exercise on a cycle ergometer x 5 days/week, at moderate intensity (70-75% Maximal Heart Rate); – group II (n=10, age=17±0,9 years) has undertaken 30min of intermittent exercise on a cycle ergometer x 3 sessions/week. The session consisted in 5 min of warm up at 70% MRH, followed by intervals of submaximal effort (7min at 80-85%MHR) separated by 3min of recovery periods at 70% MHR. The program ended with 5min of cool-down.

Anthropometric measurements. The subjects' height and weight were measured in light clothing, without shoes, using a stadiometer for height (to the nearest 0.1cm) and a digital scale for weight (to the nearest 0.1kg). Waist circumference was measured, using a metal tape measure, either at the narrowest circumference of the torso or at the midpoint between the iliac crest and the lower ribs. Body Mass Index (BMI) was calculated from height and weight using the formula: [body weight (kg) / (height $(m)^2$].

Blood sampling and analysis. Blood samples were drawn after a night of fasting. Total cholesterol (TC), triglyceride (TG), and LDL-C levels were determined in the serum by commercially available kits (end point type) on a LYSA 200 auto analyzer. The determination of

TC and TG used an enzymatic colorimetric method. HDL-C was measured by using the direct high-density lipoprotein method.

Intra-abdominal obesity measurements. It was performed with subjects having a supine position by ultrasound measurement with a 3.5MHz transducer placed on the xipho-umbilical line, 1.5 cm above the umbilicus. Intra-abdominal adiposity was estimated by the distance between internal surface of the *rectus abdominis* muscle and the anterior surface of the aorta.

This distance was measured three times from three positions. To avoid the influence of abdominal wall tension and respiratory status, the measurements were done without the compression of the abdominal wall at the end of a normal exhalation [7].

Statistical Analysis. Data are given as the mean ± standard deviation the mean (SD). Initial lipid, anthropometric and ultrasound parameters have been analyzed in order to determine the differences between parameters, before and after application of physical exercise intervention.

The changes were calculated and compared using t-Test: Paired Two Sample for Means. The level of statistical significance was set at 0.05. $p<0.05$ was considered statistically significant.

Body weight, body mass index, abdominal circumference and intra-abdominal obesity were correlated with the serum lipid by Pearson's test. We used the Pearson correlation coefficient to assess the association between ultrasound and serum lipids versus anthropometric measures and serum lipids. If the Pearson's correlation coefficient value was near ±1 it was considered a perfect correlation. Pearson's correlation coefficient value lying between ±0.75 and ±1 was considered a high degree of correlation, values between ±0.25 and ±0.75 indicated a moderate degree of correlation, and values between 0 and ±0.25 indicated a low degree of correlation.

Results

At the end of the study, we observed an improvement of anthropometric characteristics and serum lipid parameters at both groups (Table 1 and 2).

Table 1. Characteristics of the group I before and after the application of physical exercise program

Parameters	Basal	After physical exercise programs	p
BW (Kg)	94.6±7.33	88.05±6.90	0.001
BMI (kg/m^2)	29.3±2.71	26.04±2.15	0.01
WC (cm)	102.84±5.14	95.68±5.29	0.05
IAA (mm)	50.6±2.98	42.68±2.46	<0.001
TC (mmol/l)	5.91±0.06	5.29±0.11	<0.001
HDLC (mmol/l)	0.73±0.04	0.89±0.06	<0.001
LDLC (mmol/l)	3.72±0.08	3.34±0.07	<0.001
TG (mmol/l)	2.86±0.24	2.02±0.15	0.004

Legend: BW – Body Weight; BMI – Body Mass Index; WC – Waist Circumference; IAA – Intra-Abdominal Adiposity; TC – Total cholesterol; HDLC – high-density lipoprotein cholesterol; LDLC – low-density lipoprotein cholesterol; TG – triglycerides

Table 2. Characteristics of the group II before and after the application of physical exercise program

Parameters	Basal	After physical exercise programs	p
BW (Kg)	95.56±6.75	88.90±6.79	0.001
BMI (kg/m^2)	29.9±2.64	26.79±1.89	0.01
WC (cm)	101.71±5.67	93.88±5.16	0.001
IAA (mm)	48.1±5.56	36.89±4.35	<0.001
TC (mmol/l)	6.05±0.06	5.16±0.04	<0.001
HDLC (mmol/l)	0.81±0.06	1.16±0.07	<0.001
LDLC (mmol/l)	3.75±0.08	2.89±0.09	<0.001
TG (mmol/l)	2.74±0.29	1.4±0.07	<0.002

Legend: BW – Body Weight; BMI – Body Mass Index; WC – Waist Circumference; IAA – Intra-Abdominal Adiposity; TC – Total cholesterol; HDLC – high-density lipoprotein cholesterol; LDLC – low-density lipoprotein cholesterol; TG – triglycerides

It can be noticed that the best correlations of serum lipid variations were established using the intra-abdominal adiposity variations: r=0.812 in relation to the TC, r=-0.814 in relation to the HDLC, r=0.713 for LDLC and r=0.879 for TG at Group 1; r=0.811 in relation to the TC, r=-0.903 in relation to the HDLC, r=0.805 for LDLC and r=0.895 for TG at Group 2 (Table 3 and 4).

Table 3. Pearson correlation (r) between the variations of waist circumference and serum lipid values

Variables	**TC**	**LDLC**	**HDLC**	**TG**
WC at group 1	0.802	0.693	0.638	0.828
WC at group 2	0.790	-0.731	0.769	0.696

Legend: WC – Waist Circumference; TC – Total cholesterol; LDLC – low-density lipoprotein cholesterol; HDLC – high-density lipoprotein cholesterol; TG – triglycerides

Table 4. Pearson correlation (r) between abdominal visceral fat and serum lipid levels

Variables	**TC**	**HDLC**	**LDLC**	**TG**
IAA at group 1	0.812	-0.814	0.713	0.879
IAA at group 2	0.811	-0.903	0.805	0.895

Legend: IAA – Intra-Abdominal Adiposity; TC – Total cholesterol; HDLC – high-density lipoprotein cholesterol; LDLC – low-density lipoprotein cholesterol; TG – triglycerides

Discussion and conclusion

Obesity has reached epidemic proportions worldwide. In developed countries, obesity spreads more and more rapidly, even among early aged children [8]. The gravity of this growing phenomenon resides in the fact that obesity and excess weight represent a major risk factor for many of the chronic diseases, like type 2 diabetes, cardiovascular diseases or cancer [9].

Nowadays, it is well known that the role of fat in the evolution of obesity and its consequences are not at all passive, a high fat tissue body mass, especially the visceral adipose tissue, contributing directly to the installation of the systematic inflammation syndrome [1].

These findings stayed at the baseline of defining pro-inflammatory state, associated with the abdominal obesity, as a common condition for the installation and evolution of the cardiovascular diseases and diabetes mellitus. The high level of visceral adiposity is associated with the high level of pro-inflammatory proteins as: interleukin 6 (IL-6), the tumoral necrosis factor alpha (TNF-α) and *C-reactive protein* (PCR) [10]. On the other hand, obesity is often accompanied by alterations of lipoproteins metabolism, known in the special literature as atherogenic dyslipidaemia [11]. The growth of serum concentration of the total cholesterol, of the LDL cholesterol and triglycerides, associated with the decrease of HDL cholesterol, represents the main characteristic aspects of atherogenic dyslipidaemia, which consists in a major risk factor, as well as the pro-inflammatory status, for the installation of cardiovascular pathology. Therefore, it had been imposed the necessity of identifying and quantifying, as precisely as possible, the visceral adipose deposits, knowing that they represent the main cause for the installation of pro-inflammatory system and atherogenic dyslipidaemia, in comparison with the subcutaneous localizations of fat tissue. The classical methods of evaluating adiposity, the determination of the skin fold thickness, the measurement of waist circumference or the waist-hip ratio, used on a large scale in the past, show important limitation and cannot precisely convey the subcutaneous and visceral distribution of adipose tissue. That is why, the necessity of a much more precise investigation method, like RMN and CT, appeared. Yet, these methods also present important limitations, mainly concerning high costs and therefore a reduced accessibility of overweight and obese subjects to them. Taking into consideration this last aspect, the ultrasonographic measurement of adiposity method of evaluation conveys more and more powerful reasons for it to be used as a screening mean for the overweight and obese populations, as well as for the metabolic syndrome subjects, type 2 diabetes or chronic cardiovascular diseases, a large series of researches giving reasons more or less sustainable in this respect [7].

The results analysis of this research showed favorable evolution in all parameters at the end of the both exercise programs. Additionally, the correlations between variations of the serum lipid parameters and abdominal adiposity, was better at the end of the submaximal and intermittent physical effort program (r=0.811 in relation to the TC, r=-0.903 in relation to the HDLC, r=0.805 for LDLC and r=0.895) comparative with continuous and moderate intensity exercise program (r=0.812 in relation to the TC, r=-0.814 in relation to the HDLC, r=0.713 for LDLC and r=0.879). Our study was framed into this kind of logic and tried to verify the correlation degree between the variations of ultrasonographic measurement of intra-abdominal adiposity and the variations of serum lipid concentration, in comparison with the use of classical measurements represented by the body weight measurement, body weight index and abdominal circumference [12]. The results we have obtained confirms previous studies [13-14] and prove that there is a major correlation between the variations of intra-abdominal adiposity dimensions and the alterations of serum lipid concentrations, a better correlation than the one which uses abdominal circumference and way better than the one which uses body weight or body weight index.

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Body Mass Index in Children with and without Intellectual Disability: Distribution and Implications

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Abstract

Background

The effects of intellectual disability (ID) levels on body mass index (BMI) and other factors on the perceived health status of children with ID are not well known.

The aim of this research study was to determine whether intellectual disability had a direct influence on the BMI. The study included 40 children aged 14±3 years old, from 4 education units from Romania. The participants in this study were distributed into four groups as follows: group 1 – children without intellectual disabilities, group 2 – children with mild intellectual disability group 3 – children with severe intellectual disability and group 4 – children with Down's syndrome. The measurements for the subjects within the four groups were carried out in the morning, from 10 to 12. Each participant's BMI was calculated using weight and height and then categorised into healthy, underweight, overweight or obese according to Body Mass Index Classifications. After calculating the t tests and the values of the significance threshold for ($p>0.05$), it may be stated that there are no statistically significant differences between the four groups. We have also appraised the values of BMI for the four groups. It may be mentioned that the groups of children with ID have close values to the ones of children without ID, thus ranging within the limits of WHO (18.5-24.9); however, the group of children with Down's syndrome exceeds these limits, as its borderlines obesity (25.4).

Keywords: intellectual disability, Down syndrome, BMI

Introduction

Intellectual disability (ID) is a disorder characterized by impaired cognitive and adaptive skills, caused by multiple gene overexpression, single-gene mutations, different non-syndromic genes, as well as environmental factors [1]. A growing literature documents the health inequalities experienced by people with Intellectual Disability (ID) compared to the general population [2]. These disparities have been shown in both mortality and morbidity rates [3]. One particular area of concern is the number of people with ID who are overweight or obese.

Prevalence rates vary depending on country but range between 8.5% and 36%, which is consistently higher than rates reported in the general population for the same [4], [5], [6].

It is suggested that higher rates of overweight or obesity in people with ID are caused by several biological/genetic factors, such as a higher prevalence of low metabolic rate and hypothyroidism, especially in people with Down's syndrome [7], increased likelihood that they

take antipsychotic drugs and barriers to maintaining a healthy lifestyle, such as limited access to recreational facilities due to transportation problems, staff shortages and limited incomes [8].

Body mass index (BMI) is a ratio of weight to height used to assess degree of fatness or adiposity of an individual. The measurement is obtained from the calculation of weight in kilograms divided by height in meters squared. BMI is an assessment tool used to estimate degree of overweight or obesity. In the general population, a BMI of 30 kg/m^2 or above indicates obesity. A BMI below 19 kg/m^2 indicates a risk of malnutrition. However, BMI is only one component of nutrition assessment and, like body weight, it should not be the only data used to assess nutritional status especially in diseases like AIDS, which can greatly alter body composition [9]. The BMI ranges are based on the effect excessive body fat has on disease and death and are reasonably well related to adiposity. BMI was developed as a risk indicator of disease; as BMI increases, so does the risk for some diseases (WHO, 2017). Some common conditions related to overweight and obesity include: premature death, cardiovascular diseases, high blood pressure, osteoarthritis, some cancers and diabetes.

