Native Language May Affect Performance on the King-Devick Test, but not the ImPACT

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Context: Sport related concussions are common and serious injuries that can be difficult to diagnose. Following concussion, neurocognitive testing is recommended. Two of the most commonly used tests are the Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) and the King-Devick tests. Both tests, in part, rely on the athlete's ability to quickly read and comprehend the English language, which may disadvantage an athlete whose native language is not English. Considering that more than 20% of U.S. households speak a language other than English at home, a considerable portion of non-English-speaking athletes may be evaluated with these tests. While some studies have compared the results of native English speakers with non-native English speakers for both tests, there is no consensus on this topic as of yet. Therefore, we assessed the pooled effect of native language on performance on the English version of the ImPACT and King-Devick test in athletes. **Methods**: Electronic databases (PubMed, SPORTDIscus and MEDLINE) were searched through October 2018. Search terms included iterations of "concussion", "testing", "baseline", "language", "Spanish", and "ImPACT", and "King-Devick". Studies were limited to peer-reviewed, original studies, published within the last 5 years. Selection criteria required that studies 1) utilized native English speakers; 2) utilized non-native English speakers; and 3) baseline tested athletes on concussion tests in English. Selected outcomes of interest were the 1) ImPACT scores for Verbal Memory, Reaction Time, and Impulse Control subsections; and 2) King-Devick total completion time. The subsections on the ImPACT test were selected based on the responses that incorporate 'word recall' and 'color naming', specific language-based tasks, into the composite score. Means, standard deviations, and sample sizes for the ImPACT composite score for (Verbal memory, Reaction time & Impulse Control), and the KD total time score, were extracted for both groups. Hedges' g effect sizes (ES)[95%CIs] were calculated to determine the magnitude of the difference in scores between the native English and non-native English groups and these effects were pooled into a summary model. A 7-question critical appraisal tool for matched-control studies was used to assess evidence quality. **Results**: Five cohort studies were eligible. One study was removed due to not reporting standard deviations. The pooled effect of native language on performance on English testing was weak (ES=0.08 [0.15, 0.01], p=0.03). However, the summary model for the King-Devick test indicated that the effect of language was strong (ES=0.59 [1.10, 0.08], p=0.02) favoring better performance for native English speakers. In contrast, there were no group differences for the ImPACT composites (ES=0.04 [0.09, 0.01], p=0.16). All 4 studies scored 7/7, indicating little risk of methodological bias. **Conclusions**: While performance on selected subsections of the ImPACT (Verbal Memory, Reaction Time, and Impulse Control) depends on verbal performance with a speed component, the pooled results indicated there was little impact of native language on performance of an English version of the ImPACT. In contrast, there was a strong effect of native language on performance for the King-Devick, with a trend towards better performance for native English speakers. This is an important consideration, particularly following injury, when no baseline test is available. It is possible that non-native English speakers may perform lower, making comparison to normative values potentially invalid. These findings support the importance that a patient's cultural background can have on two commonly used cognitive tests. Future research should explore how native language can affect clinical evaluation and care following concussion, and also evaluated

other potential barriers that could affect to the validity of neurocognitive testing.

Bibliography

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