# Dance Medicine: Artist or Athlete?

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## Introduction

Sports medicine is a continually expanding discipline. Buckner & Khan (1), in defining sports medicine, move away from it relating solely to the management of sporting injuries, to a broader definition of 'the medicine of exercise' or 'the total core of the exercising individual'. Dance is often described as the embodiment of both artist and athlete (2), and yet a disparity exists between sport and dance, which can lead to resistance of the implementation of sports medicine principals within the dance world as the dancer often see themselves as primarily an artist.

By adopting the definition of "the exercising individual" it is clear to see where sports medicine has a role to play in the management of dancers, but the need to differentiate between dance and sport is as pertinent as differentiating between individual sports. The management of an elite level marathon runner may be distinctly different to that of an international rugby player. The key to optimal management is underpinned by the needs of the discipline and its demands, and this is certainly true of dance.

Whilst it may not be unusual to hear of an athlete undergoing a 'return from injury fitness test' as late as the day of competition, the nature of dance makes this largely impossible. Rehearsals for shows can begin 4-6 weeks prior to performance (sometimes while performing another show). A dancer generally needs to have participated in most, if not all of the rehearsals, not only for the expected benefits of skill acquisition, which is an integral part of a dancer's armoury in injury prevention, but also

because of the interaction with other cast members and props. Injury to one dancer can result in entire cast changes. This can be made even more complicated if dancers are cast in more than one role.

This paper aims to introduce the concepts of dance and dance medicine and to look at particular issues involved with the management of dancers, using the results of our own epidemiological study.

## Epidemiology of Dance Injuries

Armsey & Hosey (3) indicate that the epidemiology of sports injuries can help to identify risks and plan preventative strategies. This premise is supported by Brooks et al. (4) who place value on assessing the causal links between risk factors and injuries, thereby allowing informed decisions on preventative and therapeutic interventions.

The understanding of risk factors in dance from the literature is somewhat confounding due to the varying means by which injury is defined, data is collected and findings interpreted (5,6,7,8,9,10). A survey of the dance community in the UK indicated a reported injury incidence of 80% (11), while some studies have indicated injury incidence rates of 2.9 to 4.7 per 1000hours in dance students, (12) and 0.48-0.62 per 1000hours in professional dancers (13, 6). In our own prospective study we recorded 370 injuries from a company of 54 professional, elite level dancers in one year.

## Extrinsic Factors

Classification of injury can come from whether the injury sustained was a result of extrinsic or intrinsic factors. Bronner et al. (5) indicate extrinsic factors can include the type of work, exposure or duration of workload, equipment and environmental conditions.

The type of work, exposure and duration of workload in dance can vary considerably, and is very often influenced by whether it is a rehearsal or performance period. Our prospective study was based on a year that entailed 25 weeks of rehearsal and 22 weeks of performances, totalling 150 performances through the season. During a rehearsal period a dancer may complete up to 1 ½ hours of class, encompassing both technical and physical training, followed by up to 6 hours of rehearsals. During a performance period, this will be extended to include evening, and occasionally afternoon shows, performing normally 8 shows over 5 days during a six-day working week.

The impact of such a schedule can be counted in a number of ways.

Dancers generally have poor physiological conditioning compared to other sporting populations (14); due to their high skill levels resulting in very good economy of movement whilst dancing. Simply put, dancing no longer places a physiological stress on them. Dance can be classified as high intensity intermittent exercise (15) and a pre-requisite for this type of exercise is a good aerobic foundation. Dancers have been shown to have very poor aerobic capacities compared to other similar sports people (16) and this weakness could be the underlying source of many injury problems; Laws (11) noted that the majority of dancers perceived that the cause of their injuries was fatigue/tiredness orientated. Dance is a high skill movement form and mild fatigue has a major affect on the quality of movement, resulting in poor alignment of limbs and therefore misplacement of force. When this is accompanied by low strength levels as seen in dancers (17), injury again is more prevalent (18). Longitudinal research has shown that dancers increase their aerobic capacities during the performance period with no significant adaptations occurring during the prior rehearsal period (19). This suggests that dancers enter the performance period without the aerobic capacity to cope with the cardiorespiratory demands of performing (most dancers admit it takes two weeks of performing before they feel “fit enough to really go for it”). Myths abound within the dance world and there is often a reticence to engage in supplemental training or even an inability due to time restrictions caused by rehearsal schedules. For instance, strength training and running are often avoided as they are considered to alter the dancers’ body-shape away from the ideal.

