

Reliability of Five Novel Reaction Time and Cognitive Load Protocols

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Return to play or duty following a concussion is unique for every individual as there is no uniform recovery trajectory for clinical assessment or rehabilitation. A common side effect from a concussion is slowed reaction time. When returning to play or duty, reaction time should be at preinjury level to determine a safe return to activity, and to prevent further injury. The Dynavision D2 (Dynavision) system may be utilized as an assessment and/or rehabilitation tool to aid reaction time assessment following concussion. The system consists of 64 raised, color changing targets arranged in five rings on a square board with a central LED illuminated screen, which can display a wide range of dual task enabling stimuli. Previous research has demonstrated good intersession reliability when assessed following a 24-48 hour test-retest window. Purpose: To investigate the test-retest (intrasession and intersession) reliability of a battery of five reaction time protocols. Methods: A total of 15 nonclinical participants completed a battery of five protocols increasing in difficulty in terms of reaction speed requirement and cognitive load. Prior to testing, participants were instructed to stand approximately 30.5 cm from the board and allowed three familiarization opportunities. All protocols required participants to hit as many lights as quickly as possible in 60 seconds. After completing the initial testing session, participants waited an hour before completing the second session. Between 7-10 days later, the participant completed the same battery of tasks for the third session. The intraclass correlation coefficient (ICC) and repeated measures ANOVA were calculated. Results: The ICC values for each of the five protocols illustrated low to good reliability between time 1 and time 2 (0.27- 0.89), however; some of the tasks also indicated significant differences between the two time points ($F > 0.660$, $p < 0.05$). Time 2 and Time 3 proved to be more reliable (0.62-0.88) results for all tasks and no significant differences across time points ($F < 0.105$, $p > 0.05$). Conclusion: The one hour test-retest interval may not be ideal for clinical assessment due to potential confounding of practice effects. However, for rehabilitation purposes, this and shorter intrasession intervals may prove to be beneficial. Although these protocols have application both as a clinical assessment and rehabilitation tool, it is important to identify optimal intervention windows to improve reaction time post-concussion.