Analysis of dynamic balance in preschool children through the balance beam test: A cross-sectional study providing reference values

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Abstract
Background: dynamic balance (DB) is a complex ability at an early age and balance deficits are related to numerous disorders. There are several balance measures but wide variation in their use has restricted the capacity to synthesise references values. The main purpose of this study was to analyse the performance of the Balance beam test (BBT) in preschool children, according to age and sex providing BBT reference values, and also to analyse its reliability and validity. Research question: could the BBT be a reliable test for measuring dynamic balance in preschool children? Methods: 593 preschool children (3–6 years) participated in this study. The BBT was used to evaluate DB by measuring distance reached, time spent, and number of steps. Differences between sex and age groups were analysed using the Mann–Whitney U and Kruskal–Wallis tests. Test-retest reliability analysis was performed using intraclass correlation coefficients and the Bland–Altman graphic. Convergent validity was investigated with the Stork Balance stand test (SBST). Results: no significant differences were found for sex in any components of the BBT. Age had positive effects on BBT performance in distance ($\chi^2 = 63.474, p < 0.001$), time ($\chi^2 = 46.441, p < 0.001$), and step numbers ($\chi^2 = 40.967, p < 0.001$). Younger children performed more poorly than older children. No significant interactions between age groups and sex were found. The BBT showed adequate validity and reliability. Significance: the reference values established for Spanish preschool children in the current study could be used to monitor DB development. It is necessary to take into account distance reached, time spent, and the steps taken to obtain a more precise measure of DB in this population.

Author keywords
Normative values
Paediatrics
Postural balance
Preschool