

Building a Pendulum Impactor to Investigate Sub-Concussive Head Impact Kinematics

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Figure 1: Completed pendulum impactor system

The mechanisms of mild traumatic brain injury are not very well understood, despite being the most common brain injury. There is a gap in understanding the kinematics and brain response immediately following an impact. This research explores the biomechanical mechanisms of mild traumatic brain injury through laboratory human volunteer experiments. Specifically, it focuses on characterizing the kinematics of the head and brain in response to repetitive sub-concussive impacts in a repeatable and controlled environment. Mathematical models were used to simulate the head accelerations during impacts. From the simulation results, a pendulum impactor system was designed and built to deliver multi-directional, repeatable impacts to the head in both the sagittal and coronal plane. Preliminary impact and acceleration data was gathered using custom instrumented mouth guards and bite bar. The data was used to create a kinematic profile of the head during impacts, and in the future will be correlated to brain response using an EEG machine.

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