



Summary

Besides the typical orthopedic injury risks in sports, especially in team sports with increased physical contact, brain injuries are common. These require a careful examination and a professional treatment. The formalization of Sport Neuropsychology in German-speaking countries is proceeding. In cooperation with universities and outpatient centers the VBG takes the contemporary leadership to improve the practical diagnostic and therapeutic procedure of concussed professional athletes. Along with the particular team doctor it is vital to treat the athlete corresponding to the established return-to-play protocol. Experienced sports-neuropsychologists and sports physicians can provide assistance.

Keywords

Sport-neuropsychology – Sports medicine – Mild traumatic brain injury – Return-to-play – Concussion – Team sports

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Zusammenfassung

Neben den typischen orthopädischen Verletzungsrisiken im Sport sind insbesondere bei körperbetonten Mannschaftssportarten auch Kopfverletzungen häufig. Diese bedürfen einer sorgfältigen Untersuchung und einer professionellen Behandlung. Die Formalisierung der Sport-Neuropsychologie im deutschsprachigen Raum macht gute Fortschritte. Unter Federführung der VBG in Kooperation mit Universitäten und ambulanten Praxen wird an der Optimierung der praxisnahen Diagnostik und Behandlung von Schädel-Hirn-Traumen im Profisport gearbeitet. Zusammen mit dem jeweiligen Mannschaftsarzt gilt es, nach dem etablierten Return-to-Play-Protokoll den Spieler nach einer Concussion bestmöglich zu behandeln. Erfahrene Sport-Neuropsychologen und Sportmediziner können dieses leisten.

Schlüsselwörter

Sport-Neuropsychologie – Sportmedizin – Mildes Schädel-Hirn-Trauma – Return-to-Play – Sportverletzung – Mannschaftssport

REVIEW / SPECIAL ISSUE

Concussion in team sports: Neuropsychological aspects

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Introduction

Athletic and physical activities are an integrated part of our culture, not only covering periods of soccer European or World Championship. During sporting events, especially in team sports with increased physical contact (e.g. soccer, handball, basketball and hockey), much emphasis is laid on the retrieval of the maximum available power within the game time and to win every battle for ball or puck. In order to get this aims achieved, athletes take excessive risks which increase the likeliness of injury depending on degree of fatigue or adverse environmental conditions (weather, flooring, heat, etc.).

Understanding the neuropsychology of concussion in team sports

According to personal conversations with athletes, sport-neuropsychologists often notice their iron will for extreme performance associated with the readiness to take risk of injury, unabated high. The ultimate objective is high scoring. A hockey player expressed himself like this: “Well, the game is about to get

the puck into the goal. Every time, every puck, obligatory at all costs. If I would take into account possible physical injuries, I could no longer assist my team. Of course, I can get harmed seriously. We are really keen to win. Otherwise we can't go on like this. In addition, we are not wimps”. When it comes to a sports-related concussion during the match, a variety of interests and compulsory issues are involved. The injured athlete would like to return to play as soon as possible. The urge to continue supporting his team is remaining quite ambitious. But especially in case of this type of injury sometimes the athlete's judgement is clouded significantly.

In our opinion a good and responsible team doctor is characterized by refusal to let the athlete back into play, even in case of doubt (e.g. if GCS or SCAT-3 are passed) or against a sea of extrinsic trouble. On a number of occasions it will be the right decision quitting the match for the concerned player and the prescription of rest or the admission to hospital.

If the team doctor has diagnosed a concussion that lasts longer and requires appropriate treatment, he ideally will consult a sport-neuropsychologist. In addition to the

subjective statements of the brain-injured athlete the sport-neuropsychologist will collect objective test parameters and a carefully elaborated exploration as a basis for a qualified expert's opinion. At the best he can recourse to cognitive baseline data, raised at the season's beginning like it is a standard already applied in English professional football. For a scientific discussion of the baseline-results see Iverson and Schatz [6].

But not every concussion needs the support of a sport-neuropsychologist. Often a mild concussion will come to a complete remission by a period of rest. Returning to training and team play is managed by the established return-to-play protocol. In the last years the fundamental understanding of the pathophysiological processes of sports-related concussions and the sensitization therefore has been evolved at medical attendants continuously [10]. There are still remaining questions concerning return to play strategies following a concussion [1].

In the preface of an American handbook of sport-neuropsychology [12] Jeffrey T. Barth raises the question: "But how many of us can place the date when mild concussion first drew national attention and forever influenced the field of clinical neuropsychology?"

Until now tradition of sport-neuropsychologists in Germany is still very young. After some pilot projects over a few years in Würzburg a first formalization started in June 2015 by the establishment of the German speaking Society for Sports-Neuropsychology (G SNP, www.gsnp.eu) and in April 2016 by their first annual meeting which was attended by Prof. Erdener, an associate of the IOC Medical Board. In the course of the meeting considerably areas of conflicting topics have

arised concerning ethical, objective and emotional issues of concussion and team's and individual player's needs.

The variety of conflicting motives and motivations, personalities, background experiences, stages in life, authority and group interactions as well as monetary interests are to be reconciled both at rural matches and also at mega events. The movie "Concussion" – starring Will Smith – illustrated this issue using the sample of the American football league NFL as a minor aspect.

Serving sportsmen with traumatic brain injuries

Consequences arising from a mild traumatic brain injury (mTBI) are difficult to identify at a first glance or hardly ever. Not every forces affecting the head cause unconsciousness or a neurologic dysfunction. Clinical symptoms must not appear immediately. They can be observed even hours or days later and are easily to be confused with overtraining, if not scrutinized accurately. In case of athlete's dissimulation of complaints, feeling ashamed reporting his deficits or take medicine by himself without communication to the team doctor, the injury will not be diagnosed or their severity underestimated. Decision support can be facilitated by the instance that physical symptoms are recovering prior to cognitive symptoms [7]. If concussions are accumulated and the period of regeneration is not maintained for 7–10 days, the likeliness for persistence of symptoms is increased after already three times incidence [9].

The fundamental assignment of a sport-neuropsychologist is to diagnose a post-concussion cognitive

impairment and to treat the injured athlete according to the latest scientific state. Depending on the severity of the injury he will develop strategies for the athlete's recovery of cognitive performance and mental capacity to withstand stress. For longer periods of severe concussions he will consult the team doctor and the professional accident insurance association (VBG) to discuss the recommendation of a medical rehabilitation. To improve the therapeutic options of injured athletes the VBG-Sportreport [11] offers a detailed analysis of the occurrence of accidents of the four major team sports covering basketball, hockey, soccer and handball. The report differentiates between "injuries", "contact injury" and "indirect contact injury". In Germany the VBG takes the contemporary leadership to develop an algorithm for a practical diagnostic and therapeutic procedure of concussed professional athletes, in cooperation with university and practice facilities.

A chronic posttraumatic syndrome (CPS, or synonymously post-comotio-syndrom, PCS) occasionally encompasses unspecific syndromes like chronic pain, pain of muscle or neck, depression, etc., occurring also in people without brain damage [5]. This incidence is facing neuropsychological competence to identify the extent of cognitive deficits (attention, memory, executive function, etc.) and affective disorders (anxiety, depression, somatoform disorders, etc.) while considering the variability of symptoms. Taking into account the current situation (game season, team, family, previous injuries, etc.) he will initiate an appropriate rehabilitation process. It is also important to keep in mind the special personality among elite athletes [2].

Discussion

Considering the risk of sport-related concussions (especially in team sports with increased physical contact) it is important not to oppose the exciting and sometimes breath-taking moments by moralizing. Taking into account the fear of possible brain injuries, people cannot desire motivated and powerful athletes transforming to “couch potatoes”, as Calderwood et al. [3] annotate comprehensible in their editorial of the British Journal of Sports Medicine. Despite the danger of a concussion or second impact syndrome, to be engaged in sports remains positive at all concerning the physical and mental health [8].

Although reliable statistical data about numbers of brain injuries at sport activities are rare, the numerous amount of sports-related concussions is associated with only slight consequences. A “chronic traumatic encephalopathy (CTE)” is very rare and occurs only with frequently repeated brain injuries. Therefore it is important for the professional to be awake at diagnostic and conceptual procedures and to be sustaining at therapeutic duties. Doing things without a basic understanding of the disease and its consequences will not to be expedient.

Capable and experienced neuropsychologists can provide support even to initially severe acquired brain damaged people to participate at a normal and performance-orientated way of life. In the meantime modern sport neuropsychology provides solid and interdisciplinary options. This was outlined by several contributions during the first annual meeting of the Society for Sports-Neuropsychology in Würzburg. But sometimes anatomical and physiological barriers caused by brain

injuries cannot be overcome with therapeutic competence.

View of the prospects for the future

Neuropsychological consequences arising from concussions in team sports need extra care. Concerning diagnostic and therapeutic topics as well as return to play, powerful and elaborated algorithms offer a variety of treatment options. A broad outline is provided by Conder and Conder [4]. The return-to-play-protocol is committing to a course of action which is finely tuned to a number of successful and effective proven stages with supervised medical support. These interdisciplinary aspects will be put into the process for a continuous improvement.

Modern sport-neuropsychology includes considerably more content, however, than the administration of SCAT or simple standards. They condense a detailed neurocognitive sport-related performance specification. It encompasses the athlete’s specific personality and emotional constitution, too. For the future it is essential to ensure that athletes get the chance to be subject at an appropriate treatment by a sport-neuropsychologist and will be accompanied in the course of return to play. It took a period of 100 years to put the focus on sport-psychiatry being perceived by a broader community [2]. We hope and intend that in case of sport-neuropsychology this process will not require another 100 years again, at all.

In 1974 in his legendary fight (“Rumble in the Jungle”) Muhammad Ali has not performed the final blow against an already knocked out wobbling opponent George Foreman and thus Ali has

highly respected the fairness in sport and the athlete’s dignity. Examples like this should attract attention, respect and appreciation among fans and spectators. Perhaps one of these days there will be a score or a prize being awarded to an athlete for such fair play?

Conflict of interest

There is no conflict of interest.

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