Methods

The purpose of this research study was to determine whether ID had a direct influence on the BMI. The study included 40 children aged 14±3 years old, from 4 education units as follows: "St. Andrei Gura Humorului, Foster care centre" Laurenţia Ulici "Gura Humorului," Constantin Păunescu "School Centre Iaşi and" G. Ibraileanu Iasi, Romania. The participants in this study were distributed into four groups as follows: group 1 – children without ID, group 2 – children with mild ID group 3 – children with severe ID and group 4 – children with Down's syndrome, each group being made up of 10 subjects. It should be noted that at the beginning of the study, we obtained the consent of parents or legal guardians because some subjects came from foster care centres. The measurements for the subjects within the four groups were carried out in the morning, from 10 to 12. Each participant's BMI was calculated using weight and height and then categorised into healthy, underweight, overweight or obese according to Body Mass Index Classifications [10].

Results

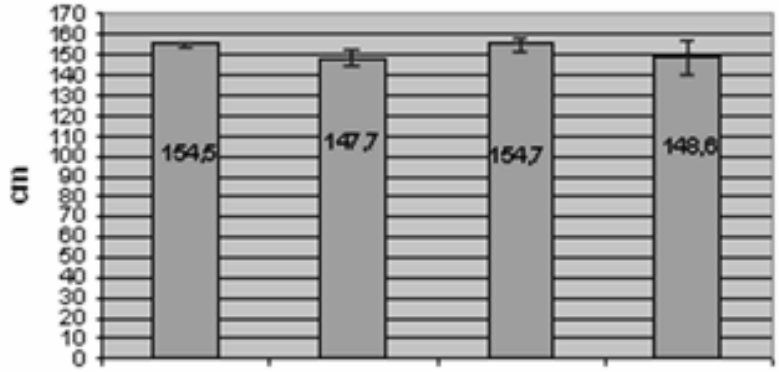
Table 1. Height characteristics in normal children and in disabled children

Group	N	M	M%	E.Std.	C.V.%	t	P
Group 1	10	154.5	100%	1.51	3.1	1.662	0.114
Group 2	10	147.7	95.59%	3.76	8.06		
Group 1	10	154.5	100%	1.51	3.1	0.051	0.96
Group 3	10	154.7	100.12	3.62	7.41		
Group 1	10	154.5	100%	1.51	3.1	0.682	0.531
Group 4	10	148.6	96.18%	8.51	12.82		
Group 2	10	147.7	95.59%	3.76	8.06	1.329	0.2
Group 3	10	154.7	100.12%	3.62	7.41		
Group 2	10	147.7	95.59%	3.76	8.06	0.107	0.916
Group 4	10	148.6	96.18%	8.51	12.82		
Group 3	10	154.7	100.12%	3.62	7.41	0.659	0.537
Group 4	10	148.6	96.18%	8.51	12.82		

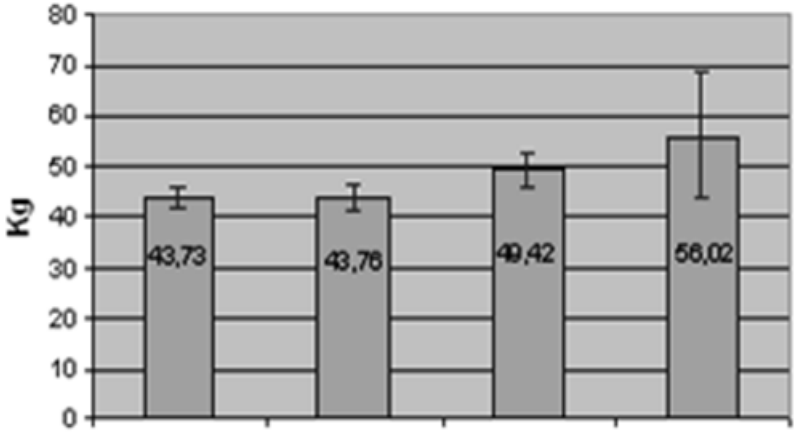
Legend: **N** – number of subjects; **M** – arithmetic mean; **M%** - percentage mean; **E. Std.** – mean standard error; **C.V.%** – variation coefficient; **t** – student test; **p** – significance threshold

Table 2. Characteristics regarding weight in normal children and in disabled children

Group	N	M	M%	E.Std.	C.V.%	t	P
Group 1	10	43.73	100%	1.91	13.85	0.027	0.979
Group 2	10	43.76	100.92%	2.79	21.45		
Group 1	10	43.73	100%	1.91	13.85	1.468	0.159
Group 3	10	49.42	113.01%	3.36	21.56		
Group 1	10	43.73	100%	1.91	13.85	0.981	0.38
Group 4	10	56.02	128.10%	12.37	49.41		
Group 2	10	43.76	100.92%	2.79	21.45	1.278	0.217
Group 3	10	49.42	113.01%	3.36	21.56		
Group 2	10	43.76	100.92%	2.79	21.45	0.961	0.386
Group 4	10	56.02	128.10%	12.37	49.41		
Group 3	10	49.42	113.01%	3.36	21.56	0.514	0.631
Group 4	10	56.02	128.10%	12.37	49.41		



Graph 1. Height: mean and standard error



Graph 2. Weight and standard error

Table 3. BMI values for the four groups

Group	Height	Weight	BMI
Group 1	154.5	43.73	18.3
Group 2	147.7	43.76	20.1
Group 3	154.7	49.42	20.71
Group 4	148.6	56.02	25.4

Discussion

Upon calculating the means for ***height***, it may be highlighted that the group of children without ID and of children with severe ID have recorded very close values: 154.5 cm and 154.7 cm, respectively (according to Graph 1). The greatest difference has been found between the group of children without disabilities (154.5cm) and the group of children with mild ID (147.7cm), namely 6.8 cm. Close values have also been found between the group of children with mild ID (147.7cm) and the group of children with Down's syndrome (148.6).

The value of the variation coefficient (*Table 1*) shows that all the four groups are homogeneous. The most homogeneous group is the one of normal children (CV=3.1%), while the highest variation coefficient is recorded within the group of children with Down's syndrome, with a value of 12.82%.

Upon analysing the t test and the values of the significance threshold ($p>0.05$) (according to *Table 1*), it may be stated that no statistically significant differences between the four groups.

After analysing *Graph 2*, concerning ***weight***, it may be noted that groups 1 and 2 have recorded very close values: 43.73 kg for the group of children without ID and 43.76 kg for the group of children with mild ID. The greatest difference was recorded between group of children without ID (43.73 kg) and the group of children with Down's syndrome (56.02 kg), the latter with a value of 12.29 kg, but the difference is statistically insignificant, for $p=0.38$.

The variation coefficient was analysed and then illustrated in *Table 2*. It may be stated that the most homogeneous one is group 1, with a VC value of 13.85%. Groups 2 and 3 are relatively homogeneous, with very close values of the variation coefficient: 21.45% for group 2 and 21.56% for group 3. Group 4 is heterogeneous from this point of view, thus recording a value of the variation coefficient of 49.41%.

After calculating the t tests and the values of the significance threshold for ($p>0.05$), it may be stated that there are no statistically significant differences between the four groups.

We have assessed the values of weight within *Graph 2*, showing that the group of children without ID and the group of children with mild ID record lower values than the two other groups featured in *Graph 2*.

We have also appraised the values of BMI (Table 3) for the four groups. It may be mentioned that the groups of children with ID have close values to the ones of children without ID, thus ranging within the limits of WHO (18.5-24.9); however, the group of children with Down's syndrome exceeds these limits, as its borderlines obesity (25.4). Whereas several research studies [11] feature increased values of the BMI, the results obtained in our measurements determine us to state that, at this age, ID does not entail significant differences in the BMI. This may be explained by the fact that our subjects live in foster care centres, and access to fast-food or other calorie-rich foods is very limited or even absent. The results of recent research [12], [13] have shown that in terms of average BMI values there are no values that exceed the threshold of normality in both children without intellectual disabilities and children with mild and severe mental disabilities, but for Children with Down syndrome studies [14], [15] show a clear exceedance of BMI.

Conclusion

- Concerning height, the highest values are recorded in the group of children with severe ID; they are also the oldest within the sample.

- Whereas the group of children with severe ID is the oldest, they have an age-specific mean of 14-15 years old; hence, it may be stated that ID has a negative influence on the growth process.
- Upon analysing the values of the weight parameter, the main conclusion to be drawn is that the group of children without disabilities the group of children with mild ID and the group of children with severe ID have close values, ranging between 43.73 Kg and 49.42 Kg, the highest value being recorded by the group of children with Down's syndrome; actually, they are characterised by mild to average obesity.
- In future research we will try to find out the relationship between BMI, food, and the number of hours of daily physical activity for these children.

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Evaluation of Health-Related Quality of Life in Rheumatoid Arthritis Patients During the COVID-19 Pandemic

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Abstract

Patients with rheumatic diseases have been affected by the isolation measures taken by the authorities due to the COVID-19 pandemic, many of them becoming physically inactive.

Purpose

This study was designed to investigate the impact of the COVID-19 epidemic on the health-related quality of life in rheumatoid arthritis (RA) patients.

Methods

A total of 14 RA patients of both sexes (mostly female – 92.86%, from urban areas – 78.57%, with an average age of 56.42±15.97 years) were recruited for this study. An online-based questionnaire was developed and participants were invited to complete it via social media. The questionnaire included demographic and socioeconomic data, health status, the condition epidemic situation and EQ-5D scale. Patients were advised to perform blood samples in order to assess serum C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR). The Disease Activity Score (DAS 28) was recorded in all subjects.

Results

In the EQ-5D questionnaire, most patients did not report any problems related to self-care (71.42%), routine activities (50%) and anxiety or depression (64.29%), only in the case of mobility (42.86%) and pain or discomfort (57.14%) did the majority report the existence of mild problems. Most patients did not have problems, except for social activities, where most (35.71%) had mild problems. Also, a number of patients presented mild problems in terms of sleep quality (35.71%) and relationship with friends (21.43%). About performing daily exercises during quarantine, most reported no problems (57.15%), but 28.57% of them reported inability to perform them.

Conclusion

The epidemic condition, generally, did not affect the patient's quality of life, probably due to its short application period. However, quite a few patients had impaired social activities, sleep quality, and relationships with friends.

Keywords: Rheumatoid arthritis, physical inactivity, mental health

Introduction

Rheumatoid arthritis (RA) is a chronic systemic inflammatory disease with unknown etiology and autoimmune pathology, characterized by destructive alterations in the joints and synovitis.

Studies on the incidence and prevalence of RA suggest variations between different populations even within the same country. It is known that RA affects 0.72% of the worldwide population and occurs more frequently in women over 40 years of age [1]. For instance, in Romania, 200 000 people suffer from arthritis, and women are three times more likely to develop RA [2].

In December 2019, the whole world was "shaken" by a viral infection of unknown etiology that emerged out for the first time in the city of Wuhan, China. The Chinese health authorities and the World Health Organization (WHO) officially announced the discovery of a novel coronavirus (SARS-CoV-2), responsible for a new form of pneumonia that was frequently fatal because of a severe acute respiratory syndrome coronavirus 2 [3].

Later this viral infection spread rapidly so that on March 27, the total global number of COVID-19 cases has surpassed 500000 according to the World Health Organization (WHO) [4].

Moreover, since December 2019 and as of 17 October 2020, 39400032 cases of COVID-19 have been reported [5].

In Romania, the first case of coronavirus (COVID-19) was confirmed on the February 26, 2020. It seems that most of the infected people came from Italy or other countries which already had a high number of infections, or had contact with person who had traveled abroad. However, in early April, 3183 cases were reported [6]. In this situation, the Romanian authorities had to implement measures of security and isolation for all population categories such as the state of emergency for 60 days declared in March and April 2020.

Since May, the emergency regime has been replaced with a state of alert. To date the COVID-19 confirmed cases reached to 168490 in Romania, the highest daily increase being reported on October 14 [6].

Patients with rheumatic diseases have been affected by the isolation measures taken by the authorities due to the COVID-19 pandemic, many of them becoming physically inactive. Imposed physical inactivity and sedentary behavior can influence physical function, bone mineral density [7] and mental health in patients with rheumatic diseases, resulting in poor quality of life.

