

Nonlinear Analysis of Postural Sway in Multiple Sclerosis

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Abstract : Multiple sclerosis (MS) is a disease, which affects the central nervous system, and causes balance problem. In clinical, this disorder is usually evaluated using static posturography. Some linear or nonlinear measures, extracted from the posturographic data (i.e. center of pressure, COP) recorded during a balance test, has been used to analyze postural control of MS patients. In this study, the trend (TREND) and the sample entropy (SampEn), two nonlinear parameters were chosen to investigate their relationships with the expanded disability status scale (EDSS) score. Forty volunteers with different EDSS scores participated in our experiments with eyes open (EO) and closed (EC). TREND and two types of SampEn (SampEn1 and SampEn2) were calculated for each combined COP's position signal. The results have shown that TREND had a weak negative correlation to EDSS while SampEn2 had a strong positive correlation to EDSS. Compared to TREND and SampEn1, SampEn2 showed a better significant correlation to EDSS and an ability to discriminate the MS patients in the EC case. In addition, the outcome of the study suggests that the multi-dimensional nonlinear analysis could provide some information about the impact of disability progression in MS on dynamics of the COP data.

Keywords : balance, multiple sclerosis, nonlinear analysis, postural sway

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