Body Balance Ability Monitor Based on Acceleration Spectrum Analysis

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Popular balance ability monitoring methods such as scale scoring and posturography testing have many drawbacks, e.g. subjective judgments, complicated instruments, defined lab scenarios other than real-life environment. In order to improve these weaknesses, the author developed a bran-new human balance monitoring methodology. The method is developed directly based on human real walking posture as follows: (1) the body movement is represented by a three-spot model, i.e. the waist, the left foot and the right foot structure. (2) The acceleration data at each spot are collected and processed via Fourier transform to get the dynamic spectrum. (3)Based on spectrum sample study, it was found that the degree of harmonic restraining, harmonic compensating, and inter-spots spectrum correlation reveal the balance condition. Accordingly, a special algorithm was developed to generate balance ability indexes with dynamic spectrum data. Further, the author developed the electronic sensor modules and software and invented a wearable balance ability monitor. It is mini scaled and user friendly, and can precisely identify the individual differences that cannot be distinguished by human sense. For example a mild vertigo patient looks like quite normal but would be tested with a balance ability score as of 73 points, while a healthy person was scored as high as 88 points. This invention can be used for older adults, providing imbalance warning in daily life and preventing injury of falling down and it can be used as well in many other aspects, such as walking recovery training, baby caring, exoskeleton controlling and so on.

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