

Evaluation of postural steadiness in below-knee amputees when wearing different prosthetic feet during various sensory conditions using the Biodex® Stability System.

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Abstract

In recent years, computerized posturography has become an essential tool in quantitative assessment of postural steadiness in the clinical settings. The purpose of this study was to explore the ability of the Biodex(®) Stability System (BSS) to quantify postural steadiness in below-knee amputees. A convenience sample of 10 below-knee amputees participated in the study. The overall (OSI), anterior-posterior (APSI) and medial-lateral (MLSI) stability indexes as well as the percentage of time spent in left and right quadrants and four concentric zones were measured under altered sensory conditions while standing with solid ankle cushion heel (SACH), single-axis (SA) and energy storage and release (ESAR) feet. Significant difference was found between sensory conditions in SACH and ESAR feet for OSI (SACH, $p = 0.002$; ESAR, $p = 0.005$), APSI (SACH, $p = 0.036$; ESAR, $p = 0.003$) and MLSI (SACH, $p = 0.008$; ESAR, $p = 0.05$) stability indexes. The percentage of time spent in Zone A (0° - 5°) was significantly greater than the other three concentric zones ($p < 0.01$). The loading time percentage on their intact limb (80%-94%) was significantly longer than the amputated limb (20%-6%) in all conditions for all three prosthetic feet. Below-knee amputees showed compromised postural steadiness when visual, proprioceptive or vestibular sensory input was altered. The findings highlight that the characteristics of postural stability in amputees can be clinically assessed by utilizing the outcomes produced by the BSS.

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KEYWORDS: Amputees; Biodex Stability System; postural balance; prosthesis; rehabilitation

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