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RESEARCH ARTICLE

BRAIN FUNCTIONS IMPAIRMENT IN FOOTBALL: AN OVERVIEW

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ABSTRACT

Background: Football (Soccer) is a body contact game and head region may be injured due to various causes. There is a dilemma between the researchers whether football impairs brain function or not.
Aim: To review literatures related on brain function impairment and football.
Method: Researchers searched scientific papers through PubMed/Medline and other data sources, then collected full papers and analyzed all the relevant article according to the nature of this study.
Findings: Related literature supporting the controversies prevailing regarding the impairment in brain function due to participation in football. Some studies reported impairment in brain functions after regular soccer playing whereas other groups reported no evidence of brain function impairment after soccer playing.
Conclusions: This review study concluded that brain function impairment due to football playing is inconclusive and invite further controlled scientific research.

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INTRODUCTION

Football, most popular sport among all sections of people throughout the world. As the total number of football participants increasing, there is the probability of more players getting injured frequently. The American Academy of Paediatries Committee on Sports Medicine classes football as a contact sport. Anyone participating in a contact sport risks personal injury. In comparison to other injuries (e.g., sprains, spasm, fractures, etc) during football playing, head injuries are less frequent but this is very worrying side because the symptomatology associated with a blow to the head can lead to cognitive deficits ranging from mild memory impairment to dementia or even death (Cantu, 1996; Smodlaka, 1981). Soccer related head injuries may occur in many ways: head contact with the ball (heading), contact with another player (head, foot, arm), contact with the ground, and contact with stationary objects (goal post, corner flag etc), but recently scientists are more concern with the first one. Microtrauma may result from purposeful heading during practice and match play. Microtrauma is the accumulation of multiple impacts to the head that may cause to a brain injury.

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Each individual impact always may not cause injury alone, but the accumulated many impacts lead to mild traumatic brain injury (concussion) or sub concussion. The accumulated multiple brain injuries best be assessed and explained with the use of neuropsychological assessment. Neuropsychological assessment helps in finding out data related to: (i) Sports-related concussion and (ii) Neurocognitive/ medical well-being, major two modern days dimensions for the promotion and development of sports. Sports-related concussion defines a phenomenon of mild traumatic brain injury (MTBI) that occurs within a sports context. Neurocognitive/medical well-being defines the use of neurocognitive assessment of athletes to determine the role that normal sports activities might have affecting quality and duration of cognitive capacity and quality of life.

There is the controversy and disagreement between the different groups regarding the degree of impairment sports person may have experienced following minor head injuries. Several cross-sectional studies have indicated that football can cause sustained measurable brain impairment, although it was not supported by other group. So, in order to lay down general conclusion and recommendation regarding brain function impairment related to football participation, present research group searched various data sources like PubMed/Medline, Google scholar, PsycINFO, EMBASE, J-Store, Microsoft Search and Visva-Bharati E library for related literature.

During their search, this research team identified two different groups of research which are categorically stated as below:

1. No evidence of brain impairment after football playing
2. Evidence of brain impairment after football playing

1. No evidence of brain impairment after football playing

Some scientists reported that football playing does not create any sorts of impairment on brain function. Baroff (1998) reviewed the related research literature on neuropsychological findings and heading in soccer. They found neuropsychological abnormalities in a significant minority of other former professional players in Norway. They concluded that research findings specific to heading were not more than suggestive at best and clarification of the risk of heading a soccer ball awaits more definitive studies. Putakian *et al*. (2000) examined the acute effects of heading in soccer on cognitive function. They observed no significant differences between pre and post test scores of heading and non-heading groups. They concluded that heading the ball in soccer does not lead to acute changes in cognitive functions as assessed by a brief neuropsychological battery. Guskiewicz*et al*. (2002) reported that there was no significant relationship between soccer-related concussion and either neurocognitive performance or scholastic aptitude.

