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**Risk Factors for Concussion in Collegiate NCAA Division II Men’s and Women’s Soccer Athletes**

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**ABSTRACT**

Background: Certain risk factors may predispose athletes to an increased risk of concussion.

Purpose: To identify risk factors for concussion among men’s and women’s collegiate soccer athletes.

Methods: A short electronic survey was sent out to NCAA Division II autohoma in Ohio. Participants were women’s and men’s soccer athletes participating in either junior or senior varsity soccer as defined by the NCAA.

Results: Of concussion sustained while playing soccer, 28.4% of female participants sustained a concussion compared to only 17.4% of male participants. Concussion occurred during a competitive match in 8 of the 9 concussions compared to practice. There were 18 concussion per 100 years for women as well as men, while concussions occurred while playing defensive. Varsity athletes showed a high incidence of concussions (33.3%) compared to JV/Reserve athletes in which there were no concussions (p = 0.0108). Among players with a concussion history, 5 of the 12 (41.6%) sustained multiple concussions. One athlete sustained a total of seven concussions in a time period of nine years. There was a trend of 25 concussions sustained from the 12 participants who indicated they had a history of concussion, 19 of them occurring while playing soccer.

Conclusion: Being a varsity athlete, playing in a game, having a previous history of concussion, and playing on an earlier or middlefield were the risk factors for concussions.

**INTRODUCTION**

Head injuries and concussions in soccer have been of the large amount of attention in recent years. Much research has been done gathering information about signs and symptoms, evaluation, and long-term sequelae. Because of the increasing awareness of concussions there is a large discussion concerning head injuries and whether or not rest and recovery changes should be made to protect the safety of athletes involved in soccer.

Research has shown that in recent years the incidence of concussion has been increasing significantly because of headgear. In a study done on high school soccer injuries, researchers found that concussion accounted for 10-15% of all athletic injuries.

Over the years, there have been many different definitions of concussion, which has led to an inability to compare research. More recently, there has been a push to come up with a definition of concussion that can be used by everyone. In November 2012 the Orthopaedic International consensus on Concussion in Sport was held in Zürich Switzerland. They defined concussion as “a complex pathophysiological process affecting the brain, induce by biomechanical forces.”

They also noted that concussion usually involves a “rapid onset of short-term impairment of neurocognitive function that resolves spontaneously” (Helmich et al., 2012). In some cases symptoms may take more time to appear (Helmich et al., 2012). These symptoms can be classified in three categories: somatic, neuropsychological, and cognitive (Helmich et al., 2012).

Not only are short-term symptoms of concussion a concern, but the long-term effects causes by concussions are also a great worry. Which is why continued research needs to be done in order to figure out whether concussion can specifically lead to certain conditions. One study by Kerr et al. noted that the risk of being diagnosed with depression increased with an increasing amount of self-reported concussions.

There are many steps we can take as parents, coaches, and health care professionals to help prevent injuries and safely return athletes participating in sports. One way to help properly manage concussions (Helmich et al., 2012) is to educate athletes, parents, and coaches about how they occur, and what signs and symptoms they are characterized by. In one study the authors noted that 72% of soccer players who had received concussion education said that they would always notify their coach of concussion symptoms, compared to only 38% of players who reported not receiving any concussion education.

**METHODS**

An online survey using Qualtrics was sent out to collegiate division II men’s and women’s soccer programs in Ohio. Participants included both junior varsity (JV) and varsity players. The survey consisted of initial questions regarding demographics, position, and use of protective equipment. Following this section there was a filter question asking whether the athlete had sustained a concussion, and specific questions regarding the details of the concussion for the athlete who had sustained at least one. Before participating in the study, all subjects read and indicated their consent by clicking on the link to access the survey. The informed consent statement was approved by the University’s Institutional Review Board for the Protection of Human Subjects, which also approved the study.

One week following the original email a follow-up email was sent out to non-participating potential participants of the survey and encourage an increased response rate. Inclusion criteria was collegiate IV and varsity men’s and women’s soccer players that were over the age of 18, division II colleges, and colleges in Ohio. Exclusion criteria were athletes under the age of 18 or not participating in collegiate men’s or women’s soccer. All information gathered was completely anonymous.

**RESULTS**

Data was analyzed using SPSS software, and a point level of significance (alpha level) of 0.05 was used. We used a chi-square as well as Fisher's Exact Test to compute the statistical significance of certain risk factors, and determine the likelihood of concussion from the results. The statistics were also sorted for common themes, and descriptive statistics were used to indicate some of the results.

**DISCUSSION**

Gender

In agreement with most of the current research on the topic, concussions were seen to be more common in females compared to males. (Anderson 2003; Helmich et al. 2012; Helmich et al. 2013) 

Because there were only 3 players who were mouthguards, and 1 who was headgear. However, of the 9 athletes who sustained a concussion while playing soccer, 2 of those were wearing a headgear at the time of the concussion. There was no significant difference between protective equipment worn and a diagnosis of concussion (p = 0.157).

Mechanism of Injury

Out of the 40 respondents, there were only 3 players who were mouthguards, and 1 who wore headgear. However, of the 9 athletes who sustained a concussion while playing soccer, 2 of them were wearing a headgear at the time of the concussion. There was no significant difference between protective equipment worn and a diagnosis of concussion (p = 0.157).

**CONCLUSION**

In the end, this study helps to identify specific concussion risk factors among men’s and women’s collegiate soccer athletes, and determine the likelihood of recurrence or a new concussion based on those risk factors.