Physical activity, contact sports and quality of sleep: The good, the bad and the (possibly) ugly

There is little argument that physical activity is beneficial for one’s health. Indeed, increasing the amount of physical activity is associated with extensive health improvement, mostly in coronary artery disease, hypertension, stroke, insulin sensitivity, osteoporosis, and depression [1–4]. As such, the United States Department of Health and Human Services recommends “physical activity most days of the week for at least 30 minutes for adults” [5]. Some sports (mainly the “contact sports”) are, however, associated with various injuries, among which brain concussion, or minor traumatic brain injury (mTBI), is not unusual [6]. Although concussion has traditionally been described as a transient, fully reversible, cerebral dysfunction, this ostensibly mild injury sometimes results in long-lasting and disabling post-concussion symptoms as well as abnormal neuropsychological profiles characteristic of frontal or temporal lobe dysfunction, including some alterations of sleep patterns [7]. The pathological changes following concussion remain unclear, but it is widely thought that concussion results mainly in functional disturbance rather than in structural damage per se [8]. This damage may persist and manifest as some degree of cognitive, emotional and behavioral disturbances even decades after the occurrence of the event [9]. We also documented this phenomenon in a mouse model of mTBI [10].

Studying mTBI in a mouse model allows for in-depth and detailed examination of anatomical derangement far beyond that possible in clinical settings. We demonstrated apoptotic process activation in the concussed mouse brains, with the most sensitive zones for trauma being the anterior cingulate cortex and the CA3 area of the hippocampus, with no hemispheric differences. Based on these findings, we concluded that, apoptosis, as a part of post-traumatic neurodegeneration, can be activated diffusely in the brain even after minimal traumatic damage [11].

In the current issue of Sleep Medicine, Gosselin et al.’s very nicely designed and well-conducted study provides us with important new data on subjective complaints and objective measures of sleep and vigilance in concussed athletes practicing contact sports [12]. Athletes who experienced concussions during the last year (and had a self-reported history of previous sport-related concussions from participating in professional, university, or semi-professional league hockey, football, rugby, soccer or skating) were compared to a matched group of athletes on teams of other university non-contact sports activities (tennis, swimming or volleyball) without a history of concussion. The concussed athletes reported more symptoms of sleep disturbances and poorer sleep quality than the controls, but neither the polysomnograph (PSG) nor the quantitative electroencephalograph (qEEG) recordings of REM and NREM sleep demonstrated any measurable differences between the groups. On the other hand, concussed athletes did show significantly more delta activity and less alpha activity during wakefulness than the controls, and these findings point to a possible objective verification of a physical source for their complaints.

The discrepancy between subjective distresses in the face of normal objective measures of sleep has already been observed in mTBI patients [13], as well as in post-traumatic stress disorder (PTSD) patients. Interpretation of these unremarkable results may lead to dismissal of the subjective complaints as representing altered sleep perception rather than true sleep disturbance (as has been suggested for PTSD) [14] or a tendency towards catastrophization (as has been attributed to chronic pain patients) [15]. On the other hand, the subjectively reported symptoms of mTBI pa-
patients may share the reversal of attitude towards PTSD patients whose trauma-related nightmares are now considered an important factor in the occurrence of increased REM interruptions and wake time after sleep onset [16]. As such, an altered perception of symptoms as being consequences of physical injury may lead to new approaches in analyzing data. This could result in identifying the correlates of the neurophysiologic anomalies displayed by the concussed athletes during attention tasks, which may represent the early apoptotic changes such as those documented in animal models of brain concussion [17].

Further intensive research on large populations is needed in the field of sports-related brain concussion in order to better understand the associated hazards and consequences of contact sports and further develop and implement better methods of protection and treatment.

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References


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