

Neuropsychological Implications of Sport-Related Concussions among Young Athletes and Recommendations for Safety

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Abstract

Key Aspects of the Literature Review- The influx of technology fostered opportunities for neuropsychological studies for identifying and researching concussion symptoms and recovery patterns for providing better education to patients. In addition, emphasis on conducting *neurocognitive assessments* or *periodic computerised tests* can help in measuring the decision-making ability, memory and reaction time of young athletes for combating the risk of *PTSD (post-traumatic stress disorder)*. Besides, evaluating the symptoms and safety measures of such sports-related concussions through organising *neuro-psycho educational* programmes can be effective to reduce the health risk among young athletes.

Research Question- What are the Neuropsychological implications of sport-related concussions among young athletes and recommendations for safety?

Objectives: This paper intends to examine the reasons behind traumatic brain injury among young athletes that ultimately can lead to the deterioration of control motor function. Considering this, young athletes being highly vulnerable to sports-related concussions, especially due to head injury, require attention to studying the reasons and recommendations to handle such health risks.

Methods Used: Secondary method of data collection, qualitative strategy and thematic analysis

Results and Implications- Neuropsychological disorder that refers to the medical condition that includes neurology and psychiatry. Among all Neuropsychological disorders cognitive deficit disorder Seizures memory loss Alzheimer's are considered as severe issues. Sports related head injury eventually impacts the career of the athlete at an event that gives rise to severe issues such as memory loss, Alzheimer's disease, chronic traumatic encephalopathy, Mild traumatic brain injury that impact the cognition ability of the athlete. In worse cases this impact the mental health and leads to anxiety depression suicidal tendency and even cause death. Therefore it becomes essential to undergo baseline tests in order to identify the brain functioning after the engineering to prevent the negative impact on the mental health of the athletes.

Keywords: Traumatic Brain Injury, Memory Power, Baseline Test, Post-Concussion Syndrome.

1. Introduction

Concussion which is termed as the temporary disturbance in the brain function is a TBI (temporary brain injury) which can be mild, moderate and severe. It is the most common type of TBI with most of them being mild in nature. Concussions generally take place due to direct or indirect transfer of impulsive forces to the head and the common symptoms of concussions are headache, dizziness and memory impairment (Rivara *et al.* 2020).

Although more than 90% of concussions might not have any serious implications for a person, the scenario changes when it comes to athletes who suffer from multiple concussions while playing. There can be manifestations of cognitive, physical and behavioural signs due to concussions. In the most serious cases, concussions can lead to loss of consciousness while repeated concussions can have long-term implications for speech, learning and memory (Jeckell & Fontana, 2021). Athletes can suffer multiple concussions during their entire career which can have serious implications for their neuro-psychical functioning. However, suffering multiple concussions early in the career can greatly impact the future performance of the athlete in the school as well as the field. The growth and development of young athletes can be negatively impacted by any form of TBI.

Sport-related TBI is often considered to be a silent epidemic and one of the most important public health concerns (Lopez-Flores *et al.* 2022). Sports that involve collision and contact like Football, Rugby, Ice Hockey, Boxing, Ice Hockey and martial arts along with high-velocity sports like roller skating, cycling, motorcycling and roller skating are the ones that can be associated with a high risk of TBI and common elements where concussions occur (Emery *et al.* 2021). There are also a number of factors that can contribute to sports-related concussions but there is very little evidence on the role of age and level of competition on the risk of concussion. However, there is evidence that young athletes are the ones who are more vulnerable to sport-related concussions than adult athletes.

