The Psychometric Properties of an Instrument to Estimate Performance in Ball Tasks Objectively

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Abstract : Ball skills as a subset of fundamental motor skills are predictors for performance in sports. Currently, most tools evaluate ball skills utilizing subjective ratings. The aim of this study was to examine the psychometric properties of a newly developed instrument to objectively measure ball handling skills (BHS-test) utilizing digital instrument. Participants were a convenience sample of 213 adolescents (age M = 17.1 years, SD =3.6; 55% females, 45% males) recruited from upper secondary schools and invited to a sports hall for the assessment. The 8-item instrument incorporated both accuracy-based ball skill tests and repetitive-performance tests with a ball. Testers counted performance manually in the four tests (one throwing and three juggling tasks). Furthermore, assessment was technologically enhanced in the other four tests utilizing a ball machine, a Kinect camera and balls with motion sensors (one balancing and three rolling tasks). 3D printing technology was used to construct equipment, while all results were administered digitally with smart phones/tablets, computers and a specially constructed application to send data to a server. The instrument was deemed reliable (α = .77) and principal component analysis was used in a random subset (53 of the participants). Furthermore, latent variable modeling was employed to confirm the structure with the remaining subset (160 of the participants). The analysis showed good factorial-related validity with one factor explaining 57.90 % of the total variance. Four loadings were larger than .80, two more exceeded .76 and the other two were .65 and .49. The one factor solution was confirmed by a first order model with one general factor and an excellent fit between model and data (χ^2 = 16.12, DF = 20; RMSEA = .00, CI90 .00–.05; CFI = 1.00; SRMR = .02). The loadings on the general factor ranged between .65 and .83. Our findings indicate good reliability and construct validity for the BHS-test. To develop the instrument further, more studies are needed with various age-groups, e.g. children. We suggest using the BHS-test for diagnostic or assessment purpose for talent development and sports participation interventions that focus on ball games.

Keywords : ball-handling skills, ball-handling ability, technologically-enhanced measurements, assessment