

Letter to Editor

Author's response to "Response to recently published article regarding King-Devick Test"

Thank you for the opportunity to respond to Dr. Devick's letter regarding our manuscript published in *Scandinavian Journal of Medicine and Science in Sports* (Alsalaheen et al., 2016). The main issues raised by Dr. Devick are twofold: (a) the reference values we provide in our study should not be used to diagnose concussion on the sidelines and (b) that post-injury K-D scores should only be used when pre-injury K-D scores are available.

First of all, we could not agree more with the statement that reference values should not be used to diagnose concussion. Indeed, in the published manuscript, we state on the first page "In order to quantify the effects of concussion, the performance of the K-D test must be compared to the pre-injury performance baseline". We elaborate on this point in the discussion section and state "without individualized baselines, clinicians cannot be sure if poor performance on the initial post-injury K-D score is reflective of the athletes' usual performance, or is attributed to concussion" (Vartiainen et al., 2014).

Dr. Devick stated "we do not endorse, recommend, or even accept using normative data or age matched controls for concussion screening". However, in a study co-authored by Dr. Devick himself (Galletta et al., 2011), the *authors advocate* for establishing age and sport-specific reference values by stating "Further studies will include testing of athletes during games/practice who do not have a concussion but who play similar positions; these athletes would constitute a more rigorous control group with which to compare K–D scores of concussed athletes." Contrary to Dr. Devick's statement, previous investigators have indeed attempted to establish King-Devick reference scores in youth football and professional ice hockey players (Vartiainen et al., 2014; Yamaguchi, 2014).

Second of all, it is a reality that not all athletes have a baseline K-D score which can be compared to

a post-injury score in the event of an injury. If the concussion diagnosis is confirmed through a clinical evaluation, we are of the opinion that when baseline scores are not available, there is merit in comparing a post-injury score to age-referenced norms. In our manuscript, we state, "In the absence of baseline scores, the reference values presented in Table 3 can be helpful to clinicians in interpreting *post-concussion* K-D test scores". We are assuming that the concussion diagnosis is confirmed at this point.

Whenever a concussion is suspected, the current recommendations for concussion screening mandate the immediate removal of athlete from participation until evaluated by a physician or trained personnel (Broglio et al., 2014). This comprehensive evaluation is made only through clinical evaluation that is supported by triangulating multiple domains of assessment and symptoms reporting (Guskiewicz et al., 2013; Broglio et al., 2014). Therefore, Dr. Devick's claim that possibly injured athletes may be returned to the field due to the false negative K-D test alone when compared with control group could not be further from the standard concussion screening practices.

In summary, we believe we were explicit in our manuscript that the reference values presented in this study are NOT intended to replace the baseline scores and are not intended to "diagnose" concussion. The K-D reference values presented in our study should be utilized by knowledgeable clinicians exercising their clinical judgment on a case-by-case scenario.

Again, we thank you for the opportunity to respond to Dr. Devick's letter.

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