Impact of a home-based exercise intervention on fitness and walking outcomes in persons with multiple sclerosis: Preliminary results

Rachel E. Klaren
Garett Griffith
Tracy Baynard
Robert W. Motl
Bo Fernhall

Exercise Training Interventions in MS

• 50+ clinical trials of exercise training in persons with MS
  – Exercise training is safe for persons with MS¹
    • No increased risk of relapse or other adverse events
  – Benefits of exercise training in persons with MS²
    • Aerobic capacity
    • Walking mobility

¹Pilutti et al., 2014; ²Motl & Pilutti, 2012
Exercise Training Interventions in MS

- **Expresso S3u Novo cycle**
  - Precise control of exercise prescription
  - Internet portal

- **Weekly contact**
  - Exercise trainer or behavioral coach
  - Teach approaches for behavior change
Purpose & Hypothesis

- The current study investigated the effects of a novel, home-based exercise intervention that optimizes compliance and participation on aerobic fitness and walking mobility in persons with MS
  - We expected the aerobic exercise (i.e., cycle ergometry) condition would demonstrate increased fitness and walking mobility compared to the attention control (stretching along with minimal muscle strengthening stimuli)

Participant Inclusion Criteria

- Physically inactive (<2 days/week of structured exercise)
- BMI < 40 kg/m²
- Mild MS disability (EDSS: 0-4)
- Relapse free for past 30 days
- Confirmed diagnosis of MS
- Asymptomatic and no documented CVD
- No changes in medications within previous 6 months
- Physician approval
Measures

• Aerobic fitness (VO_{2peak})
  – Maximal, incremental exercise test on a cycle ergometer and indirect calorimetry
    • Measured in ml/kg/min
• Walking mobility
  – Timed 25-Foot Walk (T25FW)\(^5\)
    • Measured in speed (ft/s)
  – Six-Minute Walk (6MW)\(^6\)
    • Measured in m

\(^5\)Motl et al., 2010; \(^6\)Goldman et al., 2008

Intervention Conditions

• Aerobic exercise condition:
  – 12-week period
  – Three days/week of cycle ergometry using Expresso S3u Novo cycle
    – Initially for 10 minutes/day at 40% VO_{2peak} and progressing to 30 minutes/day at 60% VO_{2peak}
• Attention control condition:
  – 12-week period
  – Three days/week of stretching exercises
    – Beginning with one set of five different stretches and progressing to two sets of 10 stretches
Intervention Components

- Participants took part in weekly, one-on-one video coaching sessions
- Sessions were semi-scripted and based on principles of supportive accountability
- Content was based on Social Cognitive Theory\(^7\)
  - Outcome expectations
  - Goal-setting
  - Self-efficacy
  - Facilitators and barriers for exercise

\(^7\)Bandura, 2004

Procedure

- All participants provided informed consent approved by University IRB
- Participants provided demographic/clinical information, measured height/weight, underwent an EDSS examination, and completed fitness and walking tests in the laboratory at baseline
- Participants were randomly assigned into aerobic exercise or attention control conditions
- Participants returned to laboratory at endpoint (12 weeks) to repeat fitness and walking tests
- Assessors were not blinded to group assignment

\(^7\)illinois.edu
Data Analysis

- Data were analyzed in SPSS v.22.0
- Examined baseline differences between groups in demographic/clinical characteristics using independent samples \(t\)-tests and \(\chi^2\) statistics
- Examined group differences in aerobic fitness and walking mobility using a \(2 \times 2\) ANOVA
  - Group (aerobic exercise and attention control) \(\times\) Time (baseline and post-intervention)
- Provide the effect size (\(d\)) per measure for expressing magnitude of difference