Aim: This study was designed to investigate the impact of the COVID-19 epidemic on the health-related quality of life in RA patients.

Methods

The study was performed on a group of 14 patients with RA, mostly female – 92.86%, from urban areas – 78.57%, with an average age of 56.42±15.97 years. Patients were included in this study only if they met all of the following criteria: 1. Adults aged >27 years, 2. Definite diagnosis of RA according to the 1987 ACR criteria, 3. Disease duration for more than 1 year, 4.

Treatment with at least one or more disease modifying antirheumatic drugs (DMARDS) or biologic agents. Exclusion criteria were as follows: chronic pulmonary and kidney disease, uncontrolled diabetes mellitus or arterial hypertension, heart disease, dyslipidemia, obesity, and thyroid dysfunction.

All subjects gave their informed consent for inclusion before they participated in the study.

This study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Institutional Ethics Committee.

Clinical measurements and laboratory tests. In all subjects, the following data were collected: age, gender, area of origin, disease duration, body weight, height, and body mass index (BMI: Kg/m²). Patients were advised to perform blood samples in order to assess serum C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR). The rheumatoid arthritis activity was assessed using the Disease Activity Score 28 (DAS28). DAS28 was calculated based on ESR, tender joint count (28 joints), swollen joint count (28 joints), and the patient's assessment of global well-being (100 mm visual analogue scale). High disease activity was defined as DAS28>5.1, moderate disease activity was defined as 3.2<DAS28≤5.1, and low disease activity was defined as 2.6≤DAS28≤3.2, while remission was set as DAS28≤2.60.

To date, many qualities of life assessment instruments have been used in patients with rheumatoid arthritis [8]. In our study, all subjects completed a well-known questionnaire, a Euro Quality of Life-five-Dimensional questionnaire (EQ-5D). EQ-5D questionnaire is a preference-based HRQoL instrument with five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each of this dimension has response levels such as: no problems, slight problems, moderate problems, severe problems, and unable to/extreme problems. The scores given to the answers at the five dimensions of the questionnaire were the following: 1=no problems, 2=slight problems, 3=moderate problems, 4=severe problems, and 5=unable to/extreme problems [9]. We also calculate the index value of the EQ-5D questionnaire, with Canadian EQ-5D-5L index value [10]. A summary index with a maximum score of 1 can be derived from these five dimensions by conversion with a table of scores. The maximum score of 1 indicates the best health state, by contrast with the scores of individual questions, where higher scores indicate more severe or frequent problems. Also, to assess the quality of life in this period, we applied a questionnaire with 10 items about: daily activities, sleep quality, diet, job stability, personal learning/creation, relationship with parents, friends, partners, personal income, daily exercises. Each of these items have response levels such as: no problems, slight problems, moderate problems, severe problems and unable to/extreme problems. The scores given to each item varies from 0 (no problems) to 4 (unable to/extreme problems).

Results

Table I. Characteristics of RA patients and EQ-SD questionnaire results

Name, surname	Age (years)	Gender	Disease duration (years)	BMI Kg/m2	ESR	NAD[1]	NAT[2]	VAS[3]	DAS28	EQ-5D[4]
TF	53	F	4	31.3	20	3	0	2	3.49	0.885
MM	71	F	5	24	15	0	0	1	2.04	0.866
MM1	63	F	4	28.98	36	1	1	2	3.63	0.652
CM	40	F	3	16.2	56	6	0	3	4.6	0.866
GM	42	F	2	26.6	20	1	0	1	2.8	0.784
SD	72	F	4	28.3	4	4	4	5	3.36	0.764
CG	75	M	3	24.7	36	2	0	3	3.72	0.905
CDI	39	F	1	26.7	14	7	1	4	4.17	0.763
CEN	44	F	1	22.6	10	2	0	3	2.82	0.725
SI1	68	F	1	25	17	4	3	4	4.15	0.905

SI	79	F	1	30.13	10	3	3	6	4.38	0.763
LȘ	27	F	3	18.5	2	3	2	5	2.56	0.860
RE	56	F	4	47.9	20	3	3	6	4.04	0.243
FML	62	F	8	29.76	20	2	0	2	3.17	0.905
Mean ± SD	**56.42±15.97**		**3.14±1.95**	**27.19±7.36**	**20±14.29**	**2.92±1.89**	**1.21±1.47**	**3.35±1.69**	**3.49±0.74**	**0.77±0.17**

[1]Number of tender joints; [2]Number of swollen joints; [3]Visual analogue scale (0-10); [4]Euro Quality of Life-five-Dimensional questionnaire

Table II. EQ-5D questionnaire (questions 1 to 5)

	Mobility n (%)	Self-care n (%)	Usual activities n (%)	Pain/discomfort n (%)	Anxiety/depression n (%)
No problems	5 (35.71)	10 (71.42)	7 (50)	-	9 (64.29)
Slight problems	6 (42.86)	2 (14.29)	5 (35.72)	8 (57.14)	4 (28.57)
Moderate problems	2 (14.29)	2 (14.29)	1 (7.14)	5 (35.72)	1 (7.14)
Severe problems	1 (7.14)	-	1 (7.14)	1 (7.14)	-
Unable to/extreme problems	-	-	-	-	-

In the EQ-5D questionnaire, most patients did not report any problems related to self-care (71.42%), routine activities (50%) and anxiety or depression (64.29%), only in the case of mobility (42.86%) and pain or discomfort (57.14%) did the majority report the existence of mild problems (Table II). Regarding the questionnaire about the epidemic condition, most patients did not have problems, except for social activities, where most (35.71%) had mild problems. Also, a number of patients presented mild problems in terms of sleep quality (35.71%) and relationship with friends (21.43%). About performing daily exercises during quarantine, most reported no problems (57.15%), but 28.57% of them reported inability to perform them (Table III). The mean ±SD scores recorded at the EQ-5D questionnaire, for the study group was: mobility – 1.92±0.91, self-care – 1.42±0.75, usually activities – 1.71±0.91, pain/discomfort – 2.5±0.65, and for anxiety/depression – 1.42±0.64.

Table III. The quality of life questionnaire results in the quarantine period

	Question 6 n (%)	Question 7 n (%)	Question 8 n (%)	Question 9 n (%)	Question 10 n (%)	Question 11 n (%)	Question 12 n (%)	Question 13 n (%)	Question 14 n (%)	Question 15 n (%)
No problems	4 (28.57)	8 (57.15)	11 (78.57)	11 (78.57)	11 (78.57)	9 (64.29)	10 (71.43)	10 (71.43)	11 (78.57)	8 (57.15)
Slight problems	5 (35.71)	5 (35.71)	1 (7.14)	-	2 (14.29)	1 (7.14)	3 (21.43)	1 (7.14)	1 (7.14)	1 (7.14)
Moderate problems	-	1 (7.14)	2 (14.29)	1 (7.14)	1 (7.14)	1 (7.14)	-	-	2 (14.29)	1 (7.14)
Severe problems	2 (14.29)	-	-	-	-	-	-	-	-	-
Unable to/extreme problems	3 (21.43)	-	-	-	-	-	1 (7.14)	1 (7.14)	-	4 (28.57)
Comments				2 patients were retired		3 patients had their parents dead		1 patient was unmarried, 1 patient was a widower		

Legend: Q6 – daily activities, Q7 – sleep quality, Q8 – diet, Q9 – job stability, Q10 – personal learning/creation, Q11 – relationship with parents, Q12 – relationship with friends, Q13 – relationship with partners, Q14 – personal income, Q15 – daily exercises

Table IV. Pearson (r) correlation values between test results, age, BMI, ESR

	NAD	NAT	VAS	DAS28	ESR	BMI
ESR	0.11892	-0.46987	-0.35929	0.45696	-	-0.1653
BMI	-0.13379	0.37302	0.32233	0.20805	-0.1653	-
Age	-0.33257	0.30094	0.06674	0.14935	-0.00437	0.31268
EQ-5D	0.02147	-0.39051	-0.4465	-0.19963	0.0586	-0.78095

After comparing the results obtained by the patients on the NAD, NAT, VAS and DAS28 questionnaires with ESR, BMI and their age, using the Pearson correlation coefficient (r), no correlation was found, or discovered only slight negative correlations, except for the comparison of BMI with the results of the NAT and VAS questionnaires, where the existence of some slight positive correlations was discovered (r=0.37302, respectively r=0.32). Also, a slight positive association was found between the age of the patients and the BMI score, respectively between the age and the results of the NAT questionnaire (r=0.31, respectively r=0.30).

The Pearson correlation test highlighted the lack of correlation between the NAD and NAT outcomes, respectively between the NAD and EQ-5D, and EQ-5D and DAS28 results; at the same time, there were slight positive correlations between the values obtained in the NAD and VAS questionnaires (r=0.48), NAD and DAS28 (r=0.69), as well as between the results of the NAT and VAS (r=0.82894), and between DAS28 and VAS (r=0.48). A slight negative correlation was found between the results of EQ-5D and NAT questionnaires (r=-0.39), and respectively between EQ-5D and VAS questionnaires (r=-0.44).

Discussions

Currently, there are few data available from the literature on coronavirus effects on quality of life (QoL) in patients with rheumatoid arthritis. However, there are several studies that demonstrate the negative impact of the SARS-CoV2 pandemic on the QoL in RA patients.

Factors that may be associated with the poor QoL of RA patients have been extensively investigated. Studies have linked QoL to socioeconomic status, psychological factors, physical activity, and adherence to therapy [11], [12], [13]. In our study, the epidemic condition, did slightly affect the patient's quality of life, probably due to its short application period.

In accordance with other studies, we used the EQ-5D questionnaire to evaluate the health quality of life [14]. Moreover, in a 2019 study HRQoL was applied to evaluate a group of 464 patients with RA, using the Thai version of EQ-5D questionnaire and EQ VAS (EQ global health visual analogue scale). Similarly, to our study group, the majority of patients were female (85% versus 92.86% in our study), with a mean age of 59.15±11.43 years (56.42±15.97 years in our study) [15]. Also, the results of the EQ-5D questionnaire showed that most patients had no difficulties with self-care (83% versus 71.42% in our study), usual activities (65% versus 50%) and had no anxiety or depression (61% versus 64.29%). Although, in terms of mobility, the percentages were similar (49% versus 42.86% in our study), most of our patients had mild problems with the mobility.

Our patients had, in majority (57.14%) mild pain/discomfort problems, comparative with 30% reported by Katchamart W. *et al*. The mean index score of the EQ-5D questionnaire obtained in our study is similar to others in literature (0.77±0.17 in our study, and 0.70±0.26 in a Korean study, and 0.76±0.18 in a Japanese study) [16, 17].

Though the quality of evidence in the available literature is relatively low, it still contains numerous valuable observations and suggestions for all professionals working in this field, whether they are healthy persons [18] or patients with chronic rheumatic diseases [13-17].

Limitations of our study: Small number of patients because of lockdown reasons, the lack of data from the period that preceded the pandemic lockdown, evaluation of long-term results and the lack of a control group.

Conclusions

RA patients had a quality of life slightly influenced by isolation conditions, as there were no assessments before and during the pandemic, and probably due to its short application period.

However, quite a few patients had impaired social activities, sleep quality, and relationships with friends. Also, we found a slight positive association between the age of the patients and the BMI score, and NAT; between NAD and VAS, NAD and DAS28, as well as between NAT and VAS, DAS28 and VAS.

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The Effect of Physiological Hormonal Changes of the Menstrual Cycle on Athletic Performance – a Systematic Review

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Abstract

The physiological hormonal changes specific to the menstrual cycle produce a series of modifications in various apparatuses and systems of the female body which can influence the physical performance. The objective of this study was to analyse how the parameters of the athletic performance are influenced by the menstrual cycle in eumenorrheic women. Our research followed the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses; keywords such as "menstrual cycle", "athletic performance", "female sex hormones" were used for searching in several databases and, after taking into account several inclusion and exclusion criteria, the main results were related to the influence of the menstrual cycle over the elements involved in athletic performance, such as heart rate, pulmonary ventilation, VO_2 max, thermoregulation, strength, relaxation rate, fatigability, metabolism, lactate concentration, bodyweight, plasma volume, the hematocrit and hemoglobin concentration, injury rate and ligament laxity, and also on the psychological state. The most relevant changes related to physical performance in eumenorrheic women are in the energetic substrate metabolism, the basal body temperature and the pain threshold; were also found a decadence of performance in a hot and/or humid environment, an injury incidence variability (primarily related to ligament laxity) and also, changes in mood, arousal and cognition. The main conclusion reached was that each woman is different and the focus should be at an individual level, when we refer to how athletic performance is affected by menstrual cycle, but also on the reactions of the body to the myriad of physiological and endogenous changes.

