

# Welcome

## Best Practice Exercise and Physiotherapy Prescription in Multiple Sclerosis

YOUR PRESENTERS ARE ANDREA SALMON AND GILLY DAVY

YOUR FACILITATORS ARE NICOLA GRAHAM AND A/PROF PHYSIOTHERAPY, PAIGE HOOPER

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PHYSIOTHERAPY  
ASSOCIATION

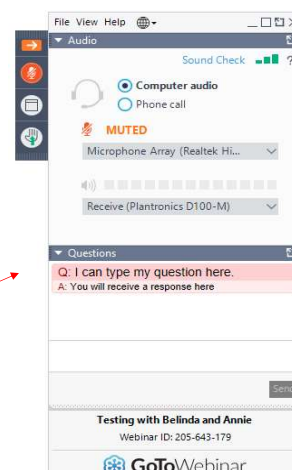
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# Housekeeping

## HOW TO ENGAGE IN THE WEBINAR



- Desktop: Control panel appears on the right of the screen
- Mac, a tablet or an iPad: Control panel appears in a grey bar across the top, side or bottom of your screen
- Click the orange box to minimize or maximise
- Click the white arrow to open the Questions pane and type in your question and click send



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# Acknowledgement of country



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# Introductions

TODAY'S PRESENTERS:



Andrea Salmon



Gilly Davy

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# Multiple Sclerosis

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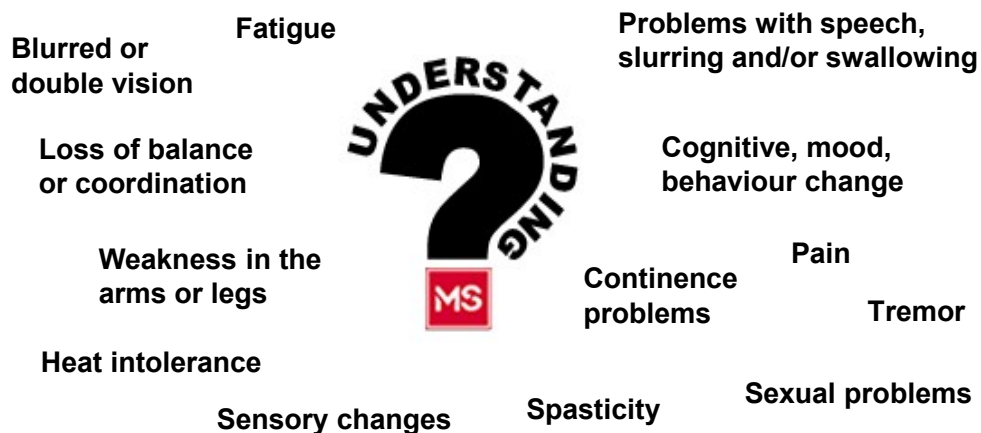
# What is Multiple Sclerosis?



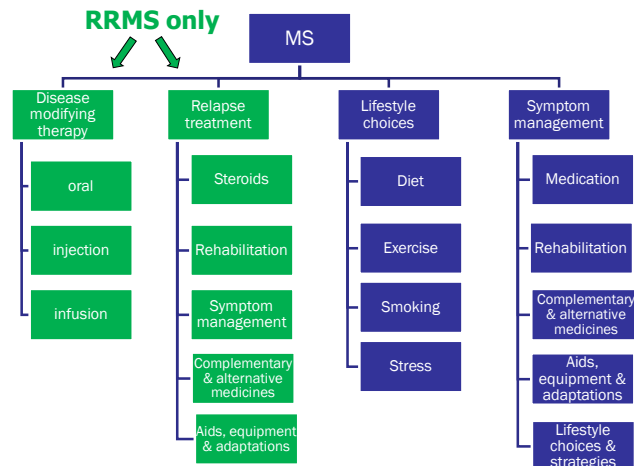
Multiple Sclerosis is a chronic, demyelinating, autoimmune disease of the central nervous system



# Symptoms



# Treating MS



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# Your Role



WHAT IS MULTIPLE SCLEROSIS
SUPPORT & SERVICES
EMPLOYMENT SUPPORT
NDIS SERVICES
LIVING WELL
GET INVOLVED

Support & services > Education and Wellbeing > Health Professionals

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MS is the go-to provider of information, advice and support for people affected by multiple sclerosis.

