Use of Accelerometers to Measure Real-life Physical Activity in Ambulatory MS Individuals of Different Disability Levels

C. Fjeldstad, Ph.D., G. Pardo, MD, A.S. Fjeldstad, Ph.D., R.S. Richardson, Ph.D.

Oklahoma Medical Research Foundation, MS Center of Excellence, Oklahoma City, OK, USA. University of Utah, Salt Lake City, UT, USA.

Introduction and Purpose
Multiple Sclerosis (MS) is a chronic immune-mediated disease of the central nervous system (CNS), with both inflammatory and degenerative components. It has the potential to negatively impact participation of physical activity secondary to muscle weakness, imbalance, spasticity, thermoregulation, and fear of worsening of symptoms.

The objectives of this study were to examine physical activity (PA) measured by accelerometry in individuals diagnosed with MS, and evaluate the relationship between PA and disability levels measured by the Expanded Disability Status Scale (EDSS).

Methods

Subjects
Forty-four patients diagnosed with relapsing-remitting MS (RR-MS) (47 ± 3 yrs) participated in this cross-sectional study (Kurtzke EDSS range of 0.5-6.5).

Subjects wore an accelerometer (ActiGraph GT1M, Pensacola, FL) from 8 am to 9 pm for seven consecutive days. Activity counts recorded during this period were analyzed in one minute epochs and categorized into one of four PA levels: Light ≥ 1552 counts (>2.99 metabolic equivalents (METs)), moderate 1553-5724 counts (3.0-4.99 METs), hard 5725-9485 counts (6.0-8.99 METs), and very hard >9485 counts (>9.0 METs). EDSS was measured by a single treating neurologist.

Statistical Analysis
Descriptive analyses (means ± standard error (SE)) were performed for all variables. A Pearson product moment correlation coefficients were computed for minutes spent in PA and EDSS as well as PA according to METS and EDDS. All statistical analysis was performed using SPSS, version 16.0 (SPSS Inc., Chicago, IL, USA). Statistical significance was defined as P-value < 0.05.

Results

All data are presented as mean ± SE. The participants wore the accelerometer as instructed. This was reconfirmed upon data analysis. Appropriate data were retrieved from the devices for the pre-determined monitoring period. There were significant negative correlations for minutes spent in PA and EDSS measures on week days (r = -0.61), weekend (r = -0.54), and full week (r = -0.61) (Table 1), as well as for number of steps taken on week days (r = -0.56), weekend (r = -0.80) and on full week average, (r = -0.68) (Table 1).

A significant positive correlation was evident for minutes spent in light PA (according to METS) and EDSS (r = 0.69) (Figure 3). However, for minutes spent in moderate (Figure 4) and heavy (Figure 5) PA and EDDS, significant negative correlations were found: r = -0.56 and r = -0.52 respectively. No significance was found in minutes spent in very hard PA and EDDS (r = -0.34) (data not shown). There was no discernable difference in activity level between MS patients and healthy controls (data not presented).

Conclusions

This study documents that accelerometers can be used to objectively quantify PA during normal daily routines in ambulatory MS individuals of different disability levels. This cohort demonstrated that the amount of PA is inversely proportional to the degree of physical disability (EDSS), and that more PA was performed during weekends. The data reveal the amount and intensity of PA performed in real life circumstances and may be of use to the clinicians in correctly evaluating these patients. Additional studies are needed to provide a more comprehensive understanding of the responses to chronic exercise in patients with MS and the potential implications for the disease.

References


Disclosure

Disclosure: Dr. Fjeldstad, Dr. Pardo, Dr. Fjeldstad and Dr. Richardson have no conflicts of interest to report

Funding

NIH PO1 HL 051630
Correspondence: Cecille Fjeldstad, Ph.D. Cecille.fjeldstad@omrf.org