Keywords: menstrual cycle, athletic performance, female sex hormones

Background

The female reproduction cycle is one of the most important biological rythms [1]. The female body is constantly changing due to endogenous sex steroid hormones [1-3]. Both recurring or ocasional activities in a woman's life are influenced by the menstrual cycle (abbr. MC) phase that dictates physical and psychological condition. The possible fluctuation of the athletic performance because of the MC has been investigated for a long time now [4], but measurements of the endocrin function such as hormone ones have been incorporated only lately [5]. Studies have shown that the estrogen influences the cardiovascular system (blood pressure, heart rate, vascular function), the metabolism or even the brain. On another hand side, the progesterone and the progestatives affect the thermoregulation, the pulmonary ventilation and the substrate

metabolism. The progesterone/estrogen ratio change could affect important elements of the athletic performance – but aerobic and anaerobic capacity, aerobic and anaerobic endurance, muscular strength was studied only to a lesser extent [1] (0).

When studying the effects of the hormonal variations, either because of the endogenous or the exogenous factors, the randomized clinical studies are the ones that can offer the best proofs for how the athletic performance could be modified by these variations, because case reports or case series or cross-sectional surveys do not offer too much information and cannot be generalized on a larger scale; also, retrospective case studies are prone to subjectivity and other prejudice, and the prospective ones can only be followed for a certain amount of cycles [1]. The accurate verification of MC phase is vital in testing the effects of that certain phase. The verification methods focus on the ovulation day, an important factor in order to exclude the luteal phase deficiency (abbr. LPD) cycles and the anovulatory ones from the research [2].

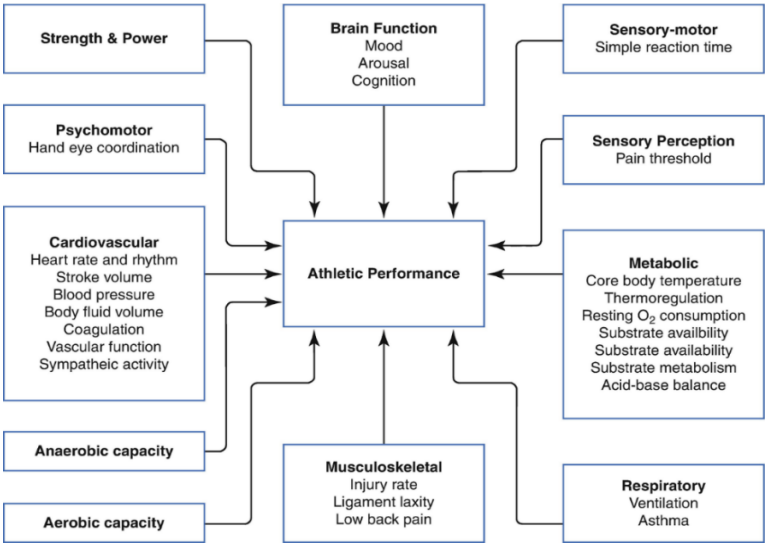


Fig. 1. Athletic performance components that can be influenced by endogenous hormones shift during the MC [5]

Objective

The objective of this study was to analyse how the parameters of the athletic performance are influenced by the MC in eumenorrheic women, and the assessment of the factors that could be modified in order to diminish the negative effects of hormonal variation, presuming that the physical activity of an eumenorrheic woman is negatively influenced by the hormonal variations throughout the MC.

Methods

The PRISMA group methodology was followed prior to this review. The scientific material for the present study has been selected accessing databases such as: Google Scholar, ResearchGate, PubMed, and specialized web-sites such as NCBI, Springer, Nature. Among the keywords used were: “menstrual cycle”, “performance”, “physical performance”, “female sex hormones”, “estrogen”, “progesterone”, “sports”, and so were identified records out of which a final number of 23 articles have been selected. The eligibility criteria included: the objective evaluation of MC phases as part of methodology of the studies by monitoring the concentrations

of the female sex hormones; to be written in English or Romanian and after 2000; to have authentic bibliographic references.

Results

Methodological Considerations Considered During the Menstrual Cycle Research

Our study focuses on research that verify the MC phase through measurements of estrogen and progesterone levels, preferably from serum. It is known that the old methods are prone to error: counting back the days does not exclude the anovulatory or LPD cycles [2, 6]; the measurement of BBT does not offer any info on hormones levels, plus the corelation between the rising temperature and the progesterone level might be low [1, 2, 7, 8]; the LH concentration in the urine predicts that ovulation will occur during the next 14-26 hours, a large interval and an accuracy up to 95% [2, 9]; the measurement of hormone concentrations from saliva or urine are both impractical and not fully accurate [1, 2]. Timing of testing and the moment of the day are very important, because of the pulsatile secretion of estrogen and progesterone, as well as to point out the hormones levels and the exact day of the MC the testing refers to [1, 2, 10]; the testing should be done at rest because physical exercise exerts a raise in estrogen and progesterone levels; even so one could miss the rapid fluctuation of the reproductive and pituitary hormones [2, 11-13]. The ratio between the progesterone and estrogen gives us extra info regarding the synergistic effects of the two, mainly in the mid luteal phase, when high concentration levels of both of them are found [2, 14].

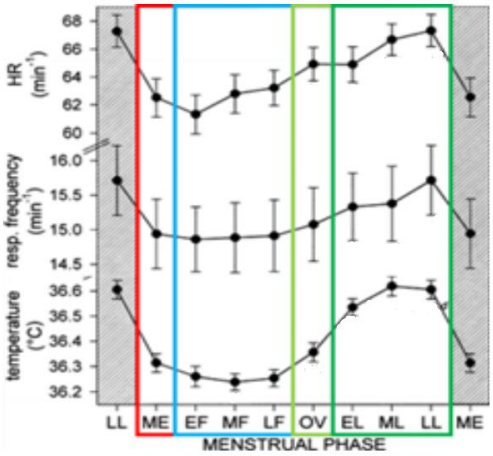
The menstrual cycle and VO2max

The physiological parameters involved in VO_2 max show the availability of the substrate energy, blood circulation and pulmonary ventilation. The fact that the VO_2 max is expressed in mL/kg/min reminds us that any change in the body weight as a result of the potential changes in fluids throughout the MC might affect VO_2 max as well. The fluids also influence the plasmatic volume and haemoglobin concentration, which in return affect blood capacity to transport O_2.

The changes in plasmatic volume can negatively impact the heart rate, a major parameter of the cardiac performance, and therefore a rise in the need for ventilation may occur in order to deliver the necessary oxygen to the lungs [2]. But the studies did not bring up any significant changes in the VO_2 max during the MC [2, 6, 15].

Cardiovascular and respiratory system. Thermoregulation

During the MC, the estrogen fluctuation determines changes in the blood volume, phenomena that can influence the heart rate. The pulmonary ventilation also fluctuates, but it depends on progesterone levels, both at rest [16, 17] or during the effort [18, 19]. Temperature fluctuation throughout the MC affects both heart rate and respiratory frequency (Fig. 3) [22, 23]. Therefore, it becomes very important to pay attention to it when exercising in hot and/or humid environments [22-25].



Legend:
In red
ME – menstrual phase

In blue – follicular phase
EF – early follicular
MF – mid follicular
LF – late follicular

In yellow
OV – ovulation phase

In green – luteal phase
EL – early luteal
ML – mid luteal
LL – late luteal

Fig. 2. Heart rate (*HR*), respiratory (*resp.*) frequency, and BBT during the 8 phases of the MC (mean values) [26]

The metabolism and blood lactate

The availability of the substrate energy is determined by the food intake and by its storage and mobilization capacity, which in turn might affect the blood lactate responses to exercise. The raised estrogen level supports the metabolism by utilizing the fatty acids prior to the glycogen stores, which enhances women's ability for ultra-endurance exercise [1, 16, 27]. The change in bodyweight is rather an expression of changes in the distribution of fluids in the body than an absolute fluid retention or excretion [2, 28].

Characteristics of skeletal muscle contractility

The findings are conflicting due to methodological shortcomings, but some of the ones that have tested the women accordingly with the female sex hormones concentrations during different moments of the MC have found no systematic changes in strength or fatigability value over the MC [2, 29-35]. It's very important to mention that not even the best trained individuals do not have the capacity to control to the fullest the neural activation of their maximal muscular capacity, therefore the maximal neural activation through electrical stimulation becomes particularly important when comparing strength values over such a long period as the MC [2].

Injury incidence variability, primarily related to ligament laxity

Data collected from ball sports, running and military training suggests that women have an injury rate up to ten times higher than men [36] and that the female sex hormones affect the anatomical and biomechanical factors, the ligaments laxity (mainly the anterior cruciate one) and the neuromuscular control. Therefore, many more accidents happen during the follicular phase than the luteal one, and lots of them happen during the ovulation phase [1, 37-39].

Psychological state

Constantini *et al*., (2005) cites the specialty literature on the behavioral nature of man and says that there seems to be a connection between estrogen and different cognitive aspects and cognitive performance [40], that estrogen and testosterone have opposite effects on cognition [41], while progesterone seem to have a negative and sedative impact [42]. It's postulated that the elevated estradiol during the luteal phase results in lower performance of spatial abilities [43]. However, these studies base their research on calendar estimates of the MC phases, therefore they may be only conjectural conclusions, while the studies using MRI in conjunction

with measurements of the steroid sex hormone levels may bring up a better association between the neuropsychological parameters and the MC phases [1].

Aerobic capacity and aerobic endurance

Even though the effects of female sex hormones on metabolism could affect the aerobic endurance, the studies have not reached this conclusion. The variety of protocols used, from incremental to steady-state exercise, using different percentage of aerobic capacity, power vs endurance tests and the standardization of variables such as the moment of the day, diet, motivation and psychological factors [1], lead to a large amount of data that could be confusing to interpret. On top on this confusion we can also add that the number of participants in case studies ends up being very small; the selected females, after their willing consent are checked for a regular physiological MC, to exclude the non-physiological cycle lengths, anovulatory and LPD cycles, exclude the use of contraception, completely different types of testing etc. [44].

Anaerobic capacity and anaerobic endurance

Tested by comparing the neccessary time used until the ATP stores in the muscles are used, through maximal effort test, force-velocity and multi jump tests, the anaerobic capacity doesn't reveal any modification during the MC [1], even though there are studies that have shown that the presence of PMS symptoms may affect flexibility or that there could be a greater anaerobic capacity during the luteal phase [45, 46]. But it's exciting that technology brings greater possibilities to visualize muscle tissues through NMR spectroscopy that will support more detailed studies on metabolism throughout the MC.

Overall, the comparison of athletic performance measured during the follicular phase with the other phases of the menstrual cycle does not reveal any significant changes [47].

Conclusion

Tabú in society, controversed throughout the specialty literature, the subject of the effect of MC and its physiological hormonal changes on athletic performance will be unexhausted for a long time; the multitude of difficulties and limitations that rise up throughout the study seem to make the subject hard to be understood. But once we become aware of these limitations, the science and technology through which they will be overlooked will be developed.

Until then, the individual approach of using a journal for monitoring training capacity and performance and, by doing so, the modifications induced by female sex hormones, is a good option because the effects of the MC on different aspects of athletic performance most probably vary from one to another, except the established decadence of performance in a hot or humid environment and the ligament laxity and accidents incidence rate variation during the MC.

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Relationship Between Smartphone Addiction and Physical Activity Among Students in Timișoara

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Abstract

Introduction

The use of mobile devices and the internet has increased during the past decade. The smartphone has become an indispensable tool among teenagers. Nowadays, socialising face to face gave way to a better alternative. Time spent online on smartphones has many advantages, it offers one the possibility to stay in touch either with other people across continents or with people that are not so far. Although, socializing can be made much easier online. Also, it has many disadvantages due to the fact that this kind of time spending contributes to a sedentary lifesyle caracterized by a lesser time spent on physical activity (PA).

