Concussion History Adversely Affects King-Devick performance in Collegiate Student-Athletes
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Context: While most concussion assessments have investigated cognitive and balance performance and self-reported symptoms, recent evidence suggests that ocular motor impairments are also an area of concern. These impairments can be assessed either with the Near Point Convergence (NPC) or the King-Devick (KD) Test. However, there is limited data examining the relationship between previous concussion and ocular motor test performance.

Objective: The purpose of this study was to examine the effect of concussion history on ocular motor performance on the NPC and KD assessments.

Design: Cross-Sectional.

Setting: Athletic Training Room.

Participants: Participants were 132 NCAA Division I student-athletes (78 female, age 19.8±1.1 years, ht: 180.2±10.3 cm, wt: 81.7±4.6 kg, 96 with no concussion history and 36 with a prior concussion [range=1-4, mean=1.4]). Interventions: The King-Devick test was administered following standard test protocols. The near point convergence (NPC) test, which was collected as a part of the Vestibular/Ocular Motor Screen, was performed using a size 14pt font “T” on a tongue depressor. The distance from the nose at which the participant reported diplopia was measured, and the average of three trials was recorded as the NPC distance.

Main Outcome Measures: The King-Devick outcome was the faster of two trials without participant errors. Abnormal NPC scores were identified as 1) a mean NPC score >5cm or 2) clinician-observed exophoria/esophoria during the NPC test. An ANOVA compared group (with or without concussion history) ocular motor performance.

Results: A failed NPC test (>5cm) was seen in 8.3% of participants while exophoria/esophoria was observed in 16.4% of participants. Participants with concussion history (41.85±6.36 sec) had significantly slower KD scores than those without concussion history (39.19±6.05 sec, p=0.029, d=0.42). There was no difference in NPC between those with (2.20±4.10cm) and without (1.94±2.82cm) a prior concussion.

Conclusions: The main finding of this study suggests the King-Devick scores reflects oculomotor deficits which are associated with history of a previous concussion. Previous literature found no relationship between concussion history and KD in a population of high school football players. Additionally, there was not a significant relationship between concussion history and performance on NPC. This finding may suggest that NPC abnormalities are not associated with neurological deficits, if present, due to previous concussions. As the KD and NPC assess different aspects of the ocular motor systems, it is expected that each would not be adversely impacted by previous concussion. Since the King-Devick test focuses on rapid eye movements which are often needed for sports, this is a potentially functional deficit which could delay motor responses and increase injury risk. Further investigation of concussion history and oculomotor function is warranted to confirm trends and investigate long-term impacts.

Word Count: 436