Active Voice: Measuring Postural Control Following Concussion — Tandem Gait Outperforms BESS

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This commentary presents the authorsí views on the topic of their research article, which was published with other co-authors in the June 2018 issue of Medicine & Science in Sports & Exercise (MSSE).

The Balance Error Scoring System (BESS) was developed in the late 1990s. BESS has been the most widely utilized post-concussion postural
control assessment, regardless of its documented limitations. The 3rd edition of the Sport Concussion Assessment Tool (SCAT3) introduced tandem gait as a possible alternative to the BESS, yet BESS continues to be the more commonly used of the two assessments. Further, a modified BESS also is currently included in the SCAT5. For readers interested in additional background on sports-related concussion assessment tools, please see this link at the NIH website. Despite these efforts to improve tools for concussion assessment, tandem gait has largely remained in the shadows, receiving minimal attention across concussion literature.

Gait studies performed in motion capture laboratories routinely have identified alterations in postural control — both acutely, after concussion, and later as persistent deficits beyond the clinical recovery period. However, these controlled lab environments are not feasible for the majority of clinical situations. Tandem gait assessment has similar clinical feasibility and takes less time to administer than the BESS, thus presenting an appealing alternative for clinical settings. As presented in the June 2018 issue of MSSE, our prospective longitudinal evaluation included 76 collegiate student-athletes (38 acutely concussed and 38 controls). The tandem gait assessment identified a significantly worse performance (1.2 seconds slower) in the concussion group acutely post-injury, compared to healthy controls, whose performance remained quite stable across time. Conversely, and as expected, the BESS performance slightly improved (0.3 errors) in the concussion group acutely post-concussion. Further, 96 percent of the individuals who performed worse on tandem gait acutely post-concussion exceeded the minimum detectable change score, compared to only 18 percent on the BESS. This suggests that the post-injury change in tandem gait likely is a direct result of the injury and not due to tester variability.

Our investigation was the first to directly compare the psychometric properties of tandem gait and BESS. To provide a true clinical comparison, we also included the modified BESS (mBESS), which is the recommended balance assessment in the SCAT5. Tandem gait had
overall better efficacy than both BESS and the mBESS, with a higher sensitivity and area under the curve (AUC) acutely post-concussion. Poor psychometric properties are a well-known limitation of both the BESS and mBESS, even at time of injury. Thus, it appears that tandem gait may provide a more clinically robust picture of post-concussion postural control.

The transition from the SCAT3 to the SCAT5 assessment removed the timed trials of tandem gait from the balance assessments section and scaled it down to a single item within the neurological screen component—reducing its overall contribution to a simple “yes/no” interpretation as to whether the individual can perform tandem gait normally. In our experience, this may not be sufficient to identify impairments following concussion, as all our student-athletes in this study were able to successfully complete tandem gait acutely post-concussion, i.e., they scored as “normal” on the question but took longer to complete the task. Thus, time to complete tandem gait may be a more suitable approach for identifying post-concussion postural control impairments, compared to a subjective “yes/no” approach to performance.

Even though the BESS and mBESS remain the more popular post-concussion postural control assessments, our investigation of tandem gait demonstrates better overall efficacy and psychometric properties acutely post-injury. Therefore, tandem gait should be viewed as a clinically feasible and useful assessment for evaluating post-concussion postural control performance in collegiate student-athletes. Future research should continue to evaluate tandem gait following concussion to further explore possible determinants of performance.