Aim

The aim of the study was to establish the level of smartphone addiction, the level of physical activity and the evalaution of Body Mass Index (BMI) among the students from West University of Timisoara (WUT) and to identify the relationship between the three variables.

Hypothesis

Students who spend more time using a smartphone will have lower levels of physical activity.
There is a difference in smartphone addiction between male and female students.

Material and methods

The research was carried out from October till December 2019.A total of 369 students were asked to participate in this study, 213 females and 156 males. The questionnaires were distributed during the physical education classes. The assessment of the smartphone addiction was performed using SAS-Smartphone addiction scale. For assessing the physical activity level, we used the Godin-Shephard Leisure-Time Physical Activity Questionnaire (GSLTPAQ). The results obtained after applying the questionnaires were analyzed using Microsoft Excel® and IBM® SPSS® Statistics V25.

Results

No relationship was found between the physical activity score and the smartphone addiction score ($r=0.006$, $p=0.91$). However, there is a slight, negative correlation between BMI and the number of hours spent using the smartphone on weekends ($r=-0.11$, $p=0.03$). A stronger correlation was found between the smartphone addiction score and the number of hours of smartphone use per week ($r=0.29$, $p<0.001$) and on weekends ($r=0.36$, $p<0.001$). At the same time, the number of hours spent using the smartphone during the week correlated with the hours

of use on the weekend ($r=0.75$, $p<0.001$). Significant differences have been found for SAS, male averaging 83.11 and females 89.21 ($p<0.05$). Significant statistical differences between the BMI means of male and female students ($p<0.001$) was found. The mean value found for males was 21.88 whilst females had an average BMI of 23.55.

Conclusions

Our study did not reveal any association between SAS and physical activity among students in WUT. However, we found a moderate correlation of BMI and the hours spent on the smartphone on the weekend. The study concluded that the usage of smartphones, regardless of the purpose, leads to less involvement in physical activity.

Keywords: students, physical activity, smartphone, addiction, SAS

Introduction

The use of mobile devices and the internet has increased during the past decade. "Latest developments in digital technology have changed the current cell phones from a device of single feature to a multi-feature gadget with proficiency comparable to a web-compatible computer" [1]. Considering this transformation, people have started to use, more often, all kinds of gadgets and the internet. The smartphone has become an indispensable tool among teenagers and students across the world [2].

According to ITU (International Telecommunications Union)'s (2009) report, mobile phones are the most common and widespread personal technology worldwide [3]. Nowadays, socialising face to face gave way to a better alternative and that is socialising online. Time spent online on smartphones communicating with others or only searching/watching different topics has many advantages. It offers ones the possibility to stay in touch with other people across the continents or who live nearby and it provides easier access to information, too. Although, socializing can be made much easier online, it has many disadvantages because this kind of time spending contributes to a sedentary lifestyle associated with less physical activity (PA) [4].

In a more recent study, Fennell *et al*., (2019) revealed that cell phone/smartphone usage is seen as a major contributor to sedentary behaviour toghether with watching TV or using the computer. They say that this type of behaviour cuts down the time allocated to physical activity [5]. Due to the fast development and accessibility of the internet and smartphones, people become more addicted to the virtual media, which adds a lot of changes in day by day life [6].

"Addiction is currently defined as a behavior over which an individual has impaired control with harmful consequences" [7].

Smartphone addiction is consuming most of one's time, preventing people from having a healthy lifestyle and contributing to a sedentary one which has negative influence also on personal physical fitness.

Material and methods

The research was conducted during the physical education classes carried out within October-December 2019. 369 students from WUT (213 females and 156 males) have been included into the study after they agreed to participate by compleating an informed consent form that respects all the GDPR regulations. The smartphone addiction was assesed by analyzing the self reported formobtained by completing a Smartphone addiction scale (SAS) consisting of 6 factors and 33

items, with a six-point Likert scale (1: “strongly disagree” and 6: “strongly agree”) [8]. For assessing the physical activity level, the Godin-Shephard Leisure-Time Physical Activity Questionnaire (GSLTPAQ, developed by Godin and Shephard in 1985) has been used [9]. It was developed to classify physical activities/exercises performed by adults and to determine their activity levels. Activities were classified into three subgroups, including “strenuous,” “moderate,” and “light”. The frequency and type of activities/exercises performed weekly by individuals were used as criteria while calculating individuals’ physical activity/exercise score in the questionnaire: total score = (9 × Strenuous) + (5 × Moderate) + (3 × Light) [10]. Height and weight were requested for determining the body mass index BMI. Lastly, the students were asked to provide information regarding time spent using the smartphone during the week (HPW) and during the weekend (HPWE).

The results obtained after applying the questionnaires were analyzed using Microsoft Excel® and IBM® SPSS® Statistics V25. The results were expressed as mean valeues±standard deviation (SD). The statisitical analysis was performed by independent samples t-test and values of $p<0.05$ were considered statistically significant.

Results

SAS values had a mean of 86.63 (SD=19.48). The GSLTPAQ score averaged at 49.86 (SD=22.96). The BMI ranged from 17 to 34 with a mean value of 22.59 (SD=3.66). Students reported an average of 24.07 HPW (SD=14.83) and 8.86HPWE (SD=6.27) using the smartphone which means they are spending more time online during the weekends. We have compared the means for both males and females on SAS, GSLTPAQ and BMI using the independent-samples T-Test. Significant gender related differences have been found for SAS (male averaging 83.11±19.314 *vs.* females 89.21±19.240, $p<0.05$) (Table 1) and also for BMI means (male: 23.55±3.513 vs female:21.88 kg/m 2±3.609, $p<0.001$). The mean value found for males was whilst females had an average BMI of Table 1.

Table 1. SAS, GSLTPAQ and BMI Independent samples T-Test

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
SAS	Equal variances assumed	.095	.758	3.003	367	.003	6.098	2.031	2.104	10.091
	Equal variances not assumed			3.001	333.409	.003	6.098	2.032	2.100	10.095
GSLTPAQ	Equal variances assumed	.591	.442	-.422	367	.673	-1.023	2.423	-5.788	3.741
	Equal variances not assumed			-.425	341.158	.671	-1.023	2.409	-5.761	3.714
BMI	Equal variances assumed	.207	.649	-4.450	367	.000	-1.673	.376	-2.413	-.934
	Equal variances not assumed			-4.468	339.098	.000	-1.673	.374	-2.410	-.937

Table 2. SAS, GSLTPAQ and BMI Group statistics

Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
SAS	Female	213	89.21	19.240	1.318
	Male	156	83.11	19.314	1.546
GSLTPAQ	Female	213	49.43	23.362	1.601
	Male	156	50.46	22.477	1.800
BMI	Female	213	21.88	3.609	.247
	Male	156	23.55	3.513	.281

No relationship was found between the physical activity score and the smartphone addiction score (r=0.006, p=0.91). However, there is a slightly negative correlation between BMI and time spent using the smartphone on weekends (r=-0.11, p=0.03). A stronger correlation was found between the smartphone addiction score and the number of hours of smartphone use per week (r=0.29, p<0.001) and on weekends (r=0.36, p<0.001). At the same time, the number of hours spent using the smartphone during the week correlated with the hours of use on the weekend (r=0.75, p<0.001). Table 3.

Table 3. Correlations between BMI, GSLTPAQ, SAS, HPW and HPWE

Correlations

			BMI	GSLTPAQ	SAS	HPW	HPWE
Spearman's rho	BMI	Correlation Coefficient	1.000	-.073	.015	-.093	-.112*
		Sig. (2-tailed)	.	.163	.779	.074	.031
		N	369	369	369	369	369
	GSLTPAQ	Correlation Coefficient	-.073	1.000	.006	-.080	-.063
		Sig. (2-tailed)	.163	.	.913	.126	.227
		N	369	369	369	369	369
	SAS	Correlation Coefficient	.015	.006	1.000	.299**	.361**
		Sig. (2-tailed)	.779	.913	.	.000	.000
		N	369	369	369	369	369
	HPW	Correlation Coefficient	-.093	-.080	.299**	1.000	.750**
		Sig. (2-tailed)	.074	.126	.000	.	.000
		N	369	369	369	369	369
	HPWE	Correlation Coefficient	-.112*	-.063	.361**	.750**	1.000
		Sig. (2-tailed)	.031	.227	.000	.000	.
		N	369	369	369	369	369

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Discussions

There was no relevant correlation found between smartphone addiction score and GSLTPAQ values. It seems that the subjects had difficulties in identifying the types of subgroups, "strenuous," "moderate," and "light," although examples were provided in the items.

The study was performed to evaluate the relationship between physical activity, smartphone addiction and body mass index. The mean and standard deviation of SAS was 86.63 (SD=19.48).

The GSLTPAQ score averaged at 49.86 (SD=22.96). The BMI ranged from 17 to 34 with a mean value of 22.59 (SD=3.66). The average tells us that the students of West University of Timisoara are spending 24.07 h/week, and 8.86 h/weekend.

Results revealed no significant relationship between physical activity score and the smartphone addiction score ($r=0.006$, $p=0.91$). While our study did not find a relationship between PA and smartphone use among WUT students, there is still room for concern. Similar results, regarding no relationship of smartphone use to physical activity, was found in college students in a Midwestern US university with a variety of majors [11], and in a study led by Penglee *et al*., in 2019[12].

However, a sedentary lifestyle leads to the concern that time spent on smartphones contributes to this matter. Also, research supports the claim that use of a smartphone during physical activity may lead to reduced intensity of physical activity [13, 14]. It seems that students need a better education and practice regarding both physical activity and nutritional habits in order to maintain a healthy, qualitative lifestyle as Mirică et. al. concludes in a 2019 study [15].

A stronger correlation was found between the smartphone addiction score and the number of hours of smartphone use per week ($r=0.29$, $p<0.001$) and on weekends ($r=0.36$, $p<0.001$). At the same time, the number of hours spent using the smartphone during the week correlated with the hours of use on the weekend ($r=0.75$, $p<0.001$). The addictive use of smartphones is linked with obesity, musculoskeletal problems, poor sleep, memory and concentration problems among the youth [16, 17]. Consequently, smartphone usage leads to a low cardio-respiratory fitness, raising levels of obesity, higher fat mass, and a lower muscle mass [18].

Conclusion

Our study did not reveal any association between SAS and physical activity among students in WUT. However, we found a moderate correlation of BMI and the hours spent on the smartphone on the weekend. The study concluded that the usage of smartphones, regardless of the purpose, leads to less involvement in physical activity.

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The Development of a Biofeedback-Based System Used in Boxing Training

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Abstract

Sensors are a way for coaches to collect data related to certain aspects of athletes' condition or performance. In order to be able to monitor specific boxing training, we set out to develop a system to monitor the number of punches delivered in the punching bag and heart rate. This system consists of a microcomputer, triaxial accelerometer and heart rate monitor sensor. In order to be able to transmit the information to user, the raw data is recorded using software that excludes punches that do not exced the default acceleration written in the system software. The binary research method was used to determine the optimal acceleration and time required to record punches so that the system can exclude transmiting incorrect information to user. Errors are rendered by false positive punches that represent the recording of a greater number of stikes than those delivered or false negative punches represented by the number of unrecorded strikes.

Thus, a time interval of approximately 50 ms was determined following the tests carried out at an acceleration threshold of approximately 28. The system proposed by us, can render real-time information related to the number of punches transmitted in the punching bag, heart rate and can also generate a score depending on the effort. However, there are certain aspects that require further research in order to optimize the system and apply it into the boxing gyms.

Keywords: Innovation, technology, boxing

Introduction

With the evolution of humanity, the implementation of new regulations and protective measures have emerged in this world of contact sports and technology, starting from the technology implemented in equipment manufacturing, reaching to combat simulators with virtual partner or smart boxing bag [1].

From a meta-analysis [2] published in 2019, we can see an upward trend over the last 15 years in terms of interest in the development of new technologies in contact sports. However, the number of publications is relatively low comparing them to research in other fields.

A wide range of technologies have been used so far with which a large number of data have been recorded (arm speed, strike power, etc.) [3, 4].

With the help of data collected by these sensors, coaches can model and guide athletes, even intervene on training routine in real time. Thus, it was introduced into training and fitness the feedback. The efficient functioning of any system – electrical, physiological or social – depends on the reception of information on its performance. The way to provide the system with information about the initial action is called feedback. Similarly, all learning processes depend

on knowledge of the results. Practice can become perfection only if the individual is aware of how well he performs certain actions [5].

