

Editorial

Mental fatigue and sport performance: Current knowledge and future directions

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This editorial is a brief summary of current knowledge on mental fatigue (MF) in sports and future recommendations on the topic for researchers, coaches and athletes.

Current knowledge

MF in sports is defined as a psychobiological state caused by the mental load on the brain that athletes have during specific-sports scenarios (Van Cutsem et al., 2017). MF is caused both by cognition and emotions; on one hand by the perceptual-cognitive demands of attention or making decisions, and on the other hand by the control of emotions as anxiety or stress (Van Cutsem et al., 2017). MF presents with subjective (e.g., exacerbated feelings of tiredness), behavioral (e.g., reaction time impairments) and physiological symptoms (e.g., changes in electroencephalogram signals when compared with non-mentally fatiguing scenarios). However, it depends on interindividual differences among athletes, and it is not necessary that all these three types of symptoms appear in a state of MF (Russell et al., 2019). Indeed, the existing instruments to quantify the state of MF in athletes have been organized by the derivation of MF recorded (Díaz-García et al.,

2021). The most used instruments in sports have been the Visual Analogue Scale for the reported subjective feelings of MF (athletes reported from a minimum of 0 to a maximum of 10 their feelings of mental exhaustion) and different sport-specific performance tests (e.g., passing accuracy) or reaction time measures for the behavioral derivation. Despite the large number of expert recommendations on the need to use electroencephalograms for physiological derivations of MF and to obtain further insights about the brain mechanisms involved in MF, it remains difficult today because this technique cannot be used during sport-specific movements. (Díaz-García et al., 2021).

About the research investigating the effects of MF on sport performance, it has been concluded that MF impair both the physical and the technical-tactical performance of athletes. With regard to physical performance, a state of MF causes a significant increase in the Ratio of Perceived Exertion (Van Cutsem et al., 2017). Despite more studies seem necessary to clarify the brain mechanisms evolved in this phenomenon (Ishii, Tanaka, & Watanabe, 2014; Meeusen, Van Cutsem & Roelands, 2021) MF causes significant decreases in the



time to exhaustion during aerobic tests (Martin et al., 2018). With regard technical-tactical performance, negative effects of MF on these variables have been observed in different sports. Indeed, mentally fatiguing athletes perform less accuracy technical actions (Badin et al., 2016) and decrease the distance between teammates (i.e., poor distribution; Coutinho et al., 2017) in soccer, increase the number of fails in the free-throw in basketball (Filipas et al., 2021), decrease the speed of shots to maintain accuracy in table-tennis (Le Mansec et al., 2018), or perform slower reactions in badminton (Van Cutsem et al., 2018). Despite the effects of MF on physical performance may influence on these results, other hypothesis related with possible impairments caused by MF on cognitive performance has been suggested brain physiological measures are necessary to further insights in possible explanations (Habay et al., 2021).

Future guidelines

Based on the information about the negative effects that MF causes on performance, this editorial call coaches to highlight the importance of quantify the MF state of athletes firstly. Similarly to Sport&Conditioning coaches would not understand the absence of conditional measures during trainings and matches nowadays, measures about MF should be included in athletes daily work. Indeed, this quantification should be recorded during specific scenarios to obtain information about which specific situations cause MF. For example, the importance of the match or the match congestion may be interesting to know using longitudinal studies. Secondly, this editorial calls for more ecological designs in the studies that research about the effects of MF on performance. Most of these studies have induced a state of MF using an Incongruent Stroop Tasks. We are not going to discuss the use of this technique in these lines, but it seems necessary to test the effects of specific scenarios of athletes on MF and sport performance (Thompson et al., 2019). For example, how mentally fatiguing is to take or not take a nap during concentrations

or travel the previous or the same day of the match and what effects have these on performance. Finally, we call coaches and researchers to perform more interventional studies to investigate how they can develop more resistant players to the effects of MF on performance through trainings strategies. For example, how are the effects of train in mentally fatiguing conditions for a time on the effects of MF, or how the use of more/less mentally fatiguing constraints (Díaz-García et al., 2021; García-Calvo et al., 2021) influence on the state of MF and the performance of athletes in the next competition.

Conflicts of Interest: The authors declare no conflict of interest.

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