We're a combined entity of the ACT, NSW, Victoria and Tasmania with over 60 years' insight into how to live with multiple sclerosis.

## Health Professionals

### 2021 Health Professional Webinars - Upcoming Programs

From 1 February 2021, all of our webinars will be free to attend and obtain your CPD points

- PD - Cognitive Screening Tools; what to use, when, what the results mean and how to take a really useful history  
Thursday 21 October, 10.30am - 11.30am AEDT

You can also access the [Health Professional Webinar Library](#) of our previously recorded topics.

Along with our Health Professional Webinars, we have an extensive range of educational products to support you to care for your clients living with multiple sclerosis.

- Subscribe to Inform**, a monthly eNewsletter including details of upcoming MS programs, useful online resources, disease-related news and research news.

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# How symptoms may present



**Inflexibility/ Rigidity**  
**Impaired insight**  
**Never goes out**  
**Forgetful**  
**Irritable**  
**Hopeless with money**  
**Doesn't complete tasks**  
**Distractible**  
**Doesn't listen**  
**Cranky, irritability, agitation, aggression**  
**Disorganised**  
**Lazy**  
**Demanding**  
**Unreliable**  
**Overwhelmed**  
**Messy**  
**Procrastination**  
**Vague**

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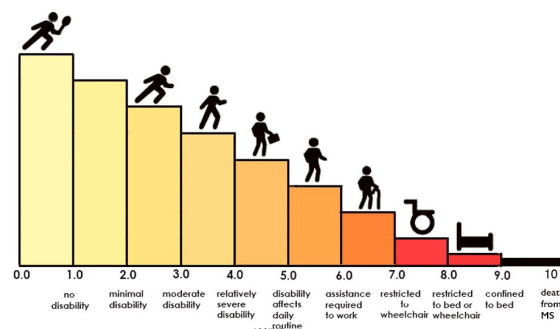
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# EDSS



EDSS (EXPANDED DISABILITY STATUS SCALE)



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# MS Services



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## Best Practise Exercise and Physical Therapy Prescription in Multiple Sclerosis



**Gilly Davy**

*Founder and Clinical Lead Neurological Physiotherapist*

*BSc Hons Physiotherapy*

*PG Cert Health and Rehab Science*

Gilly Davy - Founder and Clinical Lead

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A presentation slide featuring a large cartoon character on the left. The character is white with a large, open mouth showing a pink tongue, and two large, round eyes. It is set against a red circular background. To the right of the character is a pink starburst shape containing the text "Not Changed for 25 years". Above this starburst is the "MS" logo, which consists of the letters "MS" in red inside a blue brain-like shape, with the text "Get a Head Start" below it. Below the starburst, there is a list of references: "Latimer-Cheung et al 2013", "Kinnett-Hopkins et al 2017", and "Motl et al 2017". At the bottom of the slide, there is a woman standing at a podium, and the text "Gilly Davy - Founder and Clinical Lead" is visible. The slide also has some partially visible text on the left: "We" and "ed?".

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## Today's Journey...

- The evidence behind exercise
- Assessing and testing in MS
- Confidence in exercise prescription
- Best practice for common issues of;
  - Foot drop
  - Knee hyperextension
  - Hand weakness
- Case study examples



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## What is a primary impairment?