Participants

- Preliminary sample included 27 participants who were randomly assigned into aerobic exercise (n=12) or attention control (n=15) conditions and completed baseline and post-intervention testing
Participant Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Aerobic exercise (n=12)</th>
<th>Attention control (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>46.7 (10.9)</td>
<td>43.9 (10.2)</td>
</tr>
<tr>
<td>Sex (% female)</td>
<td>66.7</td>
<td>86.7</td>
</tr>
<tr>
<td>Race (% Caucasian)</td>
<td>83.3</td>
<td>66.7</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>26.8 (4.8)</td>
<td>27.5 (6.6)</td>
</tr>
<tr>
<td>Disease Duration (years)</td>
<td>10.6 (6.4)</td>
<td>9.5 (8.3)</td>
</tr>
<tr>
<td>EDSS Score (median, IQR)</td>
<td>3.5 (1.0)</td>
<td>3.5 (1.0)</td>
</tr>
<tr>
<td>Type of MS (% RRMS)</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Note. Values are mean (standard deviation), unless otherwise noted.

Compliance

- Aerobic exercise frequency: 27/36 sessions; 73.8%
  - 100% compliance for duration and intensity
- Attention control frequency: 31/36 sessions; 85.0%
Results

<table>
<thead>
<tr>
<th>Measure</th>
<th>Aerobic exercise (n=12)</th>
<th>Attention control (n=14)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Post (12 weeks)</td>
</tr>
<tr>
<td>VO$_{2peak}$, ml/kg/min</td>
<td>20.8 (4.8)</td>
<td>22.3 (6.0)</td>
</tr>
</tbody>
</table>

- No significant group by time interaction: ($F(1,24)=1.78, p=0.20, \eta^2=0.07$)

$\text{d}=0.28$

Results

<table>
<thead>
<tr>
<th>Measure</th>
<th>Aerobic exercise (n=12)</th>
<th>Attention control (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Post (12 weeks)</td>
</tr>
<tr>
<td>T25FW, ft/s</td>
<td>5.4 (1.1)</td>
<td>5.9 (1.4)</td>
</tr>
</tbody>
</table>

- No significant group by time interaction: ($F(1,25)=3.86, p=0.06, \eta^2=0.13$)

$\text{d}=0.54$
Results

<table>
<thead>
<tr>
<th>Measure</th>
<th>Aerobic exercise (n=12)</th>
<th>Attention control (n=15)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Post (12 weeks)</td>
<td>Baseline</td>
<td>Post (12 weeks)</td>
</tr>
<tr>
<td>6MW, m</td>
<td>427.4 (81.2)</td>
<td>478.0 (77.0)</td>
<td>447.0 (82.6)</td>
<td>484.1 (115.7)</td>
</tr>
</tbody>
</table>

• No significant group by time interaction: (F(1,25)=0.28, p=0.60, η²=0.01)

Exploratory Results

• Change (post – baseline) in VO₂peak (ml/kg/min) and T25Fw (ft/s)
  • Pearson correlation (r)
    – Overall sample: r=0.537, p<0.01 (2-tailed)
    – By group:
      • Attention control: r=0.219
      • Aerobic exercise: r=0.624, p<0.05 (2-tailed)
Preliminary Findings

- A home-based aerobic exercise intervention can be efficacious for increasing aerobic fitness and walking mobility in persons with MS
- Interventions might need to adopt approaches that monitor and maximize compliance
- Support notion that an increase in aerobic fitness might be important for increasing walking mobility in persons with MS

Strengths & Limitations

- Strengths:
  - Novel intervention delivery
  - Capacity to measure compliance
  - Standard performance-based measures of mobility disability in persons with MS
- Limitations
  - Halfway done with the study
  - Demographic/clinical characteristics of sample
  - 12-week intervention

8Motl et al., 2010
Conclusion

• Home-based exercise may be a good approach for increasing aerobic capacity and walking mobility in persons with MS
• Potential value of home-based exercise for large numbers of persons with MS who cannot undertake supervised, center-based exercise programs
• Results contribute to the process of understanding how therapeutic interventions such as exercise training impact persons with MS

Acknowledgments

• Funding: NMSS RG 4702A1/2
• UIC IPL director: Prof. Bo Fernhall
• UIUC ENRL director: Prof. Robert Motl
Thank you! Questions?