Investigating Shear Thickening Fluid Applications to Decrease Linear and Rotational Mean Peak Acceleration as Measured by Dual Axis Accelerometers in Hockey Headgear and a Hybrid 3 Head Form

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Recently a new emphasis has been placed on protection headgear in hockey and other sports as the importance concussion and sub-concussive brain Injury has been better understood, A Summation of Tests for the Analysis of Risk (STAR) formula has been previously described by mapping on ice exposure impact data to laboratory test conditions as expressed in the equation: (4 impact locations) Summation (L=1) and (3 impact energy levels) Summation (theta= 1) E(L, theta)(R(linear(a), angular(alpha))). Linear(a) and rotational(alpha) head acceleration are potentially modifiable risks in this equation. A four meter pendulum was carefully designed and constructed to closely replicate the testing conditions of the STAR paper. Using this pendulum testing system, sheer thickening fluids and materials containing cornstarch and silica/PEG and nanoparticle sized Mica suspensions were tested for their potential to decrease mean peak acceleration and rotational acceleration. Externally applied engineered sheer thickening fluids and materials tested in this experiment significantly ($p<.05$) reduced risk (R) of concussion as a function of linear(a) and rotational (alpha) head acceleration.

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