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CONFERENCE ABSTRACT

Portable, scalable postural sway assessment for population-level identification of balance instability in adults with type 2 diabetes: an exploratory analysis

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Aim: To explore whether a portable, low-burden balance device can detect group-level differences in postural sway between adults with and without diabetes and to express findings as internal age/sex-referenced percentiles suitable for population monitoring.

Methods: Cross-sectional population data analysis encompassing, adults, mean age(SD)=74.5(14.9) years, female=51.3%, who performed an ~60-second standing test on a portable mat (Balance Mat) with embedded sensors and a USB-connected analytics dashboard. Measurements included postural sway velocity (mm/s), path (mm) and range (mm). Diabetes was self-reported n=34, without diabetes=228. Analyses used non-parametric between-group comparisons of medians(IQRs), Hodges-Lehmann (HL) estimates of group differences, Mann-Whitney tests with false-discovery-rate (FDR) adjustment and effect sizes (Cliff's δ) with 95% confidence intervals. The device lacked external norms, hence internal percentiles were derived by constructing age/sex-stratified empirical reference distributions from the without diabetes group, then summarised into pooled percentiles.

Results: The group with diabetes exhibited higher sway metrics: normal stance sway velocity median=14.22(37.39) vs. 8.57(15.81) (without diabetes) [HL=6.36 (95% CI: 1.55, 15.50), Cliff's δ=0.29 (95% CI: 0.08, 0.49), FDR-q=0.016]; normal stance sway path median=284.5(747.8) vs. 171.5(316.3) [HL=127.25 (95% CI: 28.98, 304.00); δ=0.29 (95% CI 0.08, 0.50), q=0.016]; normal stance sway range median=4.75(6.00) vs. 3.00(3.00) [HL=1.00 (95% CI: 0.00, 4.00), δ=0.24 (95% CI 0.03 to 0.45) q=0.043]. For pooled internal percentiles: diabetes group velocity median=68.5 vs. 51.6 (without diabetes), HL=12.5 (95% CI: 1.18, 22.62) percentile points; sway path median=68.5 vs 51.6, HL=12.5 (95%CI:1.57, 23.81); Sway range median=75.6 vs. 64.4, HL=8.67 (95%CI: -1.68, 19.61). Sensitivity analyses adjusting for extreme values confirmed that differences in sway velocity and path remained significant (p=0.0056).

Conclusion: A portable, rapid balance assessment detected consistent, small-to-moderate elevations in sway among adults with self-reported diabetes, expressed in raw units and internal percentiles. While preliminary, these findings support further enquiry into scalable balance instability monitoring for population-level falls-risk stratification, with potential relevance to future investigation of diabetes peripheral neuropathy.