Reduction of Mild Traumatic Brain Injuries

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Effects of Additional External Padding on Football Helmets in the Reduction of Mild Traumatic Brain Injuries
Joshua Walker, ATS
Fort Hays State University

ABSTRACT

Participation in football has skyrocketed in the last two decades. With this influx of participation, there is increased research going into sports related mild traumatic brain injuries (mTBI) or sports-related concussions. The use of aftermarket external padding for football helmets is examined concerning impact force accelerations and impact severity. In each study examined, there were no live patients but instead reduction of severity for brain injuries can be achieved. This would also significant change in the Gadd Severity Index (GSI) with or without the Chronic Traumatic Encephalopathy (CTE). The clinical question that was both studies. In these studies, the data collected indicated a reduction in either force or impact severities. In higher velocities, there was a significant change in the Gadd Severity Index (GSI) with or without the Guardian-Cap and where the impact took place (Bowman, Breedlove, Breedlove, Lininger, & Nauman, 2017). With both studies showing significant findings with confidence intervals (CI) in the 95th percentile, there is a need for further evaluation of the topic and lager scale studies for a more powerful significance.

INTRODUCTION

The purpose of this study is to look at what the effects of adding external padding to football helmets are regarding mTBI’s. The significance of this study shows that with more information coming out every year over the damage and danger of sport related brain injuries poses, the question of how to reduce them comes to mind. Reducing the severity or likelihood of severe mTBI would significantly increase the safety of youth athletes and even professional athletes alike. If the reduction of severity for brain injuries can be achieved. This would also likely lower the amount of sub-concusive hits to the head. The sub-concusive hits have been linked to brain damage later in life, like chronic traumatic encephalopathy (CTE). The clinical question that was posed for this research was as follows. Does the use of external padding on football helmets reduce the chances of getting a mild traumatic brain injury?

Key Term Definitions
mTBI – Mild Traumatic Brain Injury
CTE – Chronic Traumatic Encephalopathy
NOCSAE - National Operating Committee on Standards for Athletic Equipment
PEDro – Physiotherapy Evidence Database

RESULTS/ FINDINGS

There was findings that when the use of external padding is used there was some decreases in velocity transmitted to the helmet. Rotational forces were not effected as highly as the linear values. Although the confidence intervals were high in the impact reduction, other measurements were not as conclusive. There is also a variable of helmet brand. In each of these articles there were only two brands represented there are a lot of different brands on the market. There may be a difference in the manufacturing process or materials that may effect the outcomes of the research. Therefore these research articles are a good start but there needs to be more research compiled in order to decide on whether external padding will be beneficial to use on the field for athletes.

METHODOLOGY

Search Strategy
A database search was completed using the key words external padding, football helmet, concussion, and reduction. All Boolean operators used in the searches were “AND”. Inclusion and exclusion criteria were used for this literature search. The inclusion criteria were any article that was published in English and any age of football players for the study. Exclusion criteria were any conflicts of interest, like a manufacturer of external padding conducting the research, and helmets other than those used in football. While using all these criteria’s when searching there were two articles found that fit all of them. Each of the two article were evaluated using the PEDro scale and the values are as follows: Nakatsuka & Yamamoto, 2014 received a 5/10. Bowman et al, 2017 received a 6/10.

REFERENCE


crossref

Table 2

<table>
<thead>
<tr>
<th>Study design</th>
<th>Participants</th>
<th>Intervention investigated</th>
<th>Outcome measures</th>
<th>Main finding</th>
<th>Level of evidence</th>
<th>Validity score*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>Riddell helmet with internal HITS technology and standard Riddell helmet on a boxing torso mannequin</td>
<td>Layers of 1.3cm thick polylefin foam</td>
<td>Peak linear acceleration and peak rotational acceleration at the center of gravity of the head. GSI score, HIC, and HITsp.</td>
<td>With two layers of foam to the stationary helmet there were reductions of head impact severity measures of GSI, HIC, and HITsp. Each trial was shown with a 95% confidence interval from the average. All drops passed the NOCSAE GSI threshold. Significant findings for location of drop, velocity, helmet brand, and Guardian Cap presence were noted.</td>
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<td>5/10</td>
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<td>Crossover</td>
<td>Nine brand new football helmets, three Riddell Speed helmets, three Xenith X2E helmets, and three Xenith Epic helmets</td>
<td>Guardian Cap</td>
<td>Priori was set at 0.05 for the study. GSI scores and linear accelerations when the helmets were dropped measured in g forces dropped at three different speeds, on six different locations. Measured both with and without the Guardian Cap.</td>
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*Validity score is based on PEDro scale

For a more powerful significance.

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