Materials and methods

In order to monitor boxing-specific training, we set out to build a system consisting of a Raspberry PI 3 microcomputer, an ADXL345 accelerometer and a Heart Rate monitor H603B pulsmeter (Fig. 1). The name Raspberry Pi is given to technical components assembled in the form of microcomputers SBC (single board computers). The microcomputer equiped for bluetooth and wireless connectivity runs using a 32-bit operating system (Raspbian).

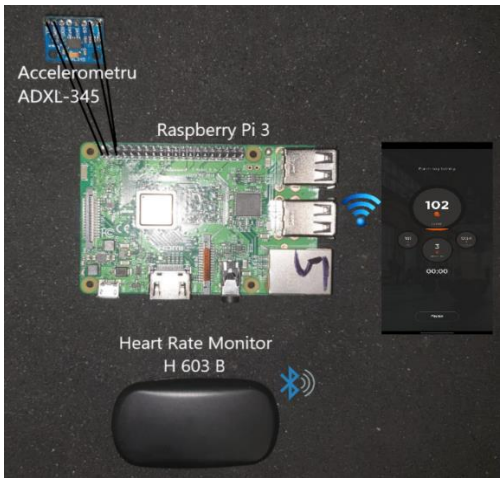

Fig. 1. Components of the monitoring system

ADXL345 is a triaxial accelerometer, a powerful analogical-numerical converter that can measure accelerations of up to 16g. Data collected by the sensor can be accessed using a serial SPI (serial peripheral interface). This accelerometer has the ability to measure both static and dynamic acceleration – resulting from the printing of a force or impulse – and also the changes in inclination that start from angles of one degree.

Portable devices for assessing heart rate and their accuracy have been evaluated in numerous studies [6, 7, 8]. Within the experiemnt a H603B sensor equipped with ANT+ wireless communication function (interoperability) and Bluetooth has been used. Products that have an ANT+ function are compatible with each other and have the ability to communicate information taken up by a sensor and processing them.

Connectivity between these sensors is achieved through a program written in a programming language (Python 3). The accelerometer records the static acceleration of the bag, and with the developed software, it records the dynamic accelerations delivered by the fist to the bag, after a punch. At the same time, the heart rate monitor records the frequency twice a second and transmits it to Raspberry Pi. The microcomputer collects the data and processes it. The prcessed data are further sent to a virtual cloud from where they will be transmited on the mobile screen throught an application for Android or IOS. The user can track, in real time, the number of punches delivered in the punching bag, as well as the achieved score (a value resulting from the calculation of the difference between the static and the dynamic acceleration of the bag during a strike) and also the heart rate.

Location of the equipment in the punching bag. In order to collect the most accurate data, the accelerometer was placed in various areas of the punching bag. Thus, after numerous attempts it was decided that the accelerometer should be placed at the base of the bag, while the microcomputer at the opposite end. False punches can be false positive when a higher number of executions is transmitted in the application than the number of actual punches, or false negative executions in situations of transmitting a smaller number than those executed. This decision was taken in order to limit the recording of false data (false punches) that may appear due to bag oscillations, as well as avoiding overheating of the microcomputer.

System software architecture. For the management of information gathered from the accelerometer and pulsmeter, a backend infrastructure has been written. They collect the information and pass it on through the aggregation service to the application programming interface (API). The accelerometer backend communicates with API with a 600 times per second rate (600Hz polling rate) and analyzes the collected data within a predetermined time frame of 58.33ms. The transmited information through the API is further processed in a virtual storage space (processing Module) and filtered by a database (Business DB). This proccess is followed by the processed data transmition to the user (Fig. 2).

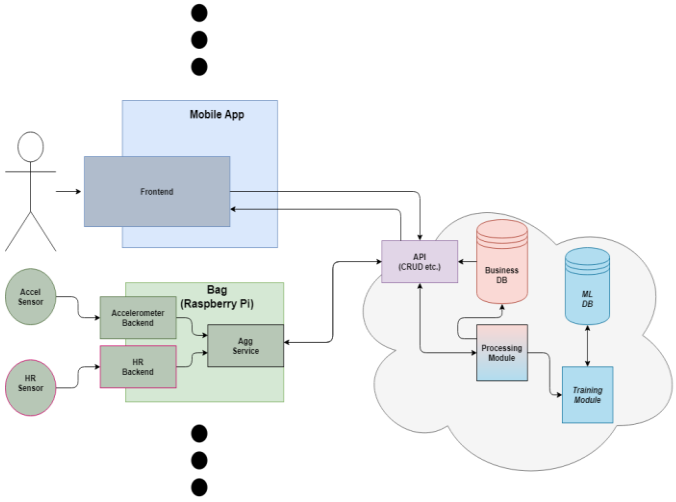

Fig. 2. System architecture

As the Fig. 3 showcased show, we have found a reference value for the lower limit of our compound synthetic metric A. Since different types of punches are triggering different values on our tri-axis accelerometer, we chose to create this synthetic metric for pragmatic concerns.

Therefore, instead of using triples of x, y, z acceleration values we compute the total acceleration as follows:

- let us first consider the resulting acceleration value on the x-z plane (a_{xz}): $\sqrt{(a_x^2 + a_z^2)}$
- the resulting acceleration can be thought of as being in the same plane as the acceleration component on the axis that was left out in the previous computation, namely a_y
- similarly, to the first step, we can now compute the resulting acceleration value on the previously mentioned plane: $\sqrt{(a_y^2 + a_{xz}^2)} = \sqrt{(a_y^2 + (\sqrt{(a_x^2 + a_z^2)^2}))} = \sqrt{(a_x^2 + a_y^2 + a_z^2)}$, which for our purposes can be decoupled from any unit of measure. Having accomplished this, we have then found the previously mentioned minimum threshold for which the system behaves reasonably, that is to say, that relatively weak punches are detected and the bag movement is ignored. Through empirical means we have found the value of said

threshold that best suits our system via a simple method similar to a binary search. By incrementing the value of this threshold, we have been able to isolate it around 27-28. We have to keep in mind that this threshold only makes sense in the context of our system, with specific constraints such as, but not limited to, the accelerometer sensor we are using, the punch bag density and weight, etc.

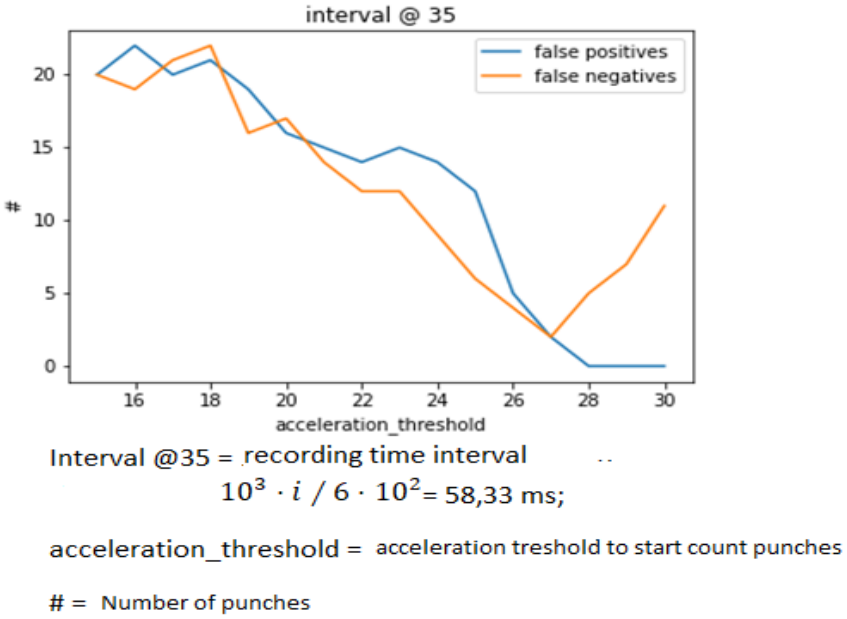

Fig. 3. Determination of the recording interval and acceleration threshold

Test protocol. Following the determination of the values, for the writing of the algorithm, the testing of the system has been performed. The testing protocol consisted of 30 punch combination, totaling 80 strikes which were carried out as follows: ten single punches, ten combination of two punches, ten combination of five punches. Table 1 depicts the results obtained within the testing protocol.

Table 1. System testing protocol

		Single punches	Double punches	Five punches
Boxing bag 1	Initial heart rate	80 bpm	81 bpm	79 bpm
	Final heart rate	120 bpm	140 bpm	153 bpm
	False pozitive	0	0	0
	False negative	0	0	2
Boxing bag 2	Initial heart rate	75 bpm	69 bpm	72 bpm
	Final heart rate	125 bpm	138 bpm	149 bpm
	False pozitive	0	0	0
	False negative	0	0	1
Boxing bag 3	Initial heart rate	68 bpm	71 bpm	70 bpm
	Final heart rate	129 bpm	136 bpm	144 bpm
	False pozitive	0	0	0
	False negative	0	0	2
Boxing bag 4	Initial heart rate	77 bpm	77 bpm	80 bpm
	Final heart rate	118 bpm	134 bpm	144 bpm
	False pozitive	0	0	0

	False negative	0	0	0
Boxing bag 5	Initial heart rate	75 bpm	80 bpm	80 bpm
	Final heart rate	120 bpm	131 bpm	133 bpm
	False pozitive	0	0	0
	False negative	0	0	3

In the case of single or double punches the system did not record any false positive or false negative punches. Instead, in the case of five punches combination it has been found that some false negative punches were not sent into the application. Analyzing the raw collected data, it could be seen that those false negative punches did not exceed the acceleration threshold, representing a specific value given by the software.

Discussions

Over the past decade, the interest in new contact sports monitoring systems development, or using new equipment for training has increased worldwide [2, 9]. Using technology or modern means of training can increase athletes performence so that they can succeed to became elite athletes [10]. Our study aligns with the research of Ishibashi *et al*., (2017) who managed to develop an intelligent training system using components similar to ourowns [11].

Another developed system by Mei *et al*., (2014) also involves the feedback component by implementing RGB LEDs that can be programmed according to the series of punches applied by the athlete to the bag [1].

These studies are defined by the technological component, but none of these systems were developed using a Raspberry Pi microcomputer, but an Arduino microcontroller. Although it is easier to use this microcontroller and the energy requirements are reduced, its computing power is low, because it can run only a single program. A Raspberry Pi is more difficult to use, being necessary to install libraries and write different programs to be able to interact with different sensors, but has an increased computing power being able to run several programs simultaneously, so the possibilities of developing a more complex infrastructure are greater.

Conclusions

The system proposed by us, can render real-time information related to the number of punches transmitted in the punching bag, heart rate and can also generate a score depending on the effort put in. However, there are certain aspects that require further research such as the software's ability to recognize the series of punches transmitted, these functions can be added to our system by developing an artificial intelligence that can be trained to recognize the type of punch, or punching biomechanics, that can be achieved by equipping the system with a recording camera attached to the microcomputer and developing motion analysis software.

The limitations of this study are provided by the following factors:

- The early phase of research, although these components have been used for years for various purposes, in the field of physical activities and contact sports the technology is relatively new;
- The composition of the bag – the density of the bag or the material with which it is filled may interfere with the written algorithm for the detection of blows, thus, the blows transmitted by the athlete are not recorded;

- The possibilities are varied and they can be adapted according to the need of the coach, the athlete or the objectives they propose.

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An Overview of Company Restructuring as Solution for Sport Business on the Verge of Bankruptcy

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Abstract

The new pandemics that has locked down the world for months, has deeply affected business, sports not being an exception. The decision of stopping competitions and even training has slowed down or even stopped the flows of income, leaving many on the verge of bankruptcy. During periods of turmoil, companies can face economic and financial troubles and according to the level of default, firms have two main options: liquidation or reorganization. This paper is meant to discuss corporate restructuring, what are its benefits, its disadvantages and also the characteristics of the reorganization process.

Keywords: restructuring, reorganizing, liquidation, bankruptcy

1. General issues about restructuring

Usually, when talking about restructuring of companies, one would normally think about mergers and acquisitions focusing on corporate expansion, on development at a higher speed than the one provided by the company's normal activity. If the economy is developing, a full merger wave is expected. If the economy is on a descending slope, the probability of noticing a tendency for M&A decreases and anyway, the reasons behind are changed. Companies that experience economic and financial difficulties use mergers to survive.

