Neurotrauma

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Neurophysiological effects of repetitive non-concussive impacts in collegiate football players

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doi: 10.1017/cjn.2025.10268

Background: Over 1.3 million people in North America participate in tackle football annually. Football players experience a disproportionately higher risk for repetitive non-concussive impacts (NCIs) compared to other high-contact sports athletes. Quantifying how this exposure influences a player's cognitive function is imperative. While NCIs share the same mechanism as concussions, they do not elicit immediate symptoms. Methods: This study tracked impact exposure in 13 male Queen's Varsity Football players using six-axis mouthguard accelerometers throughout the season. Electroencephalography (EEG) recordings were conducted at two time points (pre-season and post-season) to measure event-related potentials (ERPs), evaluating auditory sensation, basic attention, and cognitive processing. Results: Analysis of pre- and post-season EEGs revealed group differences in N100 and N400 wave amplitudes but found no correlation between impact exposure metrics (including varying magnitudes, frequencies, and linear and angular accelerations) and deficits in attention or cognitive processing. Conclusions: These findings suggest that a single season of football-related NCIs may not be sufficient to produce detectable changes in cognitive function as measured through ERPs, despite the variation in impact exposure. Further longitudinal studies spanning multiple seasons and additional neurophysiological measures may be necessary to fully understand the cumulative effects of NCIs on cognitive function in football players.

Stroke

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The impact of pre-stroke frailty on stroke rehabilitation outcomes: a retrospective cohort study

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doi: 10.1017/cjn.2025.10269

Background: Stroke is a leading cause of disability worldwide, resulting in long-term impairments requiring rehabilitation. Frailty, characterized by reduced physiological reserve and vulnerability to stressors, is associated with poor health outcomes. When assessed using the Clinical Frailty Scale (CFS), frailty has been linked to adverse outcomes; however, its role in stroke rehabilitation remains underexplored. This study investigates the impact of pre-stroke frailty on functional recovery during inpatient stroke rehabilitation. Methods: A retrospective cohort study was conducted on 206 stroke patients admitted between 2020-2022. Pre-stroke frailty was assessed using the CFS, and rehabilitation outcomes were measured using Functional Independence Measure (FIM) gain and efficiency. Differences across CFS categories, stroke location, age, and sex were statistically analyzed. Results: Among these patients, 42.7% were female, and 75.7% were aged 60 or above. There were no significant differences in FIM gain or efficiency across CFS categories ($p > 0.05$). Frailty was associated with lower admission ($p = 0.041$) and discharge ($p = 0.032$) FIM scores. Conclusions: Pre-stroke frailty, assessed retrospectively using the CFS, does not predict functional improvement or efficiency during inpatient rehabilitation. However, frailty was associated with poorer functional status at admission and discharge. All patients meeting the admission criteria benefited from rehabilitation, regardless of frailty level.

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Regenerative white matter effect of neurod1-based gene therapy in non-human primate stroke model

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doi: 10.1017/cjn.2025.10270

Background: Stroke therapies remain an area of ongoing research. Gene therapies offer a novel approach to repair tissue damage, particularly NeuroD1-mediated astrocyte-to-neuron conversion, which regenerates functional neurons after ischemic injury. Here, we applied NeuroD1 therapy in a non-human primates (NHPs) stroke model to evaluate its effects on corticospinal tract (CST) recovery and motor performance. Methods: Eight NHPs underwent middle cerebral artery occlusion (MCAO). Fourteen days later, six animals received intracranial NeuroD1 treatment (three high-dose, three low-dose), while two received a control solution. Neurological and functional performance were assessed daily. MRI scans were performed at baseline and at 7, 30, 90, 120, and 240 days post-MCAO, with the bilateral CST reconstructed at each time point. All procedures followed Canadian Council of Animal Care guidelines and were approved by Queen's University's Animal Use Subcommittee. Results: We found that NHPs receiving the control solution exhibited poorer motor recovery and minimal CST reconstruction. In contrast, those treated with a low dose of NeuroD1 demonstrated motor and functional recovery along with CST reconstruction. Notably, animals receiving the higher dose showed the most significant overall recovery including a greater CST integrity. Conclusions: NeuroD1 treatment promotes white matter tract restoration and facilitates motor recovery following stroke.