There are a number of reasons that contribute to the large number of concussions among young athletes such as the fitness and equipment level, their growth and development and immature/developing brains that cannot autoregulate the flow of blood for managing concussions (Wilmoth *et al.* 2019). On the other hand, majority of the concussions go unreported and there is a lack of recognition for concussions among young athletes. The coaches of young athletes often used phrases like 'blow to the head', 'suffered a ding' or a bell rang in his head' to describe concussions (Covassin *et al.* 2019). This leads to the belief that concussion is a part of the game and there is nothing to be concerned about in the process. However, a young athlete is bound to suffer more concussions and symptoms pertaining to repeated concussions can be quite serious. Hence, the Neuropsychological implications of sports-related concussions will be discussed in this study along with appropriate recommendations for improvement to address the issue.

2. Aim of Study

Although young athletes might be less aware of the concussions that they have suffered, it is still important to address the issue to ensure that it does not cause long-term problems for them in the future. It is integral to develop a complete idea of the impact that concussion can have on a young athlete. Hence, the aim of this study is to explore the Neuropsychological implications that are associated with sports-related concussions among young athletes. The study will also discuss appropriate measures that can be taken to improve safety and reduce risk among young athletes.

3. Materials and Methods

Sports-related concussions especially among young athletes are a matter of great concern and are often considered a serious public health concern. This further has led to a large number of studies being conducted on the subject by various organisations, institutions and researchers. Hence, this study will make effective use of past studies that have been conducted on the subject to achieve the above-mentioned aim. To be more specific, the secondary method of data collection which involves using the primary work of others to gather information has been used in this present the findings of the work. The secondary method makes it easy to gather a large amount of information on the topic in the way of providing a detailed summary of the entire phenomenon. Hence, peer-reviewed journals and online articles published by top institutions have been used in this study to provide an effective discussion. Further, the secondary data collection method has been supported by the qualitative strategy. The qualitative strategy involves gathering textual and non-numerical data on the topic to provide a comprehensive and detailed account of the particular concept and phenomenon. This strategy has been used in this context to gather a large amount of data that can provide a clear idea of the scenario.

Further, another important aspect of any study is the analysis technique that has been incorporated by the researcher to complete the study. The most common and effective technique to analyse qualitative data is the thematic analysis and thus the same has been used in this study. The thematic analysis involves looking for codes and patterns within the collected while developing themes to present the findings of the work in a structured manner. The thematic analysis provides a certain level of flexibility to the researcher while making it easy to present the findings in an effective manner. Hence, multiple themes have been developed in the next section of the article to present the findings of the work. On the other hand, there are various ethical issues that can arise in the way of conducting the secondary research. This study has ensured that the ethical issues are addressed by acknowledging all the sources that have been used to complete the work. The researcher has taken no credit for others' work and properly acknowledged other researchers' work with the use of in-text citations and a reference list at the end.

4. Findings

4.1. Neuro-psychological symptoms and factors involved with sport-related concussions among young athletes

Neurocognitive disorder refers to the medical term that holds a broad range of medical conditions which includes both neurology and psychiatry. One of the common neuropsychiatric disorders comprises attention difficulty disorder, cognitive deficit disorder, seizures and so on. Sports related concussion is considered as one of the social neurological concerns that is capable of impacting the career of young athletes to an extent. It is everything that in sports injuries are a part of life. In some cases the effect of sports related head injury is long lasting and this event causes severe damage to the brain and eventually impacts the career growth of young athletes (Narayana *et al.* 2019). It is evident that being a young athlete the brains of the individuals are still developing, therefore considered one of the vulnerable and long term replications of these injuries.

Moreover it is true that all types of post related concussions are considered as mild traumatic brain injury (mTBI). Traumatic brain injury is one of the major causes of lifelong disability of The Young athletes and even this causes death in some cases (ARNETT, 2019). This is even one of the public health concerns due to severity and critically. There are several factors that eventually lead to Greater risk in case of sports related concussion. Primarily it is evident that changing the level of competition affects the risk of concussion and as there are more male athletes in the sports industry therefore it becomes evidence that the number of concussions is higher in men compared to women. It is evident that concussion risk and gender eventually varies sports to Sports. For example the higher respects are present in football hockey and for women Soccer and basketball are considered as one of the highest risks of concussion.

