"Is fatigue associated with exercise tolerance among patients suffering from multiple sclerosis?"

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Abstract
Objective: Fatigue is the most common and disabling symptom among patients suffering from Multiple Sclerosis (MS). Its underlying mechanisms are poorly understood. From the initial stages of the disease, a physical deconditioning is also observed among these patients. The aim of this study is to assess the cardiorespiratory endurance (i.e. exercise tolerance functions) and self-reported fatigue, as well as their associations, among patients suffering from MS with mild disability (Expanded Disability Status Scale ≤ 4), in order to progress in the comprehensive management of this symptom. Material and methods: Twenty one patients with MS (15 women; age: 26-64 years, median 46 years; duration of disease: 0.33-48 years, median 7.25 years; EDSS 0-4, median 2.5; clinical forms: Relapsing –Remitting: 16, Primary Progressive: 4, Secondary Progressive: 1) were evaluated. Cardiorespiratory endurance was assessed by a maximal exercise test on a cycle ergometer, from which different indices ...

Document type : Communication à un colloque (Conference Paper)

Référence bibliographique


DOI : 10.1177/1352458516663067
Is fatigue associated with exercise tolerance among patients suffering from multiple sclerosis?

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Background

Multiple sclerosis (MS) and fatigue
- 80% of patients
- One of the worst symptoms
- Early symptom
- Prevalent among patients with mild neurological disability
- Heavy functional burden
- Poorly understood pathogenesis

Multiple sclerosis and physical fitness
- Majority of patients deconditioned
- Less physically active

Objectives

- To assess fatigue and physical fitness of patients suffering from MS with mild neurological disability (EDSS≤4)
- To explore the relationships between fatigue, physical fitness and other parameters

Materials and methods

Participants
- n=20; 14 Women (70%), 6 Men (30%)
- EDSS ≤ 4 (median 2.5), Stable Disease
- Clinical Course RR/SP/PP: 15/1/4
- Disease duration: 0.33-48 years (Mean 9.75)

International Classification of Functioning, Disability and Health-based evaluations

- Disease
  - Severity: Expanded Disability Status Scale (EDSS)
- Body structures and functions
- Aerobic capacity: VO2peak
- Mobility: Timed Up and Go test (TUG)
- Fatigue: Modified Fatigue Impact Scale (MFIS)

Fatigue Severity Scale (FSS) (with Rasch-validated modified version: FSSrasch)
- Psychological factors: Hospital Anxiety (Score A) and Depression (Score D) Scale (HADS)
- Muscular strength: Maximal voluntary contraction (MVC)
- Neuromuscular fatigability index (NMFI)

- Activities
  - Walking capacity: 2-minute walking test (2MWT)
- Participation
  - Physical participation: Godin Leisure-Time Exercise Questionnaire (GLTEQ)

Descriptive data of the tests

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (Median) [range]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normalized 2MWT</td>
<td>171.5 [125-225.5]</td>
</tr>
<tr>
<td>TUG (s)</td>
<td>8.01 [4.29-11.82]</td>
</tr>
<tr>
<td>FSS</td>
<td>5.36 [3.35-7]</td>
</tr>
<tr>
<td>FSSrasch</td>
<td>0.54 [0.25-1.95]</td>
</tr>
<tr>
<td>MFIS</td>
<td>40.2 [10-85]</td>
</tr>
<tr>
<td>Fatigued (MFIS&gt;30)</td>
<td>80% (n=17)</td>
</tr>
<tr>
<td>MFIS Physical subscale</td>
<td>23.7 [6-34]</td>
</tr>
<tr>
<td>MFIS Cognitive subscale</td>
<td>23 [6-34]</td>
</tr>
<tr>
<td>MFIS Psychosocial subscale</td>
<td>4 [0-7]</td>
</tr>
<tr>
<td>HADS Score D</td>
<td>5.9 [1-12]</td>
</tr>
<tr>
<td>HADS Score A</td>
<td>10 [2-10]</td>
</tr>
<tr>
<td>GLTEQ</td>
<td>26.95 [4-185]</td>
</tr>
<tr>
<td>Mean MVC (N.m)</td>
<td>78.73 [28.075-132.765]</td>
</tr>
<tr>
<td>Mean NMFI</td>
<td>38.26 [18.63-62.38]</td>
</tr>
</tbody>
</table>

Conclusions

- A large majority of people with MS with mild neurological disability (EDSS≤4) are fatigued (85%) and physically deconditioned (65%)
- Other parameters are moderately linked to perceived fatigue among these patients: walking capacity, functional mobility, depression and neuromuscular fatigability
- A combination of aerobic capacity, neuromuscular fatigability and duration of the disease explains a large part (65.1%) of perceived fatigue in this population
- Focusing on these outcomes could be an effective strategy to reduce fatigue while designing rehabilitative programs based on therapeutic exercise for people suffering from MS with mild neurological disability