### *Compared to a secondary impairment?*

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**Fear**

**Inconsistency**

**Poor referral**

Sadeghi-Bahmani et al 2021, Motl et al 2017, Kayes et al 2011, Backus 2016  
 Learmonth & Motl 2016, Richardson et al 2019, Sandroff et al 2021  
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## Exercise Induced Symptom Exacerbation

- Due to a HEAT response
- Can last for 30 mins to 2 hours
- Often sensory changes
- Its temporary
- Proactive cooling – ice slushy



- You NEED to support and provide confidence in exercise

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Leavitt et al 2014



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## Neuro Muscular Fatigue

- Direct fatigue of the muscle
  - Muscle energy store becomes depleted
  - Due to partial innervation
  - Temporary
- 
- No damage is caused pushing through.....however
    - Can cause biomechanical changes
    - Increased risk of injury – falling etc.



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## The Benefits of Exercise (what you already know)



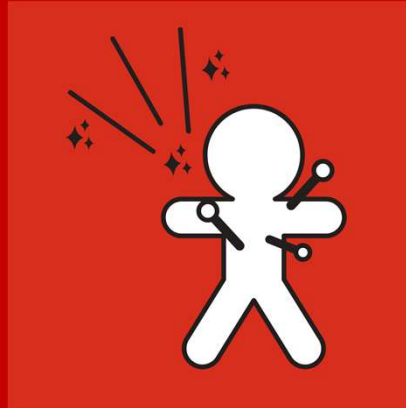
Motl et al 2012  
Motl et al 2017  
Jorissen et al 2018,  
Campbell et al 2018

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## The Benefits of Exercise (what you hopefully know)



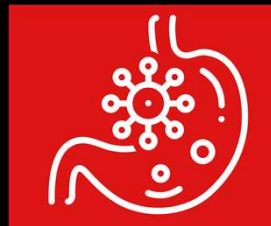
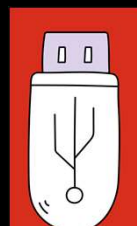
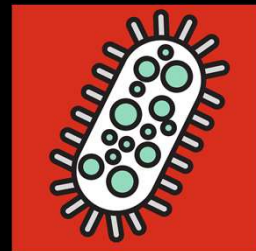
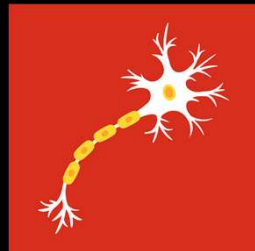
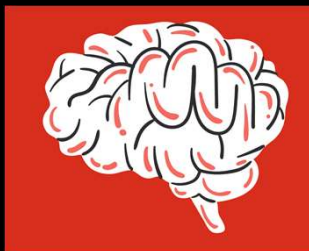
Pilutti et al 2013,  
Motl et al 2017

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## The Benefits of Exercise (that is REALLY important to know)

