Get Active – Preventing falls in MS

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Overview

1. Falls: a huge problem in MS
2. Characteristics of frequent fallers
3. Some recommendations to reduce falls
The expanded Disability Status Score (EDSS)

**Disease Steps in MS**

0 Normal
1 Mild Disability (visibly abnormal gait)
2 Moderate Disability (visibly abnormal gait)
3 Early Cane (25 feet or 7.6 meters without cane)
4 Late Cane (< 25 feet without cane)
5 Bilateral Support (needed to walk 25 feet)
6 Wheelchair (may be a few steps)
U Unclassifiable

(Hohol et al, 1995, Neurology, 45:2251-55)
The cumulative evidence suggests that individuals with MS are less physically active than non-diseased, but not diseased, populations.

An example of ICF model

Patient perception of bodily functions in MS

Heesen et al, 2008
Neuropsychological, Balance, and Mobility Risk Factors for Falls in People With Multiple Sclerosis: A Prospective Cohort Study

Phu D. Hoang, PhD, a Michelle H. Cameron, MD, b,c Simon C. Gandevia, PhD, DSc, a Stephen R. Lord, PhD, DSc a

From the aNeuroscience Research Australia, University of New South Wales, Randwick, Sydney, Australia; bDepartment of Neurology, Oregon Health & Science University, Portland, OR; and cPortland Veteran Affairs Medical Center, Neurology Service, Portland, OR.

Fig 1 Number of falls reported by participants during 6-month follow-up. Among frequent (≥3) fallers, 21.5% reported 3 to 9 falls, while 11.5% reported 10 falls or more.
Falls in MS – highly prevalent

Research Paper

Falls in people with MS—an individual data meta-analysis from studies from Australia, Sweden, United Kingdom and the United States

Y Nilsgård, H Guna, J Freeman, P Hoang, S Lord, Rajarshi Mazumder and Michelle Cameron

~ 60% will fall in 3 months

N = 537
Fallers ≤ 1 (N = 300 or 56%)
Frequent fallers ≥2 (N = 197 or 37%)
Circumstances of falls

- Gunn et al. (2013): Frequency, characteristics and consequences of falls in multiple sclerosis: findings from a cohort study
- N = 150 reported 555 falls in 3 months
- 72.8% occurred during day
- 62.2% indoors
- 16.4% related to “personal hygiene”
- 14.6% related to “working outdoors”
- 41.5% related to “mobility”

Characteristics of MS fallers

- Higher EDSS Score or high Disease Steps
- Balance impairments
- Impaired mobility (spasticity, ankle joint contracture, use of walking aids)
- Reduced executive functioning
- Muscle weakness in the lower limbs
- Fatigue
- Fear of falling, forgetfulness, incontinence
Muscle weakness

- Most common complaint by PwMS
- Lower limb affected first
- Especially flexors and hip abductors
  - Hip flexors
  - Knee flexors
  - Ankle dorsiflexors
- Occurs very early (wish referral happens early!!)

Prevalence of weakness

RESEARCH PAPER

Prevalence of joint contractures and muscle weakness in people with multiple sclerosis

Phu Dinh Hoang, Simon C. Gandevia, and Robert D. Herbert

*Neuroscience Research Australia, Sydney, Australia*

Proportion of participants with muscle weakness (defined as muscle manual testing score ≤ 3/5) in one or more muscles in each disease step. Greyed areas are 95% confidence intervals. (Hoang et al, Disability and Rehabilitation, 2014; 36(19): 1588–1593)
Can weakness be improved?