Neither participation in soccer nor a history of soccer-related concussions was associated with impaired performance of neurocognitive function in high-level United States soccer players. Rutherford *et al*. (2003) reviewed soccer heading and neuropsychological impairment because a growing literature seems to support the claim that neuropsychological impairment results from general football play and football heading in particular. They concluded that although there is exploratory evidence of subclinical neuropsychological impairment as a consequence of football-related concussion, but there is no reliable and definitive evidence that such impairment occurs as a result of general football play or normal football heading. Pellman *et al*. (2004) reported no evidence of neurocognitive decline after multiple mild traumatic brain injuries in football players. Straume-Naeshein *et al*. (2005) examined the association between previous concussions and heading exposure with performance on computers based neuropsychological test among professional Norwegians football players.

They reported that no evidence of neuropsychological impairment due to heading exposure or previous concussions. Stephens *et al*. (2005) analyzed the data collected for examining whether cumulative incidence of mild head injury, or cumulative heading frequency related to neuropsychological functioning in male adolescent player. They concluded that these findings indicate the absence of neuropsychological impairment arising due to cumulative mild head injury incidents or cumulative heading. Kaminski *et al*. (2007) examined whether there was a relationship between purposeful heading and scores on cognitive function in high school and collage female soccer players. They reported that no significant correlations between the total number of game headers and performance on neuropsychological testing. Kaminski *et al*. (2008) studied several article to determine a relationship exist between purposeful heading in soccer and neuropsychological test performance. They concluded that no detrimental relationship between the number of purposeful headers and the neuro-cognitive measures. Rutherford *et al*. (2009) compared male players from Soccer, Rugby and a variety of non-contact sports at a UK University on biographical and neuropsychological test measures. They observed that no relationship was detected between footballer heading frequency and their neuropsychological test performance. Rieder and Jansen (2011) investigated in an experimental study with a control group design. They observed the effects of a short heading training season on neuropsychological performance and concluded that no neuropsychological deficits which could only be attributed to the heading training. Kontos *et al*. (2011) conducted a cross-sectional relationship study between soccer heading and computerized neurocognitive performance and symptoms in female and male youth soccer players. They concluded that there were no differences in neurocognitive performances between the groups. Gutierrex *et al*. (2013) investigated the relationship between strength impact and neuro-cognitive function in an acute bout of soccer heading in a sample of female high school soccer players. Seventeen participants completed ImPACT neurocognitive test and their isometric strength tested prior to heading drills. Participants performed a series of 15 directional headers, including 5 forward, 5 left and 5 Right headers in a random order. They reported that neurocognitive measurement revealed no significant changes following heading.

2.Evidence of brain impairment after football playing

Quiet large sections of scientists and researchers who identified that football playing creates some sorts of impairment in brain function. Tysvaer *et al*. (1991) examined 37 former soccer players of the National Football league of Norway with an extensive battery of neuropsychological test. They concluded that it may indicate some degree of permanent organic brain damage probably the cumulative result of repeated traumas from heading the ball. Matser *et al*. (1998) examined chronic traumatic brain injury of 53 active professional soccer players from several professional Dutch Soccer Clubs were compared with a control group of 27 elite non-contract sports athletes. All participants underwent neuropsychological examination. The professional soccer players exhibited impaired performances in memory, planning and visuoperceptual processing when compared with control subjects. They concluded that participation in professional soccer may affect adversely some aspects of cognitive functioning. Matser *et al*. (1999) determined whether amateur soccer players have evidence of chronic traumatic brain injury. It was a cross sectional study of 33 amateur soccer players and 27 amateur athletes involved in swimming and tract (controls) in Netherlands who underwent interviews and neuropsychological testing. They reported that amateur soccer players exhibited impaired performance on test of planning (39%) and memory (27%) when comparing with control athletes. They concluded that participation in amateur soccer in general and concussion specifically associated with impaired performance in a memory and planning functions. Master *et al*.

