Introduction to the special issue on concussion

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Introduction to the Special Issue on Concussion

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The Consensus Statement on Concussion in Sport defined concussion as ‘a subset of mild traumatic brain injury which is a complex pathophysiological process affecting the brain, induced by biomechanical forces (McCrory et al., 2013). These forces can be attributed to a direct impact on the head or to a force indirectly transmitted to the head via impact to another body region (McCrory et al., 2013). In the United States alone, up to 3.8 million sport-related concussions occur every year (Langlois et al., 2006). Sport is the leading cause of concussion in young adults and youth (Emery et al., 2017, Pfister et al., 2016).

Concussion can lead to a myriad of symptoms including headache, dizziness, neck pain, difficulty concentrating and fatigue (Levin and Diaz-Arrastia, 2015). Additionally, signs such as poor balance, cognitive impairment and sleep disturbances can be present (McCrory et al., 2017b). Concussion is thought to predominantly indicate a functional, rather than structural injury (McCrory et al., 2017a) but understanding the pathophysiology remains a challenge. Several guidelines and position statements have been proposed for the diagnosis and management of concussion (McCrory et al., 2017b, Giza et al., 2013). Nevertheless, concussion is known to be very heterogeneous by nature (Feddermann-Demont et al., 2017), which challenges both assessment and treatment and highlights the relevance of comprehensive interdisciplinary management of this condition.

This special issue presents a selection of papers focused on concussion. The articles include two Masterclass papers (Schneider 2019a, Schneider 2019b) which collectively cover common symptom presentations, the recovery pathway, assessment techniques that may assist in directing appropriate management and a review of treatment techniques and multifaceted interventions following concussion. The first article (Schneider 2019a) focuses on assessment and differential diagnosis and highlights the relevance of an interdisciplinary team in the assessment and management of concussion. The review includes an overview of

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screening tools for the acute assessment of concussion including vestibular and oculomotor screening assessments and details the physical examination of a person with concussion to identify cervical spine involvement, vestibular disorder, impaired balance, and visual disturbances. The second masterclass (Schneider 2019b) is devoted to management and includes a specific review of the management of post-traumatic headache, the role of physiotherapy for managing cervical muscle dysfunction following concussion and vestibular rehabilitation, when warranted.

Included within this Special Issue, is a systematic review and meta-analysis by Reneker and colleagues (Reneker et al., 2019) which describes the risk of injury in athletic and military populations with and without a history of concussion. The results confirm that the odds of sustaining any injury is 2.55 times higher and the odds of a secondary concussion is nearly 3.73 times higher in those with a history of concussion compared to those without. The authors suggest that behavioural attributes and ongoing motor control deficits may explain the increased incidence of secondary injury associated with a concussion.

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The original article by Galea et al., (2019a) provides normative data for the 3-metre tandem gait test; a common test used to evaluate gait performance in people post-concussion. The study also examines the influence of intrinsic and extrinsic variables on task performance (both single and dual task gait) and concludes that factors of age, foot length, BMI, and gender influenced performance time. The authors propose that the metric of dual task cost motor-percentage change (the difference in percentage between performance time during single versus dual task gait), is a superior measure of performance since no intrinsic or extrinsic variables influenced this result. The authors recommend further research to explore the use of this variable in other cohorts since it may prove to be a better tool for assessing recovery post-concussion.

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Grenier et al, (2019) evaluate the relationship between neck muscle endurance and concussion incidence, or concussion recovery in 130 university athletes. This study confirmed a moderate correlation between endurance time on a task designed to target the deep neck flexors, and concussion recovery whereby the endurance time improved predictively over the course of rehabilitation. In contrast however, the endurance time on this test was not predictive of increased risk of sustaining a concussion.

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A further article discusses the important issue of why some people are reluctant to report concussion symptoms (Wayment et al., 2019). Indeed, estimates suggest that at least half of concussions remain unreported across a variety of sports (Asken et al., 2016). The article by Wayment and colleagues suggests that athletic identity may be associated with a reluctance to report potential concussion symptoms. Specifically, from the evaluation of 205 National Collegiate Athletic Association Division I American football athletes, players with stronger athletic identities (based on their score on the Athletic Identity Scale; Brewer et al., 1993) were less likely to report symptoms during a game or 24 hours later.

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The use of diffusion tension imaging in the evaluation of paediatric concussions was examined in the article by Bompadre et al., (2019) and although this study could not confirm definitive disruption in white matter structure in concussed subjects, it does prompt future studies to examine the use of diffusion tension imaging as a biomarker.

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A number of other concussion-focused topics are addressed in other papers within a larger virtual version of this Special Issue, which can be accessed online (Link). This includes an investigation of the frequency of neck and vestibulo-ocular examination in the assessment and management of persistent post-concussion symptoms by Kennedy et al (2019), the work by Leung et al., (2019) which examined the prevalence of vestibulo-ocular dysfunction in adolescent rugby players, additional work by Galea (2019b) showing that symptoms

indicative of persisting impairments beyond the expected recovery period were present in a substantial proportion of individuals post mild traumatic brain injury and the observational study by Dickey and colleagues (2019) which showed that the magnitude of head impact kinematics depends on the game scenario and head impact location in female soccer players.

Collectively, the papers within this Special Issue address a number of relevant topics ranging from the reporting of concussion, evaluation, differential diagnosis and management approaches. We hope that this Special Issue will provide a valuable overview for clinicians managing people with concussion and will encourage researchers to further contribute to this expanding body of knowledge.

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