- Yes!
- "strong evidence in favour of exercise therapy compared to no exercise therapy in terms of muscle power function" (Rietberg et al, 2005, Cochrane systematic review)
- Compelling evidence is provided, that progressive resistant training performed over sufficiently long periods, improves functional capacity, likely due to neuromuscular adaptations (Kjolhede et al, Mult Scler 2015, 21:599-611)

Foot drop as consequence of muscle weakness

- One of the first problems affecting mobility
- Get worse with distance or motor fatigue
- A common cause of fall
- Interventions
  - Strengthening exercise
  - Dictus band***
  - AFO’s: Swedish AFO, Dynamic walk AFO, blue rocker AFO
  - FES: WalkAide, Bioness L300***
- Factors to consider: hip and knee flexors
Limitations of strengthening exercise

1. EDSS score < 7 or Disease steps 0 – 4
2. Relapses may set back
3. Fatigue may prevent exercising at required intensity
4. Psychological factors
5. Uhthoff’s phenomenon – Heat sensitivity -Worsened S&S
Uthoff's Phenomenon

Heat production per unit of body mass and changes in core (rectal) temperature for a representative age- and body mass-matched pair of participants (MS and Control) during 60 min cycling at 30°C and 30% RH

DISCUSSION!
Spasticity in MS

• Spasticity = “drawing, pulling”
• Altered skeletal muscle performance with a combination of paralysis, increased tendon reflex activity and hypertonia.
• Referred to as an unusual "tightness", stiffness, or "pull" of muscles.

• 60-80% (Rizzo, 2004).
• Increased severity
  • ↑ Age
  • Longer duration of MS
• Sub-optimally managed.
• Contribute to disability in MS.
• Can be beneficial
• Assessment: MAS vs. Tardieu Scale
Proportion of participants with spasticity in each disease step. Greyed areas are 95% confidence intervals. (Hoang et al, Disability and Rehabilitation, 2013 under review)

**Table 2: Spasticity characteristics of participant (n = 156)**

<table>
<thead>
<tr>
<th>Prevalence of spasticity</th>
<th>%</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>in any muscle</td>
<td>66.2</td>
<td>55.3 – 73</td>
</tr>
<tr>
<td>in the ankle (ankle plantar flexors)</td>
<td>48.4</td>
<td>41.7 – 55.1</td>
</tr>
<tr>
<td>in the knee (knee flexors or extensors)</td>
<td>40.7</td>
<td>33.7 – 47.7</td>
</tr>
<tr>
<td>in the wrist (wrist flexors)</td>
<td>2.2</td>
<td>1.6 – 4.3</td>
</tr>
<tr>
<td>in the elbow (elbow flexors)</td>
<td>8.7</td>
<td>4.4 – 12.9</td>
</tr>
</tbody>
</table>

**Anti-spastic agents**

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>86</td>
<td>55.1</td>
</tr>
<tr>
<td>Yes</td>
<td>70</td>
<td>44.9</td>
</tr>
<tr>
<td>Local (Botulinum toxin)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Systemic (baclofen or other muscle relaxants)</td>
<td>68</td>
<td>43.6</td>
</tr>
<tr>
<td>Implanted intra-thecal baclofen pump</td>
<td>2</td>
<td>1.3</td>
</tr>
</tbody>
</table>

**Severity of spasticity**

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>no spasticity</td>
<td>53</td>
<td>34</td>
</tr>
<tr>
<td>mild spasticity</td>
<td>46</td>
<td>29.5</td>
</tr>
<tr>
<td>moderate spasticity</td>
<td>27</td>
<td>17.3</td>
</tr>
<tr>
<td>severe spasticity</td>
<td>30</td>
<td>19.2</td>
</tr>
</tbody>
</table>

*Severity was defined as: "mild" = Tardieu score 1 – 2, "moderate" = Tardieu score 3,*

* "severe" = Tardieu score 4*
Spasticity in the knee extensors

Management of spasticity

- Oral Baclofen**
- Intrathecal Baclofen
- Diazepam
- Physiotherapy**
- Botox – some temporary effects but not clinical meaningful
- ? marijuana-based pharmaceutical
Oral anti-spastic agents