There are also cases when restructuring is meant to contract and downsize organizations, as a result of poor performances or changes in the firms' medium- and long-term plans. Corporate restructuring takes very different forms, such as divestitures, spin-offs, equity carve-outs, exchange offer, split-offs and split-ups.

Gaughan (2007) defines *divestiture* (or corporate downsize) as a sale of a certain portion or amount of a company to another company [1]. The divesting company is the new legal entity formed from the divested portion of a bigger company and can be paid for in cash, marketable securities, or a mix of the two. Companies are sometimes divesting assets and company segments in order to change their activity focus [2].

One of the divestiture forms is the equity carve-out that represents the sale of a parent company's minority interest of a subsidiary to outside investors. The parent company and the divested portion of the subsidiary become two different legal entities, so the management teams will also be different. In the case of sport clubs, this is going to lead to the rebranding of the subsidiary and decisions regarding how this is going to happen.

In the case of spin-offs, a new legal entity is born. The difference from carve-out is regarding the shares' distribution to the shareholders, for spinoffs being done at a pro-rata. The divested

company is managed as a new separate firm but the parent firm will not receive an infusion of funds. A split-off implies the division of the firm into series of spin-offs, while the parent company is liquidated.

If one regards the divestiture from the divesting firm's angle, the company suffers a contraction. Seen from the acquiring company's angle, it is an expansion. If the divestitures are a voluntary one, the reasons behind may be very complex but, in the majority of cases, they concern a reverse synergy or a poor strategic division.

George and Hwang (2010) define the concepts of synergy and reverse synergy, giving examples of the concept of 2+2=5. The reverse synergy means that 4-1=5 and therefore, by divesting the company's unit into a small legal entity, the results will increase. The same happens when the reason is the poor strategic division. The management team feels that a specific line of activity should be eliminated. If that line was profitable but just no longer fits into the strategy of development, the parent company might obtain good divestiture proceeds and a profit that could contribute to the development of the parent company [3].

For example, in the pandemic context, if we take the example of a sports club, having many sports disciplines included, divestiture will mean giving up one of the sports disciplines included. If the manager feels that the club, in a pandemic context, cannot offer their swimming team all the necessary conditions for keeping their performance, they can decide to separate the swimming club and sell it. This way, the club's performance can continue and the parent company can benefit from the extra income and from stopping spending resources on a discipline that would take more resources than those considered reasonable in order to maintain the performance.

Companies can also restructure their operations in order to avoid going bankrupt or being insolvent (which is less serious than bankruptcy, but which can lead to it if not managed).

2. Types of business failure and the solution of restructuring

The worst case of business failure is bankruptcy because, once a company files for bankruptcy, they admit being unable to reach their company objective. But failure can be of many kinds, the most common being the economic failure and the financial one.

Economic failure refers to the case when the company doesn't generate profits anymore or does not reach the profitability required by the suppliers of capital. Financial failure refers to the entity's incapacity of meeting their financial obligations. It can be a matter of lack of liquidity or a profound problem, where the financial resources are focuses mostly on the companies' inability to meet their current obligations; in other words, the companies are not able to cover their cost of debt. This happens to both firms that are not liquid enough and to the ones that have a positive net worth (the value of their liabilities does not exceed the value of their assets).

In the pandemic context that has affected all of our lives in the last few months and that looks like will influence us and the economic life for quite a long period, the financial failure of companies is one of the very important issues that, if not properly handled will generate companies going bankrupt and closing their doors. This would impact not only the lives of the employees of those companies, but also the society. OECD expects the impact of the COVID-19 crisis to be the worst after the end of the pandemics and predicts that its effects will be felt for many years, being one of the worst crises of the last 100 years [4]. The broad economic

effect of the pandemic has cast doubts both on the short-term expectations of the companies and the long-term effects that the recession is going to have.

Take the case of gyms for example: once the lifestyle of people has improved, the number of people opting to be more active increased, leading to an increased number of businesses in the field. The attitude of big corporations towards an active life also helped, many of them including in the salary packages offered to their employees, access to sports facilities. Once the COVID-19 virus hit the planet and sent people into lockdown, gyms were closed for a few months. Many of them reacted quickly, moving their trainers into the online world, and offering clients the benefits on an active life from home. Still, from the financial point of view, trouble started to be obvious. The revenues decreased while the general expenses kept pilling up. The relaxation measures have offered a bit of a break but the new evolution on the pandemics suggests that it is just a matter of time for the problems to be back on.

Expectations are not very bright either. A second lockdown is expected due to the evolution of pandemics and gyms are probably going to be closed very quickly as their activity is indoor.

Secondly, people will reduce their expenses due to the increase in unemployment and reduction of salaries that is expected. This may lead to the decision of dropping of their gyms, opting for activities outdoor and that do not cost them, even if the efficiency of those exercises is reduced. Therefore, financial solutions must be found, and financial and operational restructuring should be considered in order for financial and operational failure to be avoided.

In our opinion, financial failure should be addressed first, in order to identify possible operational changes that could contribute to easing the financial pressure.

As mentioned, financial failure refers to the case when companies cannot fulfill their obligations towards creditors. The first step to be taken in order to avoid such a case is for companies to properly analyze their fixed and variable costs but also the direct and indirect costs, related to the financing. The direct costs are usually of legal nature and the indirect ones are connected to the market reactions towards a legal entity that does not meet its obligations towards investors. This indirect cost is linked to the specific market risk, that grows in times of turmoil.

George and Hwang (2010) analysis sets a connection between capital structure and distress costs, showing that companies with a high level of distress costs tend to keep their leverage as low as possible in order to avoid insolvency and they become more vulnerable to financial failure in times of economic trouble [3]. A weak capital structure and regulatory factors are important reasons for financial distress also, as Denis and Denis (1995) show [5].

If an operation reduction is considered by the management team, asset restructuring should follow, with an important impact on the chances of avoiding financial failure. For example, the gyms can sell part of the equipment if the number of users that can be in the gym at one time significantly decreases. Therefore, the resources generated through the sale can cover part of the financial obligations as they come due.

During turmoil periods and downturns in the economy, the revenue growth of companies is normally weakening and despite the fact that ups and downs in the evolution of an economy are to be expected, as natural trends, the management of companies is not always prepared for the recession. Even more so in case the recession is due to an abnormal context.

For example, following the outbreak of the pandemics, all major professional sports were ground to a halt all over the world. Football, that has become an economically important business in the last century and brought important revenues to club owners but also to associated service provides (TV broadcasting channels, commerce related, tourism etc), has

also stopped, football leagues being suspended for many months. The restrictions imposed by COVID-19, made it impossible in many countries to complete seasons. This led to new rules being discussed, therefore a restructuring of the operating aspects. Even the return of football leagues for a while (at the beginning of this summer) was not free of problems as the approach to sports is different. Games are played without public and medical insurances and measures cost clubs a great deal. Sometimes, in order to avoid closing the company (through bankruptcy), they can go through a reorganization and operate while looking up for a restructuring plan. The plan needs to contain the new operating strategy and all the changes that are going to be made within the company in order for it to become profitable. In case this does not work, the only option available is liquidation which means selling the entire assets of the company and using the resulting money to cover for the debts.

The reorganization plan is also a document that must contain all the strategies, all the changes that are planned for fixing the companies issues and making it profitable again. The complexity of the reorganization plan will of course depend upon the complexity of the company that needs to be restructured. The restructuring plan must be approved by the creditors and equity holders. If not, the legislation (which differs from country to country) might ask for a cramdown, this being the process through which the restructuring plan is approved in court, without the approval of all the creditors or equity holders.

No matter what procedure is applied, the reorganization plan needs to be fair (no claimholder or security holder will be favored in respect to another) and feasible (namely it can have a positive impact on the evolution of the company it refers to).

Conclusions

Even though nobody wants their company to face trouble, being under the influence of the environment and actions that are not under their control, sometimes, companies need to consider different forms of reorganization, in order to avoid bankruptcy.

Knowing one's possibilities and being able to apply known restructuring methods quickly in difficult times can save companies lots of money and sometimes their existence on the market.

Also, if referring to the sports world, one must acknowledge that new ways of organizing the activities are needed, as the world will be different after the pandemics. Sports that involve large numbers of spectators but even personal approaches to sports will be different and operating restructuring doubled by financial restructuring might be the key to a safer and more profitable sports' world.

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Management of Factors Influencing Quality of Life and Leisure Activities

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Abstract

Introduction

Researchers use various approaches to define and measure a complex, multidimensional construct of quality of life (QOL), such as social indicators, subjective well-being measures, and economic indices. Regardless of differences in QOL conceptualizations and methodology, stress the importance of a comprehensive view of the construct in scientific approaches.

Methodology

The questionnaire was designed after an analysis of specialized studies published in international journals, trying to keep the same structure of questions in order to guide us in completing the questionnaire.

Subjects

Our sample of 108 participants consisted of more male than female participants. The target group of the questionnaire was people who have at least finished high school working or studying in Cluj-Napoca.

Results

Gender and Age from the data that I collected from the beginning of the 108 questionnaires, I can see that my sample consisted of more male than female participants. I can also say that the majority of participants were between ages 19 and 22. This is because these questionnaires were mainly handed out to students. The target group of the questionnaire was people who have at least finished high school working or studying in Cluj-Napoca.

Conclusions

Our group listed as very important all the reasons related to well-being and physical development. From life expectancy to body weight control to our own body image, all have been considered a top priority for our group.

Keywords: quality of life, physical activity, leisure physical activities, lifestyle factor

Introduction

Physical activity reduces the risk of numerous diseases, like ischemic heart disease, stroke, diabetes mellitus, and cognitive disorders, as well as total mortality. Health-related quality of life (HRQoL) is a global indicator of health resulting from the individual's perception of the impact that diseases exert on different spheres of life (physical, mental and social). Most of the evidence on the relation between leisure-time physical activity (LTPA) and HRQoL has been obtained in cross-sectional studies in middle-age adults. However, little evidence exists in the case of the elderly. [1] This evidence is based on clinical trials of the short-term effect of exercise programs in patients with chronic diseases, who are often institutionalized, and in cross-sectional studies, which have limited capacity to establish causal relations because HRQoL itself may influence the ability to do physical activity. To our knowledge only one study in elderly women has shown a longitudinal association between higher LTPA and better HRQoL however, it was limited to examining the effect of LTPA on the mental components of HRQoL, and did not include the physical components. [1]

Thinkers from across Canada were asked to write commissioned papers that all Summit delegates were required to read, these papers laid out their thoughts about the future of recreation in the next two decades. Presenters were asked to share their "bird's eye" view of what is needed to address the crises of chronic disease, poverty, and inactivity facing our nation in this paper we provide a brief overview of leisure education in North America. We then share a model of leisure education developed by the second author. In [2] they draw on this model to frame our thinking about the potential contributions of leisure education to promoting mental health and resilience across the life course. In [2] they end with recommendations for next steps for incorporating leisure education in leisure service delivery systems that will reach people who most need and could most benefit from leisure education. [2]

Researchers use various approaches to define and measure a complex, multidimensional construct of quality of life (QOL), such as social indicators, subjective well-being measures, and economic indices. Regardless of differences in QOL conceptualizations and methodology, stress the importance of a comprehensive view of the construct in scientific approaches. Two scientific approaches to measuring QOL are usually applied: the measurement of people's objective circumstances of living or social indicators, and measurement of peoples' subjective experiences of their life or subjective well-being.

Overall, leisure activities play a very important role in QOL because they provide opportunities for people to meet their life values and needs. Through participation in leisure activities people build social relationships, feel positive emotions, acquire additional skills and knowledge, and therefore improve their QOL. Therefore, in [3] in which types of leisure activities participate men and women of different age and how the participation in different types of leisure activities contributes to their subjective well-being (SWB). Previous research and theoretical postulation provide ground for general hypothesis that participation in leisure activities contributes positively to subjective well-being of women and men of different age.

Although, it can be hypothesized that the pattern of important leisure activities somewhat varies across different age and gender groups [3].