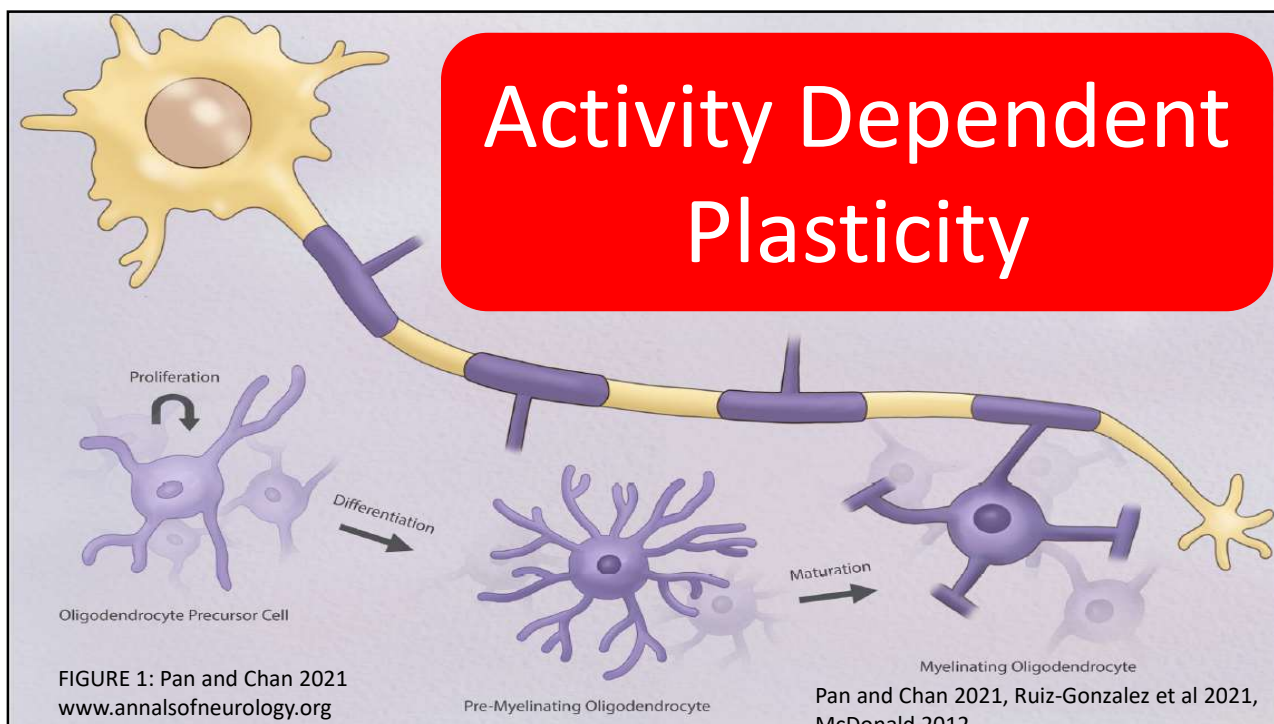


Ozkul et al 2020  
Banitalebi et al 2020  
Negaresh et al 2019  
Negaresh et al 2021  
Mokhtarzade et al 2021  
Motl and Sandroff et al 2018  
Pilutti et al 2014

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*Future Perspectives*

## Exercise and lifestyle physical activity recommendations for people with multiple sclerosis throughout the disease course

Rosalind Kalb, Theodore R Brown, Susan Coote, Kathleen Costello, Ulrik Dalgas <sup>ID</sup>, Eric Garmon, Barbara Giesser, June Halper, Herb Karparkin, Jennifer Keller, Alexander V Ng, Lara A Pilutti, Amanda Rohrig, Paul Van Asch, Kathleen Zackowski and Robert W Motl <sup>ID</sup>

*Multiple Sclerosis Journal*

2020, Vol. 26(12) 1459–1469

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**Table 2.** Exercise recommendations and key messages for EDSS

| EDSS 0–4.5 (mild disability)                                                                                                                                                                                                                                                                                                                                                                                                                    | Table 3. (Continued)<br>EDSS 7.0–7.5 (diminished ability to perform ADLs—non-ambulatory)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Key message:</b></p> <ul style="list-style-type: none"> <li>• Exercise is safe</li> <li>• Referrals to exercise programs for conditions associated with EDSS</li> <li>• Exercise recommendations should be based on individual capacity, as assessed by a rehabilitation professional</li> <li>• Supervised training may be beneficial</li> <li>• Exercise may be sensitive to heat, humidity, and other environmental factors</li> </ul> | <p><b>Key messages</b></p> <ul style="list-style-type: none"> <li>• At this level of disability, all recommendations are expert opinion except where noted, due to lack of published evidence</li> <li>• Daily physical activity is essential</li> <li>• Functional movement of any kind, including ADLs, counts as physical activity</li> <li>• Wheelchair sports/adapted physical activity programs may be appropriate and beneficial</li> <li>• Rehabilitation professionals can help persons integrate more physical activity into the day</li> </ul> <p style="text-align: right;">Kalb et al 2020</p> |

