

## EFFECT OF HIGH INTENSITY INTERVAL TRAINING WITH THE USE OF TRAMPOLINE IN INDIVIDUALS WITH STRESS

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### ABSTRACT

**Background:** Stress is a common phenomenon. Every individual experiences stress at one point or the other in their lifetime. Working on a trampoline is a cardiovascular exercise program in which you can jump, run, twist, cross country ski or do jumping jacks. The trampoline platform also folds into quarter of its size for easy storage. Trampoline exercises are gaining more and more popularity amongst group settings and gym members.

**Objective:** To estimate the effect of high intensity interval training (HIIT) with the use of trampoline in individuals with stress.



**Methods:** 30 subjects (18-25 years) with stress were selected and a four week trial with trampoline was done. Participants started with 2 mins of warm up, progressing to 5 varied sets of high intensity exercises in which they bounced at a higher speed for 2 mins, followed by 1 minute of interval. This was progressed to 3 mins of cool down period (total duration-15 to 20 mins) and by four weeks, they were assessed pre and post by measuring their heart rate, blood pressure and Perceived Stress Scale (PSS).

**Results:** Trampoline protocol of four weeks demonstrated an extremely significant effect on PSS [pre- 19.2(4.39), post- 8.23(4.16)], significant effect on Heart rate [pre- 85.93(11.41), post- 83(11.26)] and Blood pressure [pre systolic- 114.3(9.98), post systolic- 115.6(8.81) and pre diastolic- 72.4(9.31), post diastolic- 76.4(5.31)]

**Conclusion:** The experimental study concluded that trampoline reduced the PSS scores and heart rate significantly and also had significant changes in the blood pressure of the individuals with stress.

**KEY WORDS:** Trampoline, Stress, HIIT, PSS, Heart rate, Blood pressure.

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### INTRODUCTION

According to the Oxford Dictionary, "stress" has been defined as 'a state of mental or emotion-

alstrain resulting from adverse or challenging circumstances'. Stress refers to two things: the psychological perception of pressure on one

hand, and the body's response to it, on the other, which involves multiple systems, from metabolism to muscles to memory [1]. Stress, in everyday terms, is a feeling that people have when they are overloaded and struggling to meet with increasing demands. These demands can be related to finances, work, relationships, and other situations, but anything that poses a real or perceived challenge or threat to a person's well-being can cause stress [2].

The lifetime prevalence of stress among adolescents and teenagers around the world is currently estimated to range from 5% to 70% [3]. The American Psychological Association states that in October 2017, 75% of adults reported experiencing moderate to high levels of stress in the past month and nearly half reported that their stress has increased in the past year. On the other hand, the American Institute of Stress says that 40% of workers feel stress on the job and 40% say they need help in learning how to cope with it; and 42% of them say their co-workers need help to manage stress [4]. Various things can cause stress: from emotional (such as worry over family or job) to physical (such as fear of something dangerous). Identifying what may be causing the stress is often the first step in learning how to better deal with it. The Perceived Stress Scale (PSS) is the most widely used psychological instrument for determining the acuteness of stress [5].

The PSS was published in 1983, and has become one of the most widely used psychological instruments for measuring nonspecific perceived stress [6]. The scale was developed to estimate the perception of stressful experiences by asking the respondent to rate the frequency of his/her thoughts and feelings related to events and situations that occurred over the previous month. Items are designed to know how uncontrollable, unpredictable and burdened respondents find their lives [5]. Perceived Stress Scale is scored as follows: Each item is rated on a 5-point scale ranging from never (0) to almost always (4). PSS scores are obtained by reversing the scores on the four positive items: For example, 0=4, 1=3, 2=2, etc. and then summing across all 10 items. Items 4, 5, 7, and 8 are the positively stated items. Scores around 13 are considered average. High stress groups usually

have a stress score of 20 points and more [7].

Physical activity is an important health tool used in the treatment and prevention of various physical diseases, as well as in the treatment of some psychotic diseases such as stress and anxiety disorders. It has been known for many years that regular physical activity brings benefits to individuals with depressive and anxiety symptoms, a fact that is confirmed in recent studies [8]. High intensity interval training (HIIT) is a form of cardiovascular training characterised by small periods of intense anaerobic exercise with less intense recovery periods. HIIT exercise sessions generally consist of warm up period, then several repetitions of high-intensity exercise, then a cool down period [9]. The relationship of work and recovery interval is important. Many studies use a specific ratio of exercise to recovery, to enhance the different energy systems of the body. For example, a ratio of 1:1 might be a 3-minute of high intensity bout followed by a 3-minute of low intensity bout. These 1:1 interval workouts often range about 2, 3, 4, or 5 minutes followed by an equal time in recovery [10]. Urban rebounding, which is a form of cardiovascular exercise on a trampoline based platform, is gaining popularity as a high intensity interval exercise amongst many fitness centres and group settings. For workouts involving a trampoline, you can jump, twist, run, cross country ski or do jumping jacks on an urban rebounder.