The nutritional impact is also significant. The nature of dance tends to bias towards high intensive intermittent exercise with explosive, anaerobic periods lasting up to 6 minutes within solo roles, but the basis of dance is long rehearsals periods utilising low level aerobic demands. The consequence nutritionally is two fold. Firstly, the content and quantity of the fuel required, and secondly the timing of the fuel intake. Adherence to an optimal nutritional strategy is difficult because the time available to take on foods is normally close to actual performance time. This leads to the dancers decreasing the volume of food taken so as not to hinder performance, resulting in a restriction of the amount of energy supplied to their muscle systems. This may ultimately lead to diminished performance capabilities and increase the risk of injury. In addition, this may also result in the failure to provide the required post-rehearsal exercise nutrition needed to optimise recovery (20).

The variability of surfaces that athletes are exposed to and the impact of surfaces on biomechanics, loading and injury have been topical in sports medicine. Within dance, the surfaces can vary greatly. A dancer may spend the majority of his/her time rehearsing in a studio that has well-sprung floors, but be expected to perform on a solid stage, that may also be raked (tilted to afford the audience a better overall view). Awareness of the impact of surfaces is important in the management of dancers, and attempts are always made to provide a graded exposure to all surfaces when recovering from injury.

Another extrinsic factor needing consideration is costumes. Within sport, the application of additional layers is not unusual, but generally they do

not differ, allowing athletes to accommodate to their chosen sport's requirements. Within dance, costumes can vary greatly, from show to show, as well as within shows, eliminating the dancers' ability to grow accustomed to its presence. Costumes can be heavy and restrictive, altering the natural movement of the body and affecting the dancers' technique. They can also obscure visual fields effecting proprioception. All of which can have an impact on injury. By careful monitoring it is possible for medical teams to influence the impact of these factors. During David Bintley's Beauty and the Beast (fig. 1), dancers who played the principal role of the Beast were monitored for weight loss during the performance. The dancers lost an average 3.5kgs despite ingesting 2litres of fluid. The consequence of feedback led to further ventilation being applied to the costume, as well as provision of isotonic drinks in the wings.

Part of the reason behind epidemiology studies is not only to provide causal factors, but to also provide the basis for therapeutic intervention. There may be elements within the extrinsic factors that fall outside the influences of the medical teams. There may not be an opportunity to change a theatre's stage, and some costumes have remained the same over a number of years. Even scheduling may be subject to availability of visiting overseas choreographers, yet the accountability of keeping dancers fit, healthy and on stage still remains. One solution is to maximise recovery. According to Nick Grantham (21) recovery needs to be considered a multi-factoral strategy, incorporating the refuelling, rehydration and recovery of the body systems from the effects of training and performance. Our approach follows a 60-minute timeline from the end of the last session. Immediately post session, we advocate rehydration with water and isotonic drink, as well as ingesting a small

quantity of high glycemic carbohydrate. Within 30 minutes, the dancer is advised to undertake between 8-12 minutes of 50-60 % HRmax exercise either on spin bikes or in the hydrotherapy pool. This is followed by a static stretching period. The dancers are then advised to undertake either contrast or ice bathing (individual dancers choose which is best for them). We also advocate the use of compression garments. Finally, the dancers are advised to ensure they get a full meal within 60 minutes of completion of their session. Within the scheduling there is rarely an opportunity to have a full recovery day post performance and so adherence to the immediate recovery becomes even more important in dance.

**Intrinsic Factors**

The management of intrinsic factors relating to injury continues to provide challenges for the attending medical team. Bronner et al.(5) indicates intrinsic factors relate to those individual specific physical characteristics.

It is here that baseline profiling plays an integral part in developing preventative strategies for dancers. At the Jerwood Centre dancers and athletes undergo a rigorous screening programme, which includes a medical and injury profile, functional movement profile, musculo-skeletal profile, physiological and anthropometric profile, core-stability profile and a soft tissue profile. These findings are then collated and form the basis of an individualised development programme aimed at performance enhancement.

The underlying principal of management of the dancer as a result of the screening then becomes very simple. Forces naturally have to be absorbed through lever systems in the body to provide movement. If one of the sections along the 'kinetic chain' is not accepting its share of the work, it can result in energy loss, leading to a decrease in performance and the possibility of injury and so becomes the target area for conditioning and rehabilitation. There may also be occasions where, although no areas of significant energy losses are detected, establishing gains at various points of the chain e.g. improvement in ankle, knee and hip strength, can lead to an overall improvement of performance. On a psychological note, it is much easier to sell an idea of performance enhancement than injury prevention, particularly to an athlete or dancer who has not had a significant injury.