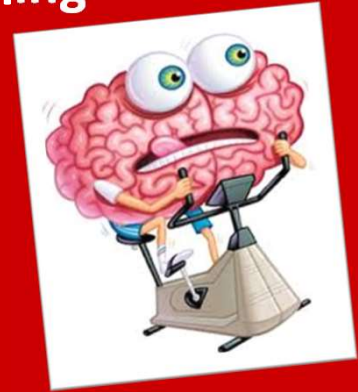
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <p><b>Recommendations:</b></p> <ul style="list-style-type: none"> <li>• Aerobic = 3 x a week / 10 -30 minutes / 40%- 60% predicted HR max</li> <li>• Advance Aerobic = 5 x a week / up to 40 minutes / 70% to 80% HR</li> <li>• High Intensity Interval Training = 1 x a week / 5 x 30 -90 sec at 90% - 100% HR</li> <li>• Strength = 2 to 3 times a week</li> <li>• Flexibility = daily</li> <li>• Neuromotor = 3 -6 x a week / 20 -60 minutes</li> </ul> <p style="text-align: right;">Kalb et al 2020</p> |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

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## High Intensity Interval Based Training

- 70% to 100% of predicted heart rate max
- 10 – 90 seconds with at least 1:1 rest ratio
- Increased outcomes by 10% to 40%
- Reduced relapse rates
- Increased strength
- Increased walking distance
- Reduced neutrophil to lymphocyte ratio



Langeskov-Christensen et al 2021,  
Joisten et al 2021, Jorissen et al 2018,  
Campbell et al 2018, Karpatkin et al 2016,  
Karpatkin et al 2015,  
Hubbard et al 2018

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## How to Apply the Intervals

| Week | Interval Time in Seconds | Numbers of sets |
|------|--------------------------|-----------------|
| 1    | 10                       | 3               |
| 2    | 20                       | 3               |
| 3    | 30                       | 2-3             |
| 4    | 30                       | 2- 3            |
| 5    | 45                       | 2               |
| 6    | 45                       | 2               |

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## Key MS Assessment Points

### Subjective

- Current exercise & physical activity habits
- Fatiguability
- Heat sensitivity
- Any usual symptom production with exercise
- Exercise intensity
- Walking limitation
- Their main concerns / barriers
- Their goals

### Objective

- Sensory
- Spasticity
- ROM – ankle in particular
- Gait pattern
- Reach Pattern
- MMT – fatigability
- Vestibular involvement
- Self efficacy / anxiety



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## Key MS Assessment Points

### Outcome Measures

- MS 12 point walking scale
- Fatigue severity scale
- Self efficacy for managing chronic disease
- Incidental and planned exercise questionnaire
- ABC scale
- 10mWT
- Mini Best Test
- HiMat
- Grip dynamometer
- 9 hole peg
- STS x5

### Exercise testing

- 6 min WT
- Step test
- 30 sec sit to stand

### What are you testing?

- Fitness or fatiguability?
- Heart rate zones and recovery?

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## Foot Drop.....or Decreased ground clearance

- Neuromuscular fatigue
  - Foot starts to catch or drag after a period of walking
  - Rests for a short period and can walk again until the fatigue kicks in again.
- Loss of ankle range
- Plantarflexor tone / spasticity
- Dorsiflexion weakness
- Evertor weakness (instability)
- Loss of toe off and hip flexion (weakness)



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## What and How to Assess Foot drop

### Subjective:

- Toes catching / Tripping / Falling
- Floppy foot
- Need to stop and rest
- Walking funny / different to compensate

### Objectively:

- ROM – dorsiflexors and plantarflexors
- Muscle strength ? Fatigable
  - Dorsiflexors
  - Plantarflexors
  - Evertors
  - Hip flexors
- Gait analysis



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## Outcome Measures?

- 10mWT ?
- 6 min walk test
- 12 Point MS Walking Scale – self assessment
- ROM
- Muscle strength (graded manual muscle testing)
- Trip rate?
- Falls?
- Walking distance / time prior to neuromuscular fatigue
- Gait efficiency? Energy conservation



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## Treatment Ideas



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## Orthotics



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## Knee Hyperextension in MS

- Weakness
- Loss of ROM – plantarflexors
- Poor core control / pelvic instability
- Pelvis alignment
- Unilateral
- Proprioceptive / sensory loss
- Compensatory / adaptive pattern
- Spasticity
- Neuromuscular fatigue



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## Outcome Measures?

