

## **Parametric Analysis of the Influence of Elastomeric Foam on the Head Response During Soccer Heading Manoeuvre**

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### **ABSTRACT**

Soccer is a unique game that permits the purposeful usage of the head in directing the ball. A lot of studies have coupled heading in soccer with brain trauma injury. This has led to the introduction of various protective headgears for soccer players. Nonetheless, studies have shown that these headgears are only beneficial in head-to-head impact, but none are useful in reducing the risk of sustaining a brain injury due to a soccer heading manoeuvre. The purpose of this study is to evaluate the influence of an elastomeric foam on the head response due to soccer heading manoeuvre by means of the finite element analysis. Validated FE models of soccer ball and human head were used to perform FE analysis of soccer heading. A layer of soft foam was added on the forehead to represent the protective headgear. The foam was defined using hyperfoam material model. A parametric study was conducted to investigate the impact of each material coefficient and foam density on the head response due to soccer ball heading. The results obtained show that an elastomeric foam alone is not able to mitigate the impact caused by soccer heading. Further work on the design of the headgear is needed to look for an optimal impact mitigation strategy.

**KEYWORDS:** Soccer headgear; elastomeric foam; finite element; hyperfoam.

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