

Dance as Sensorimotor Neuroscience

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Two things seem essential for dance to function as an art form: a dancer who moves their body, and an audience that watches the movements. These involve motor and proprioceptive processes in the dancer's brain, and visual processes in the audience's brains, respectively. Of course, many other possible elements can contribute also, such as music, narrative and others, but these are less essential. The focus on body movement, and observation of body movement shows that dance and sensorimotor neuroscience are natural allies. In this talk, I will show some examples of how data and theory from sensorimotor neuroscience can shed light on how dancers dance, and also on how audiences watch dance.

First I shall discuss how proprioception at individual muscles is used to compose a coherent representation of the body as a whole, and how this may differ in dancers from other people. Second, I will discuss evidence that watching dance involves the brain in covertly simulating the movements observed. Third, I'll discuss some more recent data on the brain basis for dance aesthetics. What patterns might the brain extract from the dancer's posture and movements, and what brain functions are involved in liking these patterns?

The Physiological Evaluation of Dance

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There is much current debate about the extent to which dance can improve the health and well-being of the general public and one recent study scientifically validated creative dance as an effective way of bringing young secondary school aged people into physical activity.¹ At the other end of the spectrum however, there is a need for a better understanding of the physiological aspects of dance training and performance and of the physiological status of dancers in order to help enhance the health as well as the performance potential of the professional dancer. Through 'match analysis' of dance performance, a new understanding of the demands being placed on dancers can be achieved. Previous studies have investigated both the physiological demands of dance as well as the physiological capabilities of dancers; however few have acknowledged the concept of specificity in their processes. Studies have used standardised lab testing techniques adopted from sport rather than use dance specific methods of measuring² and such tests have been shown to be unreliable.^{3,4} Because of the nature of dance, transitory and intermittent in terms of work output, it has been difficult to accurately measure these parameters within a dance specific setting.^{2,5} The dance specific aerobic fitness test (DAFT)⁶ has been the first step to address this issue. However to date, there is no high intensity dance fitness test available even though research has shown dance to be high intensity interval exercise.⁷ The aim of this presentation will be to address the need for dance specific measuring techniques in order to more accurately understand the physiological nature of dance. It will share the results of the development of a high intensity dance specific fitness test and highlight the complexities of dance performance analysis.

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Performance Psychology for Dancers: What Do We Know So Far?

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Injuries, stress, anxiety, and low levels of confidence are just some of the performance issues that limit a dancer's pursuit of excellence. Despite the possible benefits, however, the psychological aspect of dance has received very little research attention. Nevertheless, the few studies carried out have been informative. For instance, Brassington and Adam (2003) found that soloist dancers could be distinguished from corps de ballet dancers by their greater use of mental skills. Similarly, Nordin and Cumming (2006) found that higher-level dancers reported more frequent imagery experiences than their lower-level counterparts. Within the same study, dancers engaging in more frequent role and movement imagery reported more facilitative interpretations of their anxiety symptoms whilst dancers engaging in more mastery imagery (i.e., images of staying focused and dealing with difficulty) reported higher levels of confidence. Such studies suggest that mental skills may help dancers to develop and progress into higher ranks by improving important psychological attributes. Before definite conclusions are made, however, more systematic research is needed to: a) first understand how dancers use mental skills; b) develop valid and reliable measurement tools to assess the psychological aspects of dance performance; and c) test the effectiveness of these skills with dancers at varying levels of performance.

The aim of this presentation is to provide an overview of published studies on the use of mental skills by dancers, with a particular emphasis on imagery, observational learning and verbal cueing. Recommendations for future research directions will also be provided.

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Motivational Processes, Self Perceptions and Optimal Functioning among Dancers

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This presentation will focus on the interplay between the social environment manifested in companies or schools, dancers' self perceptions and motivation related characteristics, and indices of well-being. It will be argued that whether participation in dance contributes to health and personal growth or compromises optimal functioning is dependent on the motivational processes operating. Such an approach pulls from two contemporary theories of motivation; namely Achievement Goal Theory (Ames, 1992; Nicholls, 1989) and Deci and Ryan's (1985, 2000) Self Determination Theory. Grounded in these two frameworks, relevant research findings from high level performers in other physical domains will be highlighted and recent studies of dance students reviewed in more detail. All in all, this literature suggests that dancers are more likely to exhibit quality engagement when they feel competent to meet the challenges placed on them, self-determined in their reasons for engaging in dance, and connected to others in their immediate dance world. The existent research also indicates that dance environments marked by autonomy support, caring, and task-involvement set the stage for a healthy and adaptive participation. Future research directions regarding the antecedents and consequences of quality motivation will be proposed. Moreover, recommendations will be made about the implications of this growing body of knowledge for dance practice.

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An Epidemiological Study of Injuries amongst an Elite level Professional Ballet Company

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Objectives

To assess the aetiology, incidence and severity of injuries sustained by elite level professional ballet dancers over a four-year period to better estimate risk factors.

Method

A comprehensive injury audit system was set up to document all injuries sustained by dancers at Birmingham Royal Ballet.

Results

In season 1 (2005 / 6) 370 injuries were documented.

Discussion

This is the first year's data of a four-year study into injuries of elite dancers. Results are yet to undergo statistical analysis. Exposure data is also being calculated to better express risk factors in elite ballet. Final results are also to be correlated with those findings from the physiological and functional assessments of all company dancers.

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Tendon Injuries in Dancers

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Tendon injuries are extremely common in Sport and Dance. Our knowledge on the cause of these injuries and on the most appropriate management is limited. Most of the treatments offered have a very poor evidence-base. This is gradually changing with expanding research in this area over the last 10 years.

Imaging techniques, including MRI and Ultrasound, are improving our understanding of how these injuries evolve and how they respond to treatment. They are therefore becoming an integral aspect of the assessment.

Research on eccentric loading exercises has shown that this is a very effective treatment strategy in the management of chronic tendinopathies. It is still unclear how this type of rehabilitation works and what is the optimal way to prescribe it in terms of intensity and frequency.

Research using growth factors and stem cells is also helping to develop new ideas in the management of these disorders.