Influence of Aquatic Exercise in Physical Condition in Patients with Multiple Sclerosis

Kyrsten Le, SPT

UNC NEURO STEP UP

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2. Purpose
3. Methods
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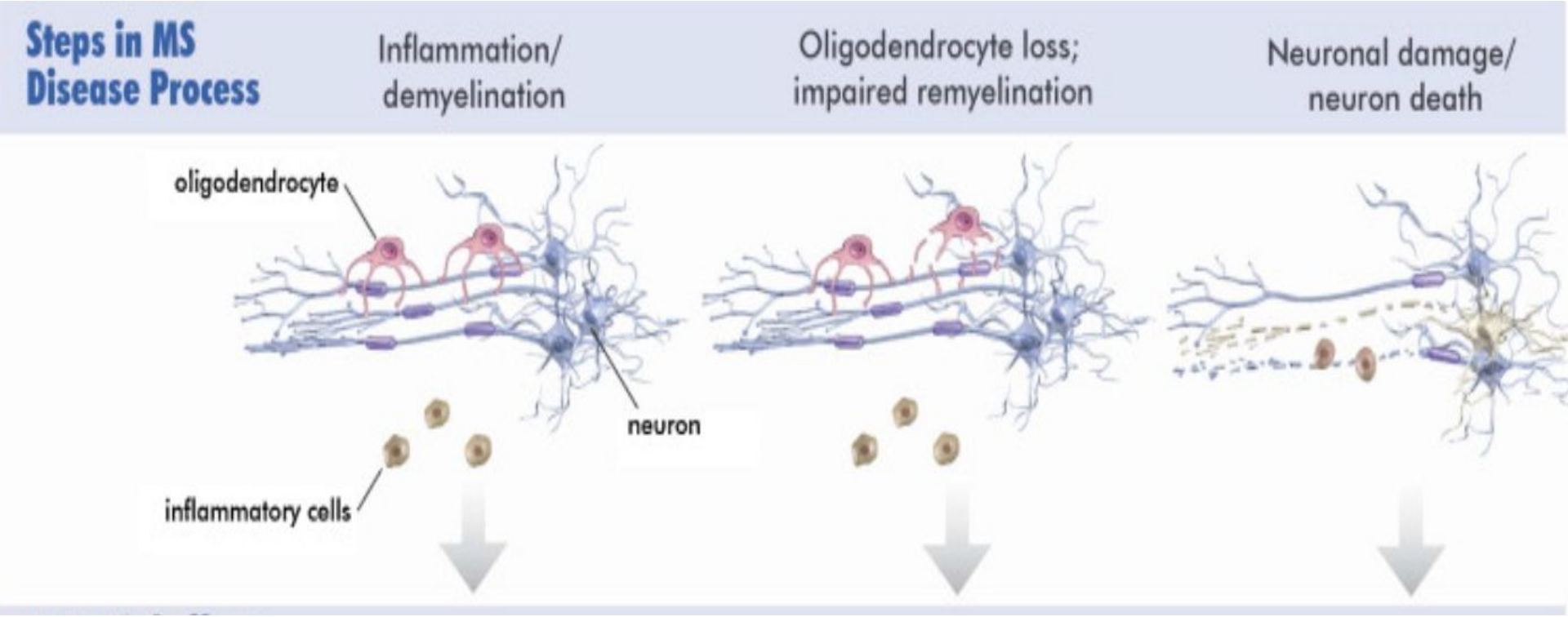
