# Staying Ahead of the Hit: Concussion Recovery in Youth Optimized Using a Comprehensive App-Based Program (CRYO CAP)

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Background: Substantial research suggests that therapeutic hypothermia could ameliorate the impact of Traumatic Brain Injury (TBI). Our goals were: 1) Study the effects of concussion in a validated animal model (Drosophila melanogaster) and determine whether therapeutic hypothermia could mitigate neurocognitive impacts and 2) Engineer a device (CRYO CAP) that delivers consistent cerebral hypothermia to an athlete with mild TBI, using app-based technology to diagnose the concussion and monitor recovery. Methods: Fly experiment - A “high-impact trauma” (HIT) device was used to induce mechanical damage to the fly brains. Flies were separated into a control group and a hypothermia group which was cooled for 3 minutes in a refrigerator at temperature of 16 C. CRYO CAP - consists of an electrical system, a cooling system, and a helmet. The helmet is lined with cooling tubing and uses a temperature sensor, at the athlete’s temple, which connects to an arduino microcontroller to relay temperature data to the app. The app diagnoses and classifies the TBI, using the Glasgow Coma Scale. Mild TBI prompts cooling for 30 minutes. The app then prompts the user to complete the Concussion Symptom Scale (CSS), a validated symptom inventory, assessed daily for 14 days. Results: Concussed files demonstrated much less time to sedate compared with controls and hypothermia seemed to mitigate this negative effect. The single and dual radiator designs resulted in CRYO CAP temperatures of 11.2°C and of 8.5°C, respectively. Conclusion: CRYO CAP provides therapeutic hypothermia after a concussive head injury while also empowering users with technical support and obtaining data in real-time that innovatively connects the trainer and athlete, at the bench, to the physician at the bedside.

**Awards Won:**
Third Award of $1,000