An Exploration into the Effects of Incorporating Biomimicry into Position Specific Helmet Technology and the Potential to Reduce, or Possibly Eliminate, Chronic Traumatic Encephalopathy (CTE)

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The purpose of this research was to determine the possibility of reducing g-Force and acceleration of frontal impacts in a football player's position-specific helmet design in an attempt to reduce the occurrence of concussions and long-term brain damage - Chronic Traumatic Encephalopathy (CTE). Biomimicry, in the form of an Experimental Facemask + Linear Dampers, was utilized to mimic the action of a woodpecker's beak to, potentially, dissipate the energy of impact before being transferred to the head. Hypothesis: By incorporating biomimicry, in the form of linear dampers, into position-specific football helmet designs, acceleration of human brains, during impacts, can be significantly reduced. Independent Variables: • Original Facemask (Control) • Exp. Facemask + 5lb. Linear dampers • Exp. Facemask + 15lb. Linear dampers Dependent Variables: • g-Force----------N/kg • Acceleration---m/sec Data was analyzed using a one-way ANOVA and Tukey HSD. Both experimental designs resulted in significant ($p < .01$) reductions in g-Force and acceleration compared to the Control. Also, 15 lb. dampers significantly ($p < .01$) outperformed 5 lb. dampers. Further testing will be performed using dampers larger than 15 lbs. Also, multidirectional dampers will be used to allow the face mask to articulate while preventing it from being used as a lever. Thus, reducing axial rotation when the facemask is impacted from the side. Since results showed significant ($p < .01$) reductions in g-Force and acceleration for each experimental design, this suggests that the experimental designs have the potential to reduce the incidence of concussions and the cumulative effect of repetitive impacts - A leading cause of CTE.

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