"Does Time Matter? The Impact of Assessment Duration on Postural Stability Measures"

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Summary

This study investigates the effect of different assessment durations on postural stability measures. Fifty legs from 25 healthy participants were evaluated using single-leg stance tests for 10 and 50 seconds with K-Plates from Kinvent. Significant differences in postural stability measures were observed between the two durations. Results indicated that longer durations increased distance-related stability measures but did not affect velocity. This suggests a stabilization effect over time. Findings highlight the importance of duration selection in stability assessments, as velocity reflects control strategy, while distance measures relate to postural control mechanisms.

Introduction

There is a lack of standardization in testing protocols and measurement parameters for postural stability assessments. The duration of center of pressure (CoP) assessments varies between 10 and 120 seconds across studies [1]. Research also indicates that the reliability of stability measures is influenced by assessment duration [1]. Therefore, this study aimed to compare postural stability measures across different assessment durations.

Methods

A total of 50 legs from 25 healthy participants (8 males, 17 females) were evaluated. Demographic data, including age and body mass index (BMI), were recorded. K-Plates from Kinvent (Kinvent Inc., Montpellier, France) were utilized to evaluate postural stability. Participants performed a single-leg stance for 10 and 50 seconds on the K-plates platforms, each repeated three times, and mean scores were analysed. Measured parameters included ellipse area (mm^2), anteroposterior (AP) and mediolateral (ML) amplitudes, and AP, ML, and CoP path lengths and velocity (mm, mm/s). Data normality was assessed using the Shapiro-Wilk test, and appropriate statistical analyses (Wilcoxon test and Paired Samples t-test) were applied.

Results and Discussion

Participants had a mean age of 22.56 ± 2.9 years and a BMI of 22.48 ± 3.03 kg/m^2. Significant differences in postural stability measures were observed between the two durations (Table 1).

Distance-related measures increased during the 50-second assessment, whereas velocity remained unchanged. These findings suggest that longer durations result in greater stability-related distances but lower velocity, reflecting participants' adaptation over time. Similar trends have been observed in bipodal stances, indicating a potential settling-in effect [2]. This suggests that single-leg stance assessments may follow a similar pattern. These results shed light on the changes in the individual's stability adaptation over a specified period of time. Also, it has been said that longer test durations may enhance the reliability and validity of stability measurements [3].

Table 1. Differences in postural stability measures.

	10 seconds	50 seconds	p
Ellipse area (mm^2)	555.62±258.45	698.40±263.43	<0.001
AP axis (mm)	31.32±7.73	35.72±7.94	<0.001
ML axis (mm)	20.60±5.15	24.03±4.65	<0.001
AP amplitude (mm)	29.11±11.04	41.50±11.67	<0.001
ML amplitude (mm)	22.91±4.67	29.31±5.72	<0.001
AP path length (mm)	236.28±74.90	970.50±321.28	<0.001
ML path length (mm)	240.64±64.94	970.16±301.11	<0.001
CoP path length (mm)	370.60±105.20	1518.48±474.39	<0.001
AP velocity (mm/s)	23.65±7.46	20.72±5.81	<0.001
ML velocity (mm/s)	23.88±6.44	20.80±5.28	<0.001
CoP velocity (mm/s)	36.78±10.43	32.44±8.52	<0.001

Conclusions

As assessment duration increases, distance-related measures rise while velocity decreases. Researchers should carefully consider the duration when evaluating stability, as velocity reflects control strategy, while distance measures relate to postural control mechanisms [2].

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References

[1] Van der Kooij et al. (2011). *Gait Posture*, **34**: 19-24.
[2] Le Clair K and Riach C. (1996). *Clin. Biomech. (Bristol, Avon)*, **11(3)**: 176-178.
[3] Doyle RJ et al. (2007) *Gait Posture*; **25**: 166-171.