Physical Activity and Quality of Life in Multiple Sclerosis: Results from a Longitudinal Study of Possible Intermediary Variables

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Epidemiology of MS

Most common neurological disease
Prevalence: 400,000 adults in U.S.
Incidence: 200 new cases per week

Who is most at risk?
Adult (20-50 years) women who live in temperate climates who are of European

(National MS Society, 2005)
The Disease Itself

Clinical Course

Reversible periods of neurological disability
Irreversible neurological disability

Pathogenesis

Focal inflammatory demyelination and transection of axons
Loss of axons and neurons

(Hemmer, Nessler, Zhou, et al., 2006)
Quality of Life in MS

Our perception of how well we live profoundly compromised in persons with MS.

Behavioral, psychological, and social correlates of QOL in MS

(Benito-Leon et al., 2003; Mitchell et al., 2005)
Does Physical Activity Improve QOL?

Meta-analysis of the overall effect of exercise training on QOL in MS

Results?

109 effects from 13 studies with 448 MS participants

Weighted mean ES of 0.23 (95% CI 0.15, 0.31)

(Motl & Gosney, 2008)
WHY? Possible Mediators

Physical activity was associated with better QOL

The pathway was indirect via depression, fatigue, pain, social support, and efficacy for MS

(Motl, McAuley, Snook, et al., 2009)
 PURPOSE OF PRESENT STUDY

Is change in physical activity associated with change in QOL across a 6-month period of time in persons with MS?

Is the relationship accounted for by changes in intermediate variables of depression, fatigue, pain, social support, and self-efficacy for managing MS?
Participants

292 persons provided baseline data and 276 provided follow-up data 6-months later.

Sample Characteristics

245 females, 47 males

Age: 48 ± 10 yrs

246 RRMS, 12 PPMS, 34 SPMS

Time since diagnosis: 10 ± 8 yrs

Mdn PDDS score: 3.0
MEASURES

PHYSICAL ACTIVITY
ACTIGRAPH ACCELEROMETER AND GLT

QUALITY OF LIFE
S WLS AND LMS QOL

INTERMEDIATE VARIABLES
FSS, HADS, SF-MPQ, MSSE, AND SPS
PROCEDURES

UIUC IRB APPROVAL AND SIGNED INFORMED CONSENT.

MATERIALS SENT THROUGH U.S. POSTAL SERVICE.

WORE ACCELEROMETER FOR 7 DAYS AND COMPLETED GLTEQ AND MEASURES OF INTERMEDIATES AND QOL ON 8TH DAY.

BASELINE AND 6-MONTHS LATER RAT FOLLOW-UP.

$40 PRORATED REMUNERATION.
DATA ANALYSIS

PANEL ANALYSIS AND COVARIANCE MODELING IN Mplus 3.0

FIML ESTIMATOR FOR MISSING DATA WITHIN/ACROSS TIME POINTS

## Results: Descriptive Statistics

*Descriptive Statistics and Changes across Time for the Measures in the Covariance Modeling*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Baseline</th>
<th>6-month follow-up</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>GLTEQ</td>
<td>25.5 (22.4)</td>
<td>25.7 (23.7)</td>
<td>0.72</td>
<td>0.47</td>
</tr>
<tr>
<td>Accelerometer</td>
<td>220.006 (121.252)</td>
<td>206.834 (104.781)</td>
<td>3.56</td>
<td>0.0001</td>
</tr>
<tr>
<td>LMSQL</td>
<td>19.3 (4.8)</td>
<td>19.1 (4.9)</td>
<td>1.51</td>
<td>0.13</td>
</tr>
<tr>
<td>SWLS</td>
<td>21.1 (8.0)</td>
<td>22.0 (8.2)</td>
<td>-1.03</td>
<td>0.31</td>
</tr>
<tr>
<td>HADSD</td>
<td>6.0 (4.2)</td>
<td>6.3 (4.3)</td>
<td>-0.86</td>
<td>0.39</td>
</tr>
<tr>
<td>FSS</td>
<td>5.0 (1.4)</td>
<td>4.9 (1.5)</td>
<td>1.71</td>
<td>0.09</td>
</tr>
<tr>
<td>MPQ</td>
<td>10.7 (7.8)</td>
<td>10.7 (7.8)</td>
<td>0.72</td>
<td>0.45</td>
</tr>
<tr>
<td>SPS</td>
<td>76.9 (10.7)</td>
<td>76.4 (10.9)</td>
<td>1.00</td>
<td>0.32</td>
</tr>
<tr>
<td>MSSE</td>
<td>146.9 (26.9)</td>
<td>147.6 (27.9)</td>
<td>-0.99</td>
<td>0.32</td>
</tr>
</tbody>
</table>
Results: Direct Association?

(χ² = 19.78, df = 14, p = .14, SRMR = .01, CFI = 0.99)

Baseline:
- GLTEQ
- Accel

6-Months:
- GLTEQ
- Accel

Physical Activity
- Quality of Life

LMSQOL
- SWLS

GLTEQ
- .46
- .86

Accel
- .24

Physical Activity
- .76
- .91

Quality of Life
- .95
- .93

SWLS
- .47
- .07
**RESULTS: INDIRECT ASSOCIATION**

**BASELINE:**

- Physical Activity
- Depressive Symptoms
- Fatigue
- Pain
- Social Support
- Self-efficacy for MS
- Quality of Life

**Variables:**
- GLTEQ
- Accel

**Correlations:**
- GLTEQ → Physical Activity: .11
- GLTEQ → Depressive Symptoms: .07
- GLTEQ → Fatigue: -.17
- GLTEQ → Pain: -.13
- GLTEQ → Social Support: -.13
- GLTEQ → Self-efficacy for MS: -.06
- GLTEQ → Quality of Life: -.35
- Accel → Physical Activity: .12
- Accel → Depressive Symptoms: .05
- Accel → Fatigue: .17
- Accel → Pain: .13
- Accel → Social Support: .13
- Accel → Self-efficacy for MS: .06
- Accel → Quality of Life: -.35

**6-MONTHS:**

- Physical Activity
- Depressive Symptoms
- Fatigue
- Pain
- Social Support
- Self-efficacy for MS
- Quality of Life

**Variables:**
- GLTEQ
- Accel

**Correlations:**
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- Accel → Quality of Life: -.35

**Statistical Information:**
- $\chi^2 = 301.92$, df = 95, $p < .001$, SRMR = .04, CFI = .95

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Change in physical activity was associated with a change in QOL across a 6-month period of time in persons with MS.

The pathway was indirect through changes in fatigue, pain, social support, and self-efficacy forms, but not depression.
IMPlications

Physical activity might represent a modifiable behavioral for improving QOL in MS.

Physical activity programs should be designed based on targeting intermediate variables awaits an RCT.
LIMITATIONS AND FUTURE DIRECTION

PREDOMINANT CAUCASIAN AND FEMALE COMPOSITION OF THE SAMPLE LIMITS GENERALIZABILITY

RELATIVELY SHORT FOLLOW-UP OF 6-MONTHS

ALTERNATIVE MODELS, OTHER POSSIBLE MEDIATORS, AND MODE RATORS
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