High intensity intervals are chosen based on every individual perceived level of exertion. To include HIIT into your trampoline workout, begin with a warm-up bounce at an RPE of no more than five. After few minutes of warm-up, begin the intensity interval by increasing the speed of the bounce to an exertion level of seven for one-two minutes and then returning to a comfortable bounce for two to three minutes. Continue alternating this two-minute intensity pattern to three minute of recovery pattern as advancing through the workout period [11]. Individuals find exercise boring, so if a recreational activity like a HIIT program with a trampoline is added in the routine of an individual undergoing stress, there is a significant chance of improving the mood of that individual. Since, there is limited literature explaining the effect

of HIIT in individuals with stress, this study showed that there was a significant effect of HIIT on Perceived Stress Scale (PSS) scores, heart rate and blood pressure of the individuals with stress when a trampoline was used.

## METHODS

The study conducted was an experimental (pre-post) study. 30 participants were recruited for it. They were scrutinized for inclusion and exclusion criteria and those who met the criteria [individuals with stress (PSS score >14), age 18-25 years, both genders] were explained the purpose of the study and were included in it. Before implementing the study, the participants were asked to fill a written informed consent form. Prior to and after four weeks of intervention, the participant's heart rate and blood pressure were measured manually and with a mercury sphygmomanometer respectively.

Also, these parameters were measured before and after each session of trampoline. The participants were also asked to fill the Perceived Stress Scale (PSS) questionnaire pre and post four weeks of trampoline training.

Procedure- Participants were first taught warm-up or what is known as the health bounce for one to two minutes at an RPE of not more than five. After few mins, the participants were asked to begin the intensity interval by increasing the speed of the bounce to an exertion level of seven for one-two minutes and then returning to a comfortable bounce for two to three minutes. During the next minute of intensity bouncing, the investigator added exercises like taking the arms out and doing crosses with the legs, running-man; which is done by alternately raising one hand and crossing the opposite leg, proceeding with twisting the body to both the sides and doing jumping jacks which is working in all the planes of movement, to going from side to side, just like doing single mini-leg squats; taking the arms up like a ballerina and maintaining them in the air, whilst crossing the legs from inside to the outside; to further increase the heart rate and the exertion level to a seven or eight. The investigator then continued alternating this two-minute intensity pattern to three-minute recovery pattern as

advancing through the workout session. The HIIT program was continued for 4 weeks, 3 days per week and with duration of 20-30 minutes each. The total number of sessions were 12. The dependent variables were PSS, heart rate and blood pressure, while the independent variable was HIIT on trampoline.

**Data Analysis:** The data was analyzed by using Graph Pad In stat 3.1 version. Mean and Standard deviation were found out as well as paired "t" test and "p" values were applied to find out the relationship between pre and post PSS values, heart rate and blood pressure.

**Fig. 1:** Participant performing single mini-leg squat on trampoline.



**Fig. 2:** Participant on trampoline twisting body to one side.

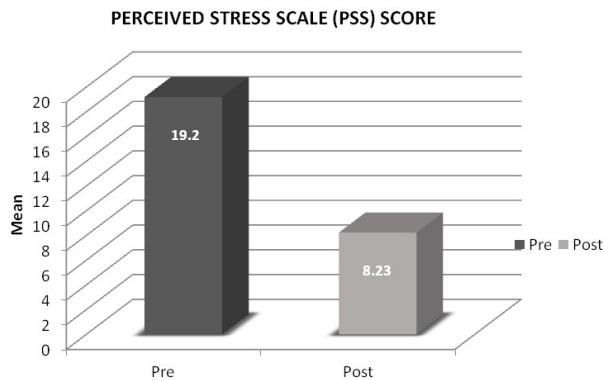


## RESULTS

A total of 30 samples were taken out, overall participants showed an extremely significant effect on Perceived Stress Scale (PSS) and significant effect on heart rate and blood pressure.

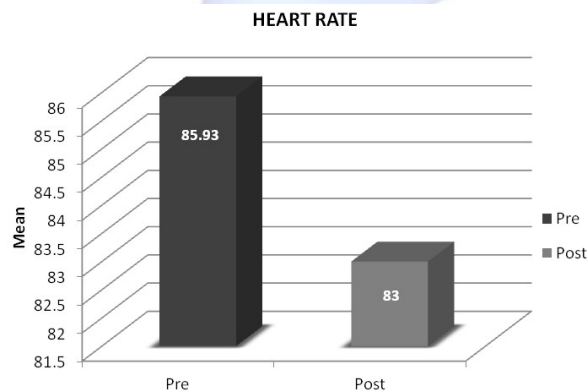


**Graph 1:** Comparison of mean of pre and post Perceived Stress Scale (PSS) scores.



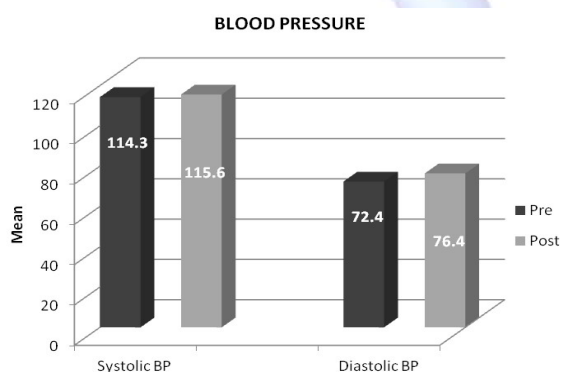
Graph No. 1 showed the comparison of mean of pre and post Perceived Stress Scale (PSS) scores, where the “p” value was found out to be <0.0001 using student “paired t test” within the group which showed highly significant difference.

