Project title

Designing a surrogate neck to study the effects of heading in football on brain injuries.

**Please briefly (100-200 words) summarise your research, stating the research question and the value of the research, who will participate, the number of participants involved and the methods to be used**

The research aims to design a new physical surrogate neck model that can be used to recreate and test how the act of heading a football can impact the player’s brain. This will be used to inform future design of footballs to reduce the damaged caused by playing the sport. Data has already been collected on high impact headers on live participants, therefor the request for this research aims only to study the movement of the players head before ball impact, which will involve 10 regular active football players performing low speed headers so that their motion can be studied. The methods of data capture will involve non-intrusive methods of video capture, surface EMGs and accelerometers.

**What is the expected value of your research? In other words, why do you think your research is important to execute? Will it provide knowledge for science and/or society?**

The research gathered will be used to help make informed decisions by the premier league and other governing bodies, on how to regulate football to better protect the players. It will provide detailed knowledge on the effects of headers for the brain and allow for future research into the area without having to use live participants.

**What is the expected impact of your research for Imperial/Society/Science?**

For society the research will directly advance our understanding into the brain damage caused through the most popular sport in the world and allow for a better understanding on how rules and regulations can be changed to better protect the millions that regularly play.

For science it will help provide more information on how the movement of the head before impact effects the brain, which is relevant and often not taken into consideration for many other studied head impacts such and bike accidents and other contact sports.

For Imperial the premier league is looking for universities to collaborate with in their aim to fund more research into football, particularly around the dangers of head impacts.

**What is expected scientific validity of your research? In other words, can you describe why your research method is best suited to fit your research interest or on what grounds you choose to conduct a sub-optimal research method.**

This method of data gathering is best suited as it will will provide precise information on how the head moves and the muscles activated during a header without using high speed impacts which could injure the player.

A sub-optimal research method will be used if we are unable to find willing participants or if participants experience any symptoms of mild concussion or injury. This would involve the participant acting out the header without the football. If this was not possible then existing video footage from football games would be used, which would greatly reduce the accuracy of the research without accelerations muscle activation or optimal video angles.

**Are there any risks for the participants to take part in the research? If yes, how do these risks compare to the gains of the outcomes of your research (explain the risk/benefit ratio).**

There is a minor risk of head injury when heading footballs, however, the participants will be selected by their ability to head the ball so they will be competent in using the correct technique and already regularly head footballs. The ball will also travel at much slower speeds than other research papers have deemed to have any lasting impact on the brain. They will be monitored during the research and asked to stop if they are using the wrong technique.

The benefits easily outweigh the risks as the risk involved is very small and easily controlled, whereas the benefits are that the research could provide information that could protect the millions of people who play football.

**Do you foresee any negative societal consequences of your research?**

There are no foreseen negative societal consequences of the research.

**Activities you will conduct to respect the participants in your research.**

The participants will be informed on all aspects of the project and given time to ask questions before participation. They will be free to stop at any time. A consent form will be provided for use of their data which will explain how it is to be used.

The activity will involve projecting low speed footballs towards active experienced football players for them to head the ball. Surface EMGs and accelerometers will be attached to gather data along with video footage on how they move their head.

Only active and experienced players will be used who understand the correct heading technique to minimise damage. The ball will be projected using the “Ball Launcher Pro Trainer” at speeds well below those shown to cause damage.