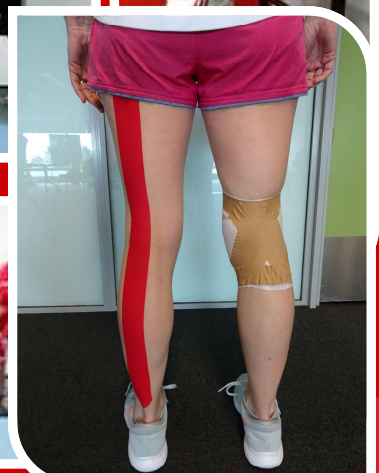
- 10mWT ?
- 6 min walk test
- 12 Point MS Walking Scale – self assessment
- ROM
- Muscle strength (graded manual muscle testing)
- Balance / falls rate
- Gait efficiency? Energy conservation
- Photo's / video
- Knee pain



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## Treatment Ideas



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## Typical MS Upper limb weakness patterns

- Wrist and finger extension weakness
- Scapular instability
- Loss of glenohumeral rhyme
- Grip strength loss
- Dexterity loss
- Sensory loss



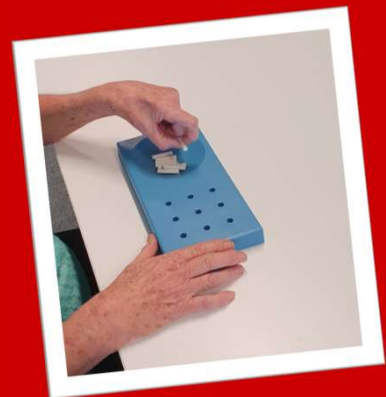
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## UL Outcome Measures

- Grip dynamometer
- 9 hole peg
- Box and block
- Action research arm test - ARAT
- 4 point kneeling to full high plank hold



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## Treatment ideas



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## Case Study 1 Minimal impairment

- 39-year-old female, diagnosed 2019
- Working office management & 1 child
- Left leg weakness, walking limited to 20 minutes, bladder urgency, some heat sensitivity, sensory changes in left foot.
- Not able to run and started to avoid walking
- EDSS score 2
- MS medication - tecfidera



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## Case Study 1 - Assessment

- Gait: Left foot loss of heel strike, increased hip flexion ++ on left and decreased stride length and loss of left push off. Lack of UL swing or holding up of Left UL due to instability in the core and left pelvis.
- Left foot / leg increased tone and spasticity ++ (hamstring)
- Foot hypersensitivity
- 1 leg calf raise: R: 30  
L: 10 // much slower
- 10mWT: N: 7 sec and 15 steps  
F: 5 sec and 16 steps

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## Video 1

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## Case Study 1 - Treatment

- Education provided on symptom response in MS to exercise and principles of exercise for MS.
- Plantarflexor strengthening and lengthening
- Foot mobilisation / Soft tissue release in left calf
- Core stability
- Proprioception
- Cross trainer and bike sprints
- Treadmill training – sprints and backwards walking
- Left leg anti hyperextension tape ELAB applied // client felt that she could walk faster.
- Trial of dictus band // made little impact to client's gait.
- Running drills on trampette
- Ballistic training - Skipping with rope, bunny hops
- Vibration plate form with a range of different positions
- Prone lying facilitation of hamstring curl with speed from therapist

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## Video 2

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## Case Study 1 – Home Program