(2001) studied literature to determine the effects of headers and concussions on cognitive impairment in professional soccer players. A group of 84 active professional soccer players from several premier league soccer clubs underwent neuropsychological evaluations. Their finding suggested that soccer players heading as well as concussions separately contribute to cognitive impairment. Downs and Abwender(2002) concluded that participation in soccer may be associated with poorer neuropsychological performance. Although deficits were most apparent among older soccer players, serial neuropsychological testing for early detection of impairment is recommended for younger players as well. Delancy *et al.* (2002) examined the incidents and characteristics of concussions among Canadian university athletes during one full year of football and soccer participation. It was a retrospective survey. 380 Canadian university football and 240 Canadian university soccer players reporting to 1999 training camp were participated in this study. They concluded that soccer players seem to be experiencing a significant amount of concussions while participating in soccer.

Witol*et al*. (2003) observed that frequent header had poorer scores on scales measuring attention, concentration, cognitive flexibility and general intellectual functioning. Comparison of individual scores to age-appropriate norms revealed higher probabilities of clinical levels of impairment in players who reported greater lifetime frequencies of heading. Rutherford *et al*. (2005) compared university soccer, rugby and non-contact sports players on a range of biographical and neuropsychological test variables. They observed attention accuracy scores in footballer were exhibiting poorest performance. Ellemberget *et al*. (2007) assessed cognitive functioning after a first concussion in female soccer players and 6 – 8 months after their injury. A total of 22 female university – level soccer players participated in this study. Paper -pencil and computerized tasks were used to assess different neuropsychological functions. They observed normal short and long term verbal memory, attention and simple reactions time and compared with the control group. They concluded that the concussed athletes were significantly slower on tasks that require decision making.

Steven *et al*. (2010) investigated concussion history, knowledge, injury identification and management strategies among soccer players, coaches and medical staff in Italian football club level. Surveys (N=727) were conducted among Italian football clubs. A total number of 342 surveys report were returned. Italian football (soccer) players were reported, concussions at a rate similar to American football players, with a slightly higher rate of unreported injuries. Stephens *et al*. (2010) assessed mild head injury effects in adolescent soccer players on neuropsychological performance across school team soccer player, Rugby player and non-contact sport in a quasi-experimental cross-sectional design. They observed soccer players were having lower premorbid intellectual functioning. Levy *et al*. (2012) reported that soccer is a sports not traditionally identified as high risk of concussion, yet several studies have shown that concussion rates in soccer are comparable to an often exceeded those of, other contact sports. In United States as many as 22% of all soccer injuries were concussions. Zhang *et al*. (2013) designed to examine the impact of ball heading among high school soccer players. They used iPad –based experiment. Their findings suggested that even sub-concussive blows in soccer can result in cognitive function changes that are consistence with mild traumatic brain injury of the frontal lobe. Seichepineet *et al*. (2013) studied executive function of football players and compared it with healthy adults. 64 college and professional football players were administered the Behavior Rating Inventory function-adult version, (BRIEF-A) to evaluate areas of executive functioning. They concluded football players were more frequent problems with executive functioning than others.

Conclusions

Impact of soccer playing or more specifically heading on neuropsychological functions is an area of controversy. One group who concluded that there is no such evidence of brain impairment after football playing. Whereas other group who supported that the football playing specially heading lead to brain function impairment. This group justified their stand by putting evidence from various measurements like fMRI, EEG, CT Scan etc and also in functional level by conducting neuropsychological assessment and evaluation. Brain function impairment after football playing is still now inconclusive and further in depth scientific study is recommended.

REFERENCES

Baroff, JS. 1998. Is heading a soccer ball injurious to brain function? *J Head Trauma Rehabil*, 13(2) : 45-52.

Cantu, RC. 1996. Head injuries in Sport. British Journal of Sports Medicine. *Brain*, 64 : 93-164.

Delaney, JS. *et al*. 2002. Concussions among university football and soccer players. *Clin J Sport Med :* 331-8.

Downs, DS. *et al*. 2002. Neuropsychological impairment in soccer athletes. *J Sports Med Phys Fitness,* 103-7.

Ellemberg, D. *et al*. 2007. Prolonged neuropsychological impairments following a first concussion in female university soccer athletes. *Clin J Sport Med.,* 369-74.