- Most commonly used: baclofen
- Factors to consider
  1. Side effects: Benefits vs. Harmful side effects
  2. Local vs. General
  3. Is it necessary? Affects functions? (e.g. Jill S.)
  4. Appropriate dosage? Frequency?
  5. New medication: Cannabinoid extracts
- New medication: Sativex®
  - Marijuana-based – mouth spray – can be used with Baclofen
  - TGA approved (Novartis Pharmaceutical) - not yet available in Australia

Spasticity – evidence of physiotherapy

- "There is 'low level' evidence for non pharmacological interventions such as physical activities given in conjunction with other interventions (Amatya et al. (2013 - Cochrane Database Syst Rev 2)
- Therapeutic exercises: Hydrotherapy Unloaded leg cycling, passive stretch, eccentric exercise
Prevalence of joint contractures and muscle weakness in people with multiple sclerosis

Phu Dinh Hoang, Simon C. Gandevia, and Robert D. Herbert

Neuroscience Research Australia, Sydney, Australia

Proportion of participants with joint contracture in each disease step. Greyed areas are 95% confidence intervals. (Hoang et al, Disability and Rehabilitation, 2014; 36(19): 1588–1593)

Table 2. Prevalence and characteristics of joint contractures of the cohort (n = 156).

<table>
<thead>
<tr>
<th>Prevalence of joint contracture</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>In any joint</td>
<td>56.4</td>
</tr>
<tr>
<td>In the ankle</td>
<td>43.9</td>
</tr>
<tr>
<td>In the knee</td>
<td>17.0</td>
</tr>
<tr>
<td>In the hip</td>
<td>28.8</td>
</tr>
<tr>
<td>In the wrist</td>
<td>3.8</td>
</tr>
<tr>
<td>In the elbow</td>
<td>4.8</td>
</tr>
<tr>
<td>In the shoulder</td>
<td>13.1</td>
</tr>
</tbody>
</table>
Severe Joint contracture in MS

Multiple Sclerosis Limited

Ankle contracture in ambulant PwMS is common

Multiple Sclerosis Limited
Typical ankle contracture + foot drop

DISCUSSION
Results

• Step training system was safe and feasible to be administered at home without supervision
• Effective in improving
  ✓ Stepping and standing balance
  ✓ Coordination
  ✓ And functional performance in people with MS
What can you do to improve Body function – Activity – Participation and reduce falls?

- Exercise

- EXERCISE

- MORE EXERCISE

PwMS don’t value exercise?

- 41% report exercise as the area about which they mostly want advice (Somerset et al., 2001)

- Top three barriers, regardless of gender (survey by Asano et al., n = 417)
  1. Too tired
  2. Impairment
  3. Lack of time
Benefits of exercise

Exercise and disease progression in multiple sclerosis: can exercise slow down the progression of multiple sclerosis?

Ulrik Delgas and Egon Stenager

But How?

- 30 min moderate intensity aerobic activity 2x/week AND strength training exercise for major muscle groups 2x/week

- Benefits: reduce fatigue, improve mobility, and enhance quality of life

**More specific?**

<table>
<thead>
<tr>
<th></th>
<th><strong>Aerobic activity</strong></th>
<th><strong>Strength training activity</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>How often?</strong></td>
<td>2x/week</td>
<td>2w/week</td>
</tr>
<tr>
<td><strong>How much?</strong></td>
<td>Gradually increase to 30 min/session</td>
<td>Work up to 2 sets of 10-15 reps</td>
</tr>
<tr>
<td><strong>How hard?</strong></td>
<td>Moderate intensity</td>
<td>Use loads heavy enough to struggle to finish 10-15 reps of the last set</td>
</tr>
</tbody>
</table>
| **How to?**          | Upper body: Arm cycling  
                        | Lower body: Walking, leg cycling  
                        | Combined upper and lower body: elliptical trainer  
                        | Others: aquatic exercise | Weight machines  
                        | Free weights  
                        | Cable pulleys  
                        | Elastic resistance bands |

**THANK YOU**