|                                                                                                                                                                             |                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p><b>1 Calf Stretch on Board - bent leg</b><br/>Freq: DAILY Hold: 3 to 4 minutes</p>     |  <p><b>1 Vertebral roll (heel lift)</b><br/>Sets: 3 Reps: 20</p>        |
|  <p><b>2 Calf Stretch on Board - Straight leg</b><br/>Freq: DAILY Hold: 3 to 4 minutes</p> |  <p><b>2 Modified side plank SLR</b><br/>Sets: 3 Reps: 10</p>           |
|  <p><b>3 Toe Extension Stretch</b><br/>Sets: 3 Freq: DAILY Hold: 30 to 60 sec</p>          |  <p><b>3 Proprioception alphabet</b><br/>Reps: 3 attempts each side</p> |
|  <p><b>4 Theraband Dorsiflexion</b><br/>Sets: 5 Reps: 8</p>                                |  <p><b>4 Jumps</b><br/>Sets: 3 Reps: 8</p>                              |
|  <p><b>5 Plantar fascia release</b><br/>Freq: Daily Duration: 2 -3 mins</p>                |  <p><b>5 Bounding</b><br/>Sets: 4- 6 Reps: 6</p>                        |
|  <p><b>6 Foam rolling calf (one leg)</b><br/>Sets: 3 Reps: 10</p>                          |  <p><b>6 Skipping rope</b><br/>Sets: 3 Duration: 1 min</p>              |
|  <p><b>7 Reverse calf stretch</b><br/>Sets: 3 Reps: 10</p>                                 |  <p><b>7 Stationary bike</b></p>                                        |



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## Case Study 2 – Moderate impairment

- 67 year old female – diagnosed 23 years, some accounting part time
- No left-hand function and now right-hand weakness and coordination loss.
- Walking a few meters with a frame and bioness on the left leg.
- Current exercise = balance class and some walking
- EDSS score 7
- MS Medication – Nil

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## Case Study 2 - Assessment

- Protracted shoulder girdle, elevated shoulders and right trunk flexion in sitting, kyphosed posture in standing
- Reduced shoulder ROM
- No dexterity in left hand and weak in right
- Box and Block – Right = 39  
Left = 9
- FSS = 30/63
- Independent but poor STS technique



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## Case Study 2 - Treatment

- Education on exercise for neuro protection
- Recumbent bike sprints
- Time spent standing and Sit to stands
- Prone standing
- UL strengthening – high sets, low reps
- FES on right extensors and flexors
- Wheelchair seating assessment
- Abdo binder
- Power breath



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## Case Study 2 – Home Program

|                                                                                                                                                      |                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p><b>1 Grip strength</b><br/>Sets: 5 Reps: 5</p>                  |  <p><b>1 Plantar flexion on two legs</b><br/>Sets: 5 Reps: 5</p> |
|  <p><b>2 Auto-assisted shoulder flexion</b><br/>Sets: 5 Reps: 5</p> |  <p><b>2 Sit to stand</b><br/>Sets: 5 Reps: 5</p>                |
|  <p><b>3 Finger Extension</b><br/>Sets: 5 Reps: 5</p>               |  <p><b>3 Bridging</b><br/>Sets: 5 Reps: 5</p>                    |
|  <p><b>4 Tricep Push Up out of Chair</b><br/>Sets: 5 Reps: 5</p>    |  <p><b>4 Standing</b><br/>Freq: DAILY x5 Duration: 1 minute</p>  |
|  <p><b>5 FES wrist extension</b><br/>Sets: 5 Reps: 10</p>           |  <p><b>5 Dorsiflexion stretch</b><br/>Hold: 3 to 4 minutes</p>   |
|  <p><b>6 Picking up paper clips</b><br/>Duration: 5 minutes</p>     |                                                                                                                                                   |
|  <p><b>7 External rotation (2 arms)</b><br/>Sets: 5 Reps: 5</p>     |                                                                                                                                                   |
|  <p><b>8 Wrist extension</b><br/>Sets: 5 Reps: 5</p>                |                                                                                                                                                   |

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Get a Head Start

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## Take Home Messages

- High intensity interval training is safe and effective
- Manage neuromuscular fatigue with interval training for cardio and strength
- Educate on exercise induced symptom production
- Assess the plantarflexors for foot clearance and knee hyperextension issues
- Early intervention is needed