A key consideration when looking at the management of intrinsic factors in dancers as opposed to most athletes relates to the relationship between strength/fitness and skill.

With a finite amount of time available for training, both athletes and dancers are required to balance the amount of work done between strength and fitness and that of skill acquisition. Athletes tend to move into their chosen sporting discipline later in life compared with dancers, who usually begin around the age of 8 and may have moved into vocational school training by the age of 11. Athletes tend to have a good general base of strength and fitness, while their skill acquisition is developing. Dancers by the nature of their training utilise a principal of repeated movements, leading to the development of an exceptional level of skill, performing tasks with an incredible efficiency. This has a twofold effect, increasing the skill level that they ultimately then rely on to protect from injury, but through the efficiency of movement minimise a possible training effect due to the diminished overload principle.

However if a situation arises that prevents a dancer from performing that "perfect move", for example the extrinsic factors previously mentioned, they often lack the underlying strength and fitness to protect them further. The opposite can be true of many athletes. Although athletes may not exhibit the perfect efficiency of movement, their protection from the "poorer biomechanical movement" is afforded by their underlying strength and fitness. But this will obviously only protect them so long, and prolonged or intense loading can result in injury.

This is by no means a criticism against athletes or dancers, but an analysis of risk factors whereby solutions can be implemented. As indicated previously, there only exists a finite amount of time in a day from which training and gains can be made, the balance of which needs to be examined, particularly in the presence of injury or identified risks as a result of screening.

## Conclusion

While the dance world may feel a disparity between itself and sport, the role of the medical team is to recognise the athletic needs of these highly skilled individuals, but to apply the same differentiation between dance and sport as they would between individual sports.

When examining the dance literature for the links between risk factors and injuries, the varying definitions of injuries coupled with different methodologies make findings confounding. From our own research we have broken these risk factors down into those of extrinsic and intrinsic origin.

Extrinsic factors, including the type of work, duration, props, stages and costumes are often difficult for the medical team to influence. Charged with the accountability of dancers' well-being, medical teams in dance can concentrate on those issues that fall within their control. This includes ensuring dancers are fit enough for the demands of both rehearsing and performing. Nutrition needs careful consideration, focusing on both the fuel required as well as the timing of intake. Adherence to an appropriate recovery strategy can play an important role

in allowing dancers to continue to display the repeatability of movement needed within the context of a busy performance schedule.

It is that ability to support the dancers' exceptional skill level that is of paramount importance when planning management programmes for dancers. Comprehensive screening can provide a thorough examination of intrinsic factors that may influence injury and provide the cornerstone of understanding and planning in regards of dancers' conditioning. Unlike most athletes, dancers are biased towards skill at the expense of base strength and fitness. In the presence of injury or identifiable risk factors, that balance needs to be shifted to allow the body to accept the forces transmitted through it, focussing attention on weakness noted within the kinetic chain in particular.

On a final note, the Jerwood Centre is in a privilege position to work with both elite level dancers and athletes, and so can see first hand the added value of cross-fertilisation of ideas and principals to the mutual benefit of these distinct worlds.

Text Block

The Jerwood Centre is currently working with its partners at University of Wolverhampton, the British Olympic Association, Dance UK and Laban in establishing a National Institute of Dance Medicine and Science. Within its agenda is to offer support for dancers within the UK by providing access to specialist clinicians, as well as to improve the understanding of needs of dancers through clinical research.

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The Jerwood Centre Team includes:
Clinical Director
2 Company Physiotherapists
2 Masseurs
1 Pilates instructor/body conditioner
1 Physician
2 Nurses
1 Psychologist
1 Physiologist
1 Podiatrist
1 Nutritionist
Orthopaedic Consultant

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Jerwood Centre Facilities:
6 bed Clinical area
Hydrotherapy pool (variable depth, 2 x video cameras)
Physiological laboratory (VO2max, lactate threshold testing)
Cardiovascular area (static/spin bikes, treadmill, ergo rowers, Precore steppers)
Pilates area (Reformers, trapeze, chair, barrel)
Strength and Conditioning area (Keiser hydraulic power rack and triple trainer, free weights)

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It is important to note that this paper has not commented on the psychological aspects of management of dancers. Psychology plays a significant role in the management of dancers but due to its specificity and scope fall outside the context of this paper.