Quality of life is considered to be a complex construct that is subjective and dynamic. They stated that health related quality of life (HRQL) is altered by a combination of multiple factors that influence the daily life of human beings. Such factors can be classified as environmental (housing, transportation, security, education, compensation and leisure activities) or individual

(heredity and lifestyle). The construct of HRQL can be studied in different ways. HRQL, for example, is a condition that goes beyond the absence of disease, and overcoming the difficulties related to morbidity. Additionally, it refers not only to how people perceive their general health, but also to specific states of physical, psychological and social support that is provided to carry out activities of daily life. Evaluating HRQL enables us to investigate its influencing factors and consequently, create interventions to improve it, especially relieving pain, malaise and consequences of diseases [4].

Physical activity (PA) is widely recognized as an important health-related lifestyle factor. The social, psychosocial and also biological health benefits of PA and exercise are well established and there is clear scientific evidence that moderate PA on a regular basis can reduce the risk of the morbidity of preventable non-communicable diseases (NCDs). Overall, lack of PA is mentioned as one of the four behavioral risk factors causing NCDs. Also, the benefit of regular PA in primary and secondary prevention as well as in the rehabilitative treatment of several NCDs is scientifically recognized. Observational and interventional studies proved positive effects of PA for diabetes, hypertension, cancer (esp. breast and colon cancer), osteoporosis, cardiovascular disease, obesity and depression. World Health Organization (WHO) guidelines addressing healthy adults and adults with NCDs not related to mobility (e.g., such as hypertension or diabetes) recommend at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity aerobic PA throughout the week or an equivalent combination of moderate- and vigorous-intensity activity. Independent of intensity, aerobic activity should be performed in bouts of at least 10 minutes' duration [5].

Methodology

The questionnaire was designed after an analysis of specialized studies published in international journals, trying to keep the same structure of questions in order to guide us in completing the questionnaire. The purpose of the questionnaire was to find out factors that influence physical leisure activities. The questionnaire was created on google Form and disseminated on social networks, Facebook, Instagram, etc.

Major benefits of web-based questionnaires and surveys are that they do not require the administration of materials in person, are accessible world-wide, and are therefore available cross-culturally. Thus, in our study, once the recruitment postings had been made, the questionnaire administration and recording of responses was self-running. E-mail addresses had been provided for any questions or feedback in relation to the questionnaire itself, and in addition an address was provided for reporting technical issues in relation to the questionnaire. The stage of ending data-gathering involved thanking respondents for their participation.

Prior reports have indicated that one of the benefits of web-based research is the ease of data-gathering. Here, we simply want to highlight that time issues may be an important consideration.

By considering the number of responses that we received, we begin to appreciate that time needs to be set-aside. If the rate of responses is a true reflection of that which may be expected in other studies, then genuine problems of resources may arise if there is insufficient time to respond to each in person.

In this questionnaire we focused on X parameters:

- Health-related quality of life – This parameter measures the lever of stress control and activities in leisure-time

- QoL – This parameter measures the way computer games and sports done in free time affect the wellbeing
- Gender and Age – This parameter measures leisure education of different physical activity agendas

Subjects

Once a questionnaire has been constructed and tested, the next stage is to recruit willing respondents. We located a number of internet discussion groups (newsgroups and bulletin boards) which were primarily or peripherally concerned with the issue of organizing physical activities in one's free time. The eventual manner of recruitment was through posting a message to the groups indicating the nature of the questionnaire and its web-address. Prior to participation, potential respondents were offered the opportunity to ask questions via e-mail. A dedicated e-mail address was set-up for the study which was intended to reinforce the 'legitimacy' of the study, while also providing a central address for respondents to make contact.

This address was monitored by all members of the research group so that we were all aware of which issues had been dealt with and which had not.

Our study was meant as a pilot research into management of factors and how they influence QoL and leisure-time physical activity, and as such we worked on descriptive statistical data.

Our parameters were unique and weren't correlated with the others. Through this pilot study we tried to observe a broad picture of the status quo in regards to QoL and sports. We displayed quantitative raw and percentile data of each parameter and interpreted in the context of known empiric data from day-to-day habits of students in Cluj-Napoca.

Results and Discussion

Gender and Age from the data that I collected from the beginning of the 108 questionnaires, I can see that my sample consisted of more male than female participants. I can also say that the majority of participants were between ages 19 and 22. This is because these questionnaires were mainly handed out to students. The target group of the questionnaire was people who have at least finished high school working or studying in Cluj-Napoca. The total age gap was between ages of 15 and 50. This may help me think of a suitable dissemination of findings for a specific age group, based on the results of this questionnaire. Most subjects were either from Cluj-Napoca itself (42%) or from another town (40.2%). The least number of subjects where from small towns or villages around Cluj-Napoca (total of 11.8%). This suggests that our findings will be related to either Cluj-Napoca permanent residents or temporary ones.

Out of the total number of questions in the questionnaire, only a few were selected to be presented in order to meet the requirements of writing the article. In the following we will present you 7 questions and their results.

How much time do you spend on sports and computer games (tablet, mobile)?

A majority of the participants (67.6%) stated that they spend more time doing physical activities than using/playing on an electronic device. (Fig. 1) This indicates that our study group values sport activities more than games on a phone or tablet, which is a rather encouraging aspect given the current trend. Compared to [3] our findings fit in their findings.

Fig. 1. How much time do you spend on sports and computer games (tablet, mobile)?

What is the main reason that makes you participate in sports physical activities? (Please tick one answer only).

This question tried to identify the main reason (most important one for each subject) for doing physical activities. (Fig. 2) The results showed that our group was motivated by health, fitness and stress control benefits of regular sport activities. Social reasons were the least motivating for our group alongside competitiveness. Compared to [2] our findings fit in their findings.

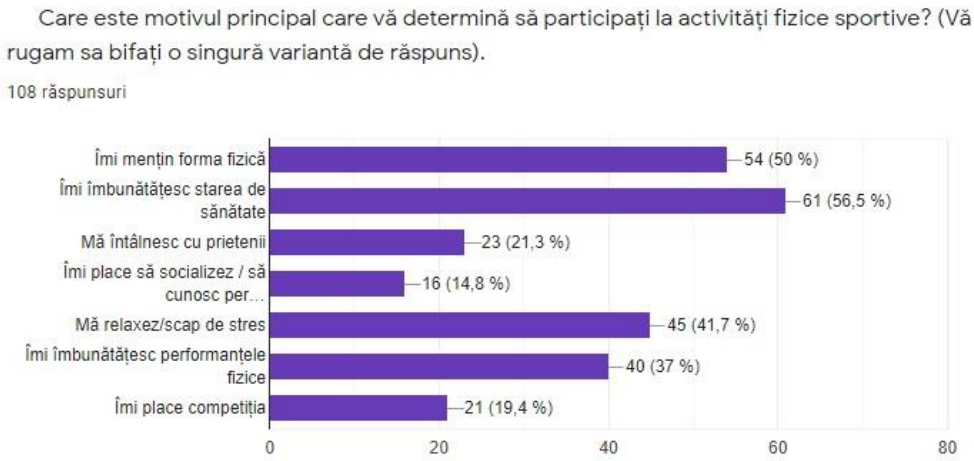

Fig. 2. What is the main reason that makes you participate in sports physical activities?

Are you or have you ever been part of a sports team?

Almost half of the participants (47.2%) stated that they have been part of a sports team but they quit. At the same time 13.9% were only involved in a sports team during school Physical Education classes and 23.1% were never in a sports team altogether. (Fig. 3) Finally, only 15.7% are still engaged with a sports team. These results illustrate a dire situation regarding sport engagement: there isn't a way to engage new citizens in a sports team or to maintain them. This indicates that quick measures must be taken in this regard because without a large population engaged in sports teams there can't be a wide enough selection pool for performance sports.

Compared to [3] our findings do fit in their findings.

Fig. 3. Are you or have you ever been part of a sports team?

Do you have the opportunity to practice your sport in your area?

We tried to see how far our group had to travel to practice sport activities where they live.

Almost half (49.5%) stated that they are able to perform these activities within 2km from their residence. (Fig. 4) Another 33.3% were able to perform them in the same city (2-5 km away) while the rest of 17.1% had to travel to another city to practice their preferred sport. Compared to [4] our findings do fit in their findings.

Fig. 4. Do you have the opportunity to practice your sport in your area?

Do you consider sport to be an important aspect of daily life?

A vast majority of our study group considered sport as a "very important" aspect of their lives. At the same time, 20.4% considered it to be "pretty important". (Fig. 5) These two groups together make up for 97.3% of the participants. This indicates that regardless of their attitude towards specific variations of sport activities or their frequency, our group views these activities as an important part of their lives. Future studies should try and identify a way of using this information for a general motivation towards being integrated in sports teams (amateur or professional). Compared to [4] our findings do fit in their findings.

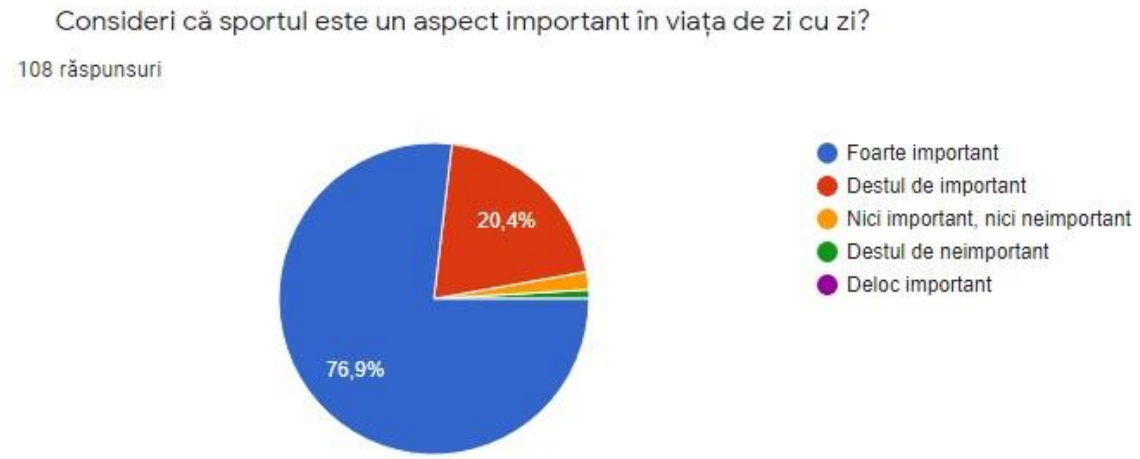

Fig. 5. Do you consider sport to be an important aspect of daily life?

Did you have any personal experience that, due to any of the events listed below, you were prevented from participating in sports activities (ex. training, matches, games, etc.)?

With this question we tried to probe the discrimination aspect of practicing a sport. The majority of our participants stated that they never encountered discrimination that would not allow them to practice sports based on: color of their skin, social status, financial status or geographical origins. This shows that our group faced a welcoming sport structure or organization that valued wellbeing, performance and fitness over any other socio-cultural and financial aspects of a person. Compared to [4] our findings do fit in their findings.

What are your reasons for practicing any sport?

While probing for reasons for practicing a sport, our group listed as very important all motives related wellbeing and physical development. From life expectancy to body weight control to self-body image, all were considered as a top priority for our group. Stress control was another important reason for doing a sport that was coupled with gaining pleasure and having fun. Compared to [5] our findings do not concur in their findings.

Conclusions

Our group listed as very important all the reasons related to well-being and physical development. From life expectancy to body weight control to our own body image, all have been considered a top priority for our group. These results illustrate a dire situation regarding sport engagement: there isn't a way to engage new citizens in a sports team or to maintain them. This indicates that quick measures must be taken in this regard because without a large population engaged in sports teams there can't be a wide enough selection pool for performance sports.

Health-related quality of life was another important reason for practicing a sport that was associated with gaining pleasure and fun. Social motives (spending time with friends), sports results, trends and reasons for earning money had a smaller majority of answers. Our group, although with a small majority, did not consider these reasons to do sports as an absolute motivation.

We would suggest that leisure education is needed in schools and community recreation settings and should be part of other health care reforms, education reform or sports and physical activity agendas. We also concluded that recreational service providers need to accept (perhaps

embrace) their role and responsibilities for improving leisure activities among participants and their communities and identify effective ways to do so.

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filo diritto editore DAL 2008

FEFSTIM 2020

THE 6TH INTERNATIONAL CONFERENCE OF UNIVERSITARIA CONSORTIUM

„FEFSTIM: Physical Education, Sports and Kinesiotherapy – implications in quality of life”

€ 20,00

ISBN 979-12-80225-05-4