November 2022

Using Laboratory Impact Testing and Finite Element Modelling to Improve Protective Sports Helmet Designs and Prevent Mild Traumatic Brain Injuries

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Helmets are an essential piece of equipment for protection against mild traumatic brain injuries (mTBIs) in sporting activities such as ice hockey. mTBIs can be caused by the straining of tissues and axonal tracts within the brain. Current helmet designs are excellent at preventing acute surface injuries, but only offer limited protection against diffuse injuries such as mTBI-relevant diffuse axonal injury, which is caused by the straining and tearing of axons within the brain. Incorporating results from finite element simulation of the brain during laboratory impact testing into the helmet design process can help equipment manufacturers design helmets that better protect against the rotational component of impacts, which cause axonal injury. Additionally, these finite element simulation results can be utilized as inputs to artificial intelligence networks, which can instantaneously quantify brain tissue and axonal strain from head impacts and indicate if the impact is likely to cause a mTBI.

Word Count: 149