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Et al.

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Multiple Sclerosis (MS) is a chronic auto-immune disorder characterized by demyelination of neurons of the central nervous system. MS-related reductions in neural activity have been associated with reductions in balance control and limitations in mobility. Multiscale entropy (MSE) analysis has been used to identify reductions in complexity of the postural control system in various disorders. The purpose of this study was to examine if center-of-pressure fluctuations, analyzed through MSE, differ between persons with MS and healthy controls. We hypothesized that MSE would be reduced in MS compared to controls in all postural tasks in both anterior-posterior (AP) and medio-lateral (ML) directions.

Eight persons with MS (7 female, 1 male) and matched controls completed the testing procedures. The MS subjects had minimal functional impairment (Patient Determined Disease Steps, range 0-3). Quiet standing and fixed distance forward and backward reaches were assessed for 30 s. MSE was computed across 30 time scales (range .01-.25s). Effect size (ES) statistics were used to assess differences between MS and control groups.

Quiet standing revealed moderate reductions in complexity among persons with MS compared to controls in the AP direction (ES = .71). The backward reach demonstrated moderate and strong reductions in complexity in the AP and ML direction in the MS group (ES = .74 and 1.0, respectively). Moderate reductions in ML complexity were also observed in the forward reach condition in the MS group (ES = .68).

These results support the hypothesis that persons with MS display lower postural complexity compared to those without MS. MSE analysis is a promising new tool for detecting MS-related changes in postural complexity. These changes in postural complexity appear to precede locomotor impairment, as assessed by the patient determined disease steps, and may provide novel insight into MS progression.