

Student Symposium Abstract

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Cervical Spine Adaptations Associated with Repetitive High-G Exposure: A Systematic Review of Motorsport and Aviation Populations

Motorsport athletes, particularly Formula 1 (F1) drivers, are exposed to repetitive high-G acceleration and deceleration forces, prolonged isometric cervical muscle contraction, asymmetric rotational loading, helmet-induced axial loading, and whole-body vibration. These unique biomechanical demands place substantial stress on the cervical spine and associated neuromuscular systems.

Although substantial literature exists regarding cervical spine degeneration, concussion, whiplash-associated disorders, cervical sensorimotor adaptations and cervical rehabilitation in traditional athletes, relatively little research to none has focused specifically on the cervical sensorimotor adaptations occurring in motorsport athletes. Existing studies suggest that repetitive cervical loading may contribute to cervical muscle fatigue, altered proprioception, joint position error, vestibulo-cervical dysfunction, accelerated degenerative changes, and impaired athletic performance.

This systematic review aims to synthesize the existing literature regarding cervical spine adaptations in athletes with repetitive high-G exposure and propose future directions for clinical assessment, rehabilitation, and biomechanical optimization in motorsport.