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**THANKYOU**

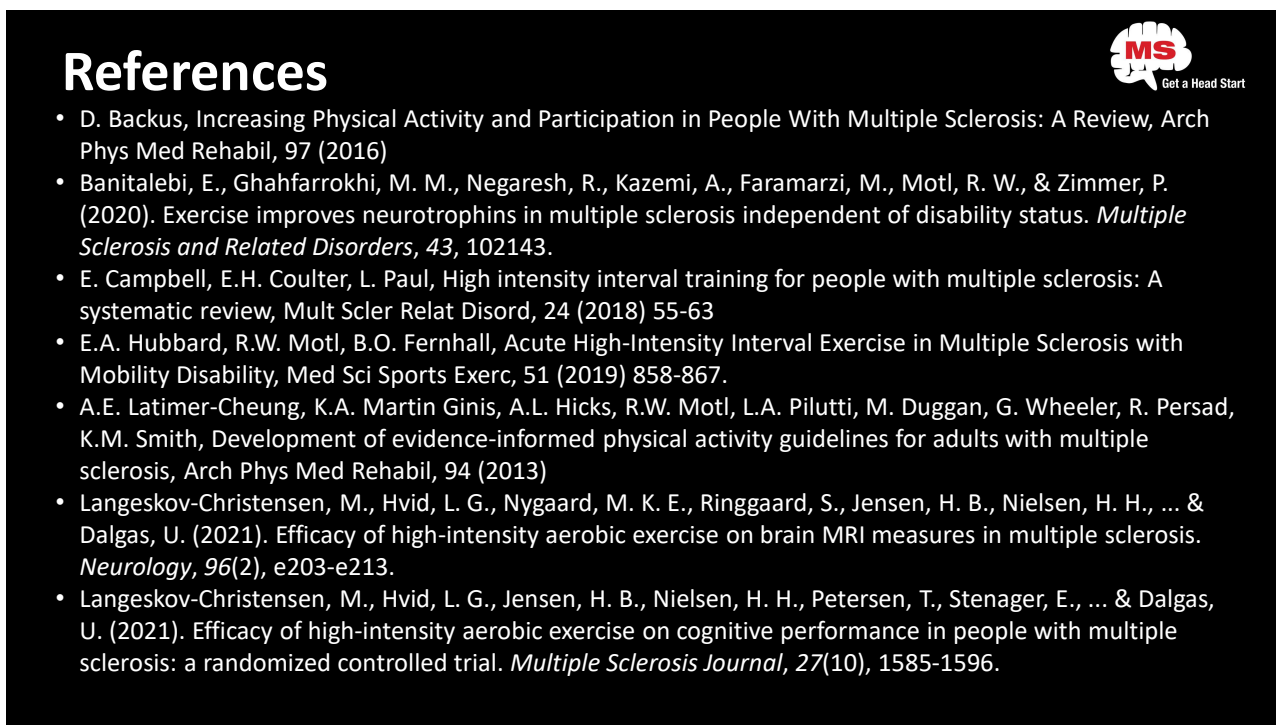
**MS** Get a Head Start

# Questions?

[www.ms-ghs.com](http://www.ms-ghs.com)  
[gilly@ms-ghs.com](mailto:gilly@ms-ghs.com)

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## Questions



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## Services

SUPPORTING AUSTRALIANS TO LIVE WELL WITH MULTIPLE SCLEROSIS



### We are here so nobody faces MS alone

Multiple Sclerosis Limited (MS) provides a range of services to support people with multiple sclerosis to live the best lives they can. We service people in ACT, NSW, TAS and VIC.



Allied Health  
(NDIS, My Aged Care)



NDIS Plan and  
Support Coordination



Free MS Helpline Service  
(Specialist Advice and  
Information)



Employment Support



Residential Care



Wellbeing and  
Peer Support



Education for Community  
and Health Professionals



Respite and Carer Support

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# Resources

FREE TO ACCESS



PODCASTS



- MS Podcast Series interviews experts as well as people living with MS to share their experiences and knowledge
- MS Practice online resources are created specifically for health professionals
- Online library – you can access free e-books and audio books via EBSCO
- Professional Development online courses are available via our website
- Inform E-Newsletter is a monthly newsletter detailing upcoming CPD webinars and research links

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