Concussive Forces and Brain Trauma in Competitive Sports

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Background
Concussions are the most common type of traumatic brain injury (TBI). They are typically caused by severe head impacts, which cause the soft brain tissue to make contact with the inside of the skull, often resulting in temporary neurological impairment.

In 2009, hospitals reported 24,184 cases of soccer head injury, and 28,716 cases of water polo head injury (American Association of Neurological Surgeons).

Soccer and water polo pose a unique danger to the head (when compared with other competitive sports) due to the nature of ball interaction. Soccer is the only competitive sport that involves and condones purposeful head contact with the ball, and water polo is one of the only sports that involves ball flight almost exclusively in a plane parallel with head altitude.

Ball pressure could have a significant impact on the concussive forces exerted by a ball on the human skull.

Overall Objective
The primary goal of this research is to ascertain whether ball inflation pressure has a significant impact on traumatic brain injury (TBI) and chronic traumatic encephalopathy (CTE). Auxiliary goals include assessing the effectiveness of headgear in competitive sports for preventing TBI and CTE, designing a new headgear for water polo players, and testing the accuracy of the new G-Force head-strap accelerometer.

Innovation
Some of the most serious head injuries in water polo and soccer are due to deflections of the ball off of the goal post. Appropriate headgear could help prevent or reduce such head injuries. In the months that follow, we plan to design a new headgear that will protect the head in a more comprehensive manner.

Current Status
The experimental procedure and timeline of experimentation have been set. We are currently awaiting confirmation for the rental of an ATD, which will be used for experimental impact testing. Most other experimental equipment have already been acquired, including a soccer ball launcher, radar gun, and G-Force accelerometer.

Next Steps
Once the experimentation has been conducted, we will spend time processing the results. This analysis will allow us to determine whether there is a correlation between ball inflation pressure and brain injury. The results will also provide insight to the accuracy of the G-Force head-strap accelerometer. Our conclusions will determine how we will proceed with headgear design.

Timeline

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