**Graph 2:** Comparison of mean of pre and post Heart rate values.



Graph No. 2 showed the comparison of mean of pre and post Heart rate values, where the “p” value was found out to be <0.0053 using student “paired t test” within the group which showed significant difference.

**Graph 3:** Comparison of mean of pre and post Blood Pressure values.



Graph No. 3 showed the comparison of mean of pre and post Blood pressure values, where the “p” value was <0.422 for Systolic blood pressure which was considered not significant,

while the “p” value was <0.0073 for Diastolic blood pressure which was considered significant using student “paired t test” within the group.

Hence this experimental study of four weeks gave a result that there were significant effects of high intensity interval training (HIIT) with the use of trampoline in individuals with stress.

## DISCUSSION

The study evaluated the effect of high intensity interval training (HIIT) with the use of trampoline in individuals with stress. The effect was measured after 4 weeks of post trampoline protocol. The result of this study showed that there was highly significant difference in the Perceived Stress Scale (PSS) scores, significant difference in the Heart rate and Diastolic blood pressure values and no significant difference in the Systolic blood pressure values.

According to the guidelines for exercise testing and prescription of the American College of Sports Medicine, individuals should perform exercise between 64–94% of HR max to improve cardiovascular fitness<sup>12</sup>. Accordingly, subjects enrolled in this study achieved an energy cost that, in line with the above guidelines, appears adequate to increase capacity of an individual and induce training effects thus showing considerable changes in their mental fitness and thereby reducing stress.

As per this study, trampoline training had highly significant effect on the Perceived Stress Scale (PSS) scores as the stress was reduced of the participants due to the oxygen deficit in the brain created by HIIT which thereby made the participant think less. Studies have shown that as compared to aerobic exercises, anaerobic exercises like HIIT play a role in reducing stress. Theories have emerged after scientific investigation into the subject, stating that it is harder to think creative, abstract types of thoughts during a HIIT workout session. It is explained by Karen Postal, an instructor in psychology at Harvard Medical School and President of the American Academy of Clinical Neuropsychology that, an individual cannot solve problems or think higher when he/she is under high exertion as in HIIT sessions. This is because, during anaerobic or HIIT exercises, the body doesn’t take in oxygen like it does during aerobic workout;

instead, the activity causes an oxygen deficit. The body is working on less available oxygen in the brain, and also is pumping more blood to the muscles instead of the brain, thus making an individual think less. Research has suggested that memory; attention and processing speed improve when an individual adopts a HIIT program [13].

The study also had a significant effect on heart rate due to an increase in the parasympathetic activity and decreased sympathetic activity in the human heart at rest. Endurance training on the trampoline also decreased sub maximal exercise heart rate by reducing sympathetic activity to the heart. Physiological aging was also associated with decrease in parasympathetic control of the heart; this decline in parasympathetic activity was reduced by consistent endurance training. Research has stated that females have elevated parasympathetic and reduced sympathetic control of heart rate. These gender definite autonomic differences likely caused decreased cardiovascular risk and increased longevity observed in females [14].

The study also showed significant changes in blood pressure as a greater quantity of blood gets pumped from the heart which increases the pressure in the blood vessels that transport the blood with each heart beat [15]. When physical activity exceeds certain intensity, BP levels start going up again, according to study results presented on June 1, 2000 at the annual meeting of the American College of Sports Medicine. The researchers, headed by Dr Rong Zhang found out that the magnitude of reduction of blood pressure is not proportional to the training intensity and duration [16]. As mentioned earlier HIIT programs cause heart to pump greater quantity of blood which thereby increases the pressure in blood vessels, thus showing changes in it.

There is very limited literature showing the effects of trampoline in individuals with stress. Hence, according to the result of the study, it would be beneficial to use high intensity interval training (HIIT) on a trampoline in individuals with stress. Trampoline can also be used in geriatric population as it improves their ability to regain balance during sudden forward falls [17].

The study had limitations since it was conducted only in a single region, on one specific age group (18-25 years), the effects observed were less as the study duration was only of four weeks.

## CONCLUSION

The study concluded that trampoline protocol of 4 weeks had an extremely significant effect on the Perceived Stress Scale (PSS) values, significant effect on the heart rate and diastolic blood pressure, and no significant changes on the systolic blood pressure in individuals with stress.

## ABBREVIATIONS

**HIIT**- High Intensity Interval Training

**PSS**- Perceived Stress Scale

**BP**- Blood Pressure

**RPE**- Rate of Perceived Exertion

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**Conflicts of interest: None**

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