Apart from that it is also evident that boxing or other sports such as rugby processes greater risk of concussions than any other Sports. Confession happens at that time when due to heavy force the brain is rapidly moved back and 4th inside the skull And this happens either by direct hit or by hit to the body that forces the entire head to quickly rotate. Concussions can happen at any point of time or during any activities therefore it becomes essential for young athletes to look at all the consequences before acting for any activities. This also happens due to falling and banging the head with the ground or with the wall and the chances of concussion is more with young adults and teenagers. It is noticeable that concussion is also common in major team sports such as line Bakers offensive lineman and defensive bags probably have the greater risk of concussion to a large extent than receivers (McGroarty, Brown & Mulcahey 2020). In addition there are other factors as well such as the body mass of the player and that training time. It is noticeable that in case the body mass of the athlete is greater than 27 kg per metre square and training time is comparatively less than this eventually gives rise to concussion.

2. Serious neuro-psychological risks associated with sports-related concussions

Sports related concussion or mild traumatic brain injury or mTBI impact the brain function of athletes to an extent and this often causes Persistent symptoms that is also known as post-concussion syndrome (PCS). Additionally repeated injury eventually increases the long term risk factor for athletes which results in neurodegenerative disease such as chronic traumatic encephalopathy (CTE) and Alzheimer's disease (Ledreux *et al.* 2020). That eventually impacts the career of athletes to a large extent and eventually impacts the health of the

athletes. It is evident that head injury is likely to cause CTE and the risk factors are associated with mostly football and hockey players to a great extent. This eventually results in memory loss and in CVR cases leads to depression and aggressiveness, impulsive behaviour and so on. In some cases, suicidal behaviour have also noticed as a result of CTE. It is evident that chronic traumatic encephalopathy is associated with motor neurone disease that appears clinically as similar to amyotrophic lateral sclerosis (ALS).

Post concussive symptoms include difficulties in adopting sleeping disorders due to mental activation anxiety and other severe effects. That does not only impact the career of the athlete but impact their life from every perspective to a large extent. Mild to CVR head injury eventually causes dementia and Alzheimer's and that affects the lifetime of the athletes and eventually impacts their Creative Thinking and behaviour. Mood disorder is also obtained and this eventually impacts the lifestyle of the active and destroys the career. An individual with CTE mistakenly put down the symptoms to the normal process of ageing and even might receive a wrong diagnosis due to the fact that the symptoms are quite similar to other conditions such as Parkinson's Alzheimer's disease (Brain Injury Research Institute, 2023). Sports related concussion affects the brain function and even leads to severe brain damage and causes serious Neuro psychological disease that impacts the career and normal lifestyle of the athlete.

4.3 Importance of baseline and post-injury neuropsychological testing in sport's related concussions

It is everything that sports related concussions are extremely dangerous for the athletes and in words cases this leads to light threatening brain damage to the young athletes. Post injury test helps to detect concussion and this eventually helps s to save the career and life of the young at least to a large extent. There are different types of post injury tests that are capable of identifying sports related concussion as early as possible. Baseline test is one of the most effective that has the ability to detect the balance of brain function of the athletes and this is even capable of identifying memory power and concentration. In simple words baseline testing measures the functioning of the brain and it is capable of detecting concussion and eventually prevents negative impact of the concussion to a large extent (Putukian *et al.* 2021). It is Everton that with the help of baseline testing the authority identifies the severity of concussion and this eventually helps to minimise the risk factor.

Concussion is a part of athletics and this eventually impacts the life of young athletes therefore it needs to be tested to better cure. The main purpose of baseline testing is to collect data that represent the athlete's brain function in a normal or an injured state as Healthcare providers can even compare this information or data after the head injury (Riegler *et al.* 2021). It is evident that sports related concussion are extremely severe and therefore it becomes essential to undergo baseline tests as this is capable of identifying the symptoms of post injury and eventually help to select the clinical procedure that increases the chance of risk prevention. The test is extremely effective and it is practised by trend Health Care professionals to treat athletes and understand their brain function, memory scale and ability to pay attention and the concentration level and the problem solving ability after the appearance of concussion syndrome. Post injury tests are extremely essential and in this scenario baseline tests help to detect the cognitive ability of the athletes and increase the chances of recovery.

