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ROLE OF NEUROPHYSIOLOGY RELATED TO MENTAL HEALTH IN SPORTS

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Abstract:

Physiology is the biological sciences dealing with how the body functions at the various levels of organisation. It is the study of mechanical, physical and biochemical functions of living organism and sports physiology is the long and short term effect of training and condition of athletes that goes hand in hand with human anatomy. The broad spectrum of skills in sport, with their high demands on strength, speed, endurance, coordination, and flexibility, represents one of the greatest challenges to human motor performances. However, the basic neurophysiological mechanisms in sport are not principally different from those in everyday motor acts. It also affects the mental health of sportsman. This review describes some of the relevant neurophysiological facts in a comprehensive frame, with emphasis on mental health regarding new findings and changes of traditional concepts. In conclusion, the recent progress in neurophysiological research on motor systems allows recognition of a substantially new trend, and motor functions, like a complicated automation, are increasingly replaced by the idea of a sensing, planning, and self-operating subject whose mental processes are decisive for motor behavior, particularly in sport.

Keywords: *Anatomy, motor behavior, physiology, neurophysiology*

Introduction:

Numerous sport performances appear aesthetically appealing and deceptively simple. At the heart of such performances are complex dynamics involving body mechanics and neural control. Here we argue for a stronger interaction between sport neuroscience. Indeed, many sports gestures can be regarded as prominent showcases of skilled motor control and thus, considering the central nervous system (CNS) as a machine producing adaptable movements, are of great relevance for various disciplines including cognitive neuroscience In the first case, sport serves to model increased level of physical activity, with a typical intervention goal being prevention of non-neural pathologies associated with sedentary lifestyle, while a more recent focus has been to use sport as a way of promoting "brain health". A more recent research line aims to investigate the neural bases of motor performance, and a first milestone has been to uncover behavioural and neural differences between naive and expert athletes, contributing to the establishment of sport neuroscience. This neurophysiological studies related to mental health will likely provide a ground-breaking stimulus toward a mechanistic understanding of the neural bases of human performance.

Sport Neurophysiology:

The effects of physical activity and exercise at the neural level are already well established in human and animal studies. In addition, sport is an umbrella term encompassing disparate disciplines associated with quite heterogeneous sets of cognitive and motor abilities.

In neurophysiology, the difference between 'motivation' and 'drive' have been used alternately in describing the direction, intensity, and persistence of behaviour. . The difference between these constructs is important in discussing factors affecting athletes' choices and actions during exercise. We propose to use

the term motivation to represent each of all different stimuli, acting within or on a person to initiate or discourage behaviour. As such, several different motivational factors might act upon an athlete at one given moment in time. A better comprehension of the interaction between relevant factors affecting drive will enable us to understand athletes' choices and behaviour during endurance exercise, may provide tools to influence and enhance their performance and possibly to counteract mental fatigue. Mental fatigue manifests primarily as reduced cognitive performance and is caused by prolonged periods of demanding cognitive activity. Task duration seems crucial, as short duration tasks (less than 30 min) have not been found to yield any negative effects on consequent exercise performance, but can impair cognitive performance.

Mental fatigue is associated with a broad range of 'side-effects': lack of energy, increased fatigability and feelings of lassitude, decreased feelings of motivation and alertness and changes in perception and mood Therefore, it has been suggested that the consequences of mental fatigue may be twofold: it might hamper performance by increasing feelings of fatigue 'I cannot do it, I am exhausted,' or by devaluating the importance of success at that specific task: 'I do not feel like doing it, it is not worth it' . On the contrary, the 'strength of self-control theory' posits that ego-depleting tasks deplete a single global metaphorical strength that has limited capacity and hence impair subsequent performance. We therefore propose to study the effects of mental fatigue by considering the interaction between perception of effort and motivation. Mental fatigue might thus affect drive through different pathways. From a neurophysiological perspective, this has been explained by the existence of two separate systems in the brain involved in the regulation of behaviour: a mental inhibition and a mental facilitation system.

Mental Fatigue during Sports:

Mental fatigue causes individuals to perform less well than expected even in exercise of long duration although cognitive functioning (such as reaction time or complex decision making) seems less crucial for a successful endurance performance. When mentally fatigued, athletes have been found to perceive endurance exercise as more effortful despite a similar objective power output and mentally fatigued recreational cyclists showed a faster increase in rate of perceived exertion and impaired. Mentally fatigued athletes consistently choose to perform at lower intensities (compared to a control condition) and to produce less work during self-paced trials.

Alterations in brain activation and the concurrent changes in brain neurotransmitter concentrations mediate between athletes' perceptions and their drive to exercise. Prolonged neural activity inducing mental fatigue can increase brain adenosine Serotonin, another neurotransmitter, is related to increased sensitivity to negative stimuli (such as perceived fatigue or effort), and also increases perceived exertion. It seems also relevant to examine whether and how mental fatigue influences athletes' motivation toward exercise and which factors may interfere in this relationship.

Endurance sports provide the ultimate arena for gaining a deeper understanding of how and when mental fatigue influences performance. Only in endurance exercise, the interaction between mental fatigue and motivation can be studied: mental fatigue seems not to affect athletes' maximal strength, explosive power, and anaerobic work.

Athletes' drive can thus be increased, and mental fatigue can be decreased, by manipulating athletes' intrinsic motivation, the value of a reward or directly by altering brain neurotransmitter concentrations. How these strategies affect athletes' drive to exercise nevertheless remains largely unknown.

Strategies affecting drive to exercise, for example providing athletes with feedback or an opponent, may work through a diminished cognitive load (athletes do not need to think about an optimal 'pace'), an increased or decreased perceived load (caused by a forced rather than self-chosen pace or thanks to distraction) or increased intrinsic motivation More multidisciplinary research thus seems useful to disentangle the effects of 'motivating' manipulations in endurance exercise, while taking mental fatigue and its effect on the balance between effort and rewards, into account.

Conclusion:

Future studies of mental fatigue and its impact on athlete's drive might benefit from considering a psychobiological approach. The effect of mental fatigue should be examined regarding athletes perceived effort in combination with modifications in their motivation toward a reward. A better understanding of both components of mental fatigue will be of benefit in both research and practice, as it will enable the manipulation and optimisation of endurance performance.

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