Guskiewcz, KM. *et al*. 2002. No evidence of impaired neurocognitive performance in collegiate soccer players. *AMJ Sports Med*., 30(2) : 157-62.

Gutierrex, GM., *et al*. 2013. The Relationship Between Impact Force,Neck Strength,and Neurocognitive Performance in Soccer Heading in Adolescent Females. *Pediatr Exerc Sci.*

Kaminski, TW. *et al*. 2007. Purposeful heading during a season does not influence cognitive function or balance in female soccer players. *J Clin Exp Neuropsychol.,* 742-51.

Kaminski, TW. *et al*. 2008. Examining the relationship between purposeful heading in soccer and computerized neuropsychological test performance. *Res Q Exerc Sport,* 235-44.

Kotos, *et al*. 2011. Relationship of soccer heading to computerized neurocognitive performance and symptoms among female and male youth soccer players. Brain Inj, 25(12): 1234-41.

Levy, ML. *et al*. 2012. Concussions in soccer:a current understanding. *World Neurosurg,* 535-44.

Matser, *et al*. 1999. Neuropsychological impairment in amateur players. JAMiA, 282(10): 971-3.

Matser, JT. *et al*. 1998. Chronic traumatic brain injury in professional soccer players. *Neurology*, 791-6.

Matser, JT. *et al*. 2001. A dose-response relation of headers and concussions with cognitive impairmaent in professional soccer players. *J Clin Exp Neuropsychol*, 770-4.

Pellam, *et al*. 2004. Conclusion in Professional Football: Neuropsychological testing-part 6. *Neurosurgry*, 55(6): 1290-303.

Putukian, M. *et al*. 2000. The acute neuropsychological effects of heading in soccer. *Clin J Sport Med*., 104-9.

Rieder, C. *et al*. 2011. No neuropsychological consequence in male and female soccer players after a short heading training. *Arch Clin Neuropsychol.,* 583-91.

Ruterford, A. *et al*. 2003. The neuropsychology of heading and head trauma in Association Football (soccer) : A Review Neuropsychol Rev, 13(3): 153-89.

Ruterford, A. *et al*. 2005. Neuropsychological impairment as a consequence of football (soccer) play and football heading:preliminary analyses and report on university footballers. *J Clin Exp Neuropsychol*., 299-319.

Rutherford, A. *et al*. 2009. Do UK university football club players suffer neuropsychological impairment as a consequence of their football (soccer) play. *J Clin Exp Neuropsychol.*, 664-81.

Seichepine, DR. *et al*. 2013. Profile of self-reported problems with executive functioning in college and professional football players. *J Neurotrauma*., 1299-304.

Smodlaka, VN. 1981. Death on the soccer field and its prevention. *The physician and Sports Medicine*, 9, 100-107.

Stephens, R. *et al*. 2005. Neuropsychological impairment as a consequence of football(soccer)play and football heading:a preliminary analysis and report on school students(13-16 years). *Child Neuropsychol*., 513-26.

Stephens, R. *et al*. 2010. Neuropsychological consequence of soccer play in adolescent U.K.School team soccer players. *J Neuropsychiatry Clin Neurosci*., 295-303.

Steven, PB. *et al*. 2010. Concussion Occurence and Knowledge in Italian Football (soccer). *J Sports Sci Med*., 418-430.

Straume-Naesheim, TM., *et al*. 2005. Effects of heading exposure and previous concussions on neuropsychological performance among Norwegian elite footballers. *Br J Sports Med*., 170-7.

Tysvaer, AT. *et al*. 1991. Soccer injuries to brain- A neuropsychologic study of former soccer players. *Am J Sports Med.,* 56-60.

Witol, AD. *et al*. 2003. Soccer heading frequency predicts neuropsychological deficits. *Arch Clin Neuropsychol*., 397-417.

Zhang, MR. *et al*. 2013. Evidence of cognitive dysfunction after soccer playing with ball heading using a novel tablet-based approach. *PLoS One*, e57364.

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