4.4 Effective management of sports-related concussions among young adults

Concussion is a common injury among adults and young athletes and this eventually impacts life and career to some extent. Therefore it becomes essential to improve the management system in order to reduce the risk factor and boost the chances of recovery. It becomes essential for the authority to ensure that there is the right amount of equipment that is capable of preventing concussion such as helmets padding skin guard and mouth guard and so on. It is evident that protective equipment helps to prevent severe concussion during sports and this helps athletes to safeguard themselves from the life threatening disaster (Waltzman *et al.* 2020). It is also essential to ensure that the protective equipment is well maintained and the fittings are on point to ensure safety to a large extent.

Strategic implementations are extremely essential in order to prevent the risk factor associated with the sports related concussion in young adults and teenagers. It is evident that one of the most risk factors of primary concussion are commonly in football soccer hockey wrestling and so on therefore it is extremely essential to incorporate effective strategies such as educational intervention and modification of the playing rules and

techniques (Waltzman, & Sarmiento, 2019). It is everything that proper education related to concussion is capable of identifying the severity of the scenario by the young athlete and this will help the individual to be safe and protective. Apart from that, effective training and proper strengthening programs must also be implemented in order to prevent the effects related to sports such as soccer (Indharty *et al.* 2023). In addition proper heading techniques and behavioural skill training and improvement of sensory and estimation also help the athletes to safeguard themselves from head injury and prevent concussion.

5. Discussion

The career of young athletes can significantly be impacted due to the multiple concussions that they face at the early stages of their careers. Concussions can create significant neuro and psychological damage in the long run to the athletes that can completely damage their careers and impact the quality of life that they are leading. There are various factors that contribute to concussions among such athletes and much of these can be attributed to the nature of the game that they play. The contact sports such as soccer, hockey and football are some of the major sports with the most cases of concussions and for young athletes, concussions are more significant. Young athletes are in the early stages of development which makes the brain immature to handle the level of impact due to collisions. Hence, such repeated concussions in sports can pose some serious risks for young adults leading to poor quality of life. Some of the most serious neuropsychological risks involved with the case are PCS, CTE and Alzheimer's. Memory loss and depression are also some of the serious risks that can be associated with concussions along with the aggressive behaviour of the players in the process. Although concussions are generally mild for the majority of cases, multiple concussions can have all the mentioned implications for young athletes whose brains are in the early stages of development. Hence, there is a need to take appropriate steps and measures to ensure that the athletes do not have to suffer serious consequences in the future. Post-injury test and baseline testing are something that needs to be done along the way to improve the entire scenario. It is also quite important for young athletes to have access to the right protective gear to reduce the impact of a collision on their heads. Young athletes do not have the right quality protective equipment at the school or national level which in turn is unable to reduce the impact. Hence, this is something that needs to take into consideration by the management along with the strategic implementation of new measures and training and development programs.

6. Conclusion

The above study has been able to provide a clear idea of the various neuropsychological implications that can arise due to concussions in certain sports activities and the way they can be effectively addressed with the help of baseline testing and quality requirements. It is quite important for authorities to make note of the situation and consider it as one a serious public health concern. This particular study has been able to provide critical insights that can motivate the relevant institution and governing bodies in taking the most appropriate steps to reduce the risks to the future of young athletes. On the other hand, this study has made use of secondary data to provide a complete idea and there still remains a scope of primary research involving interviews with sports coaches and administrations about the seriousness of the issues and the steps that are being taken to reduce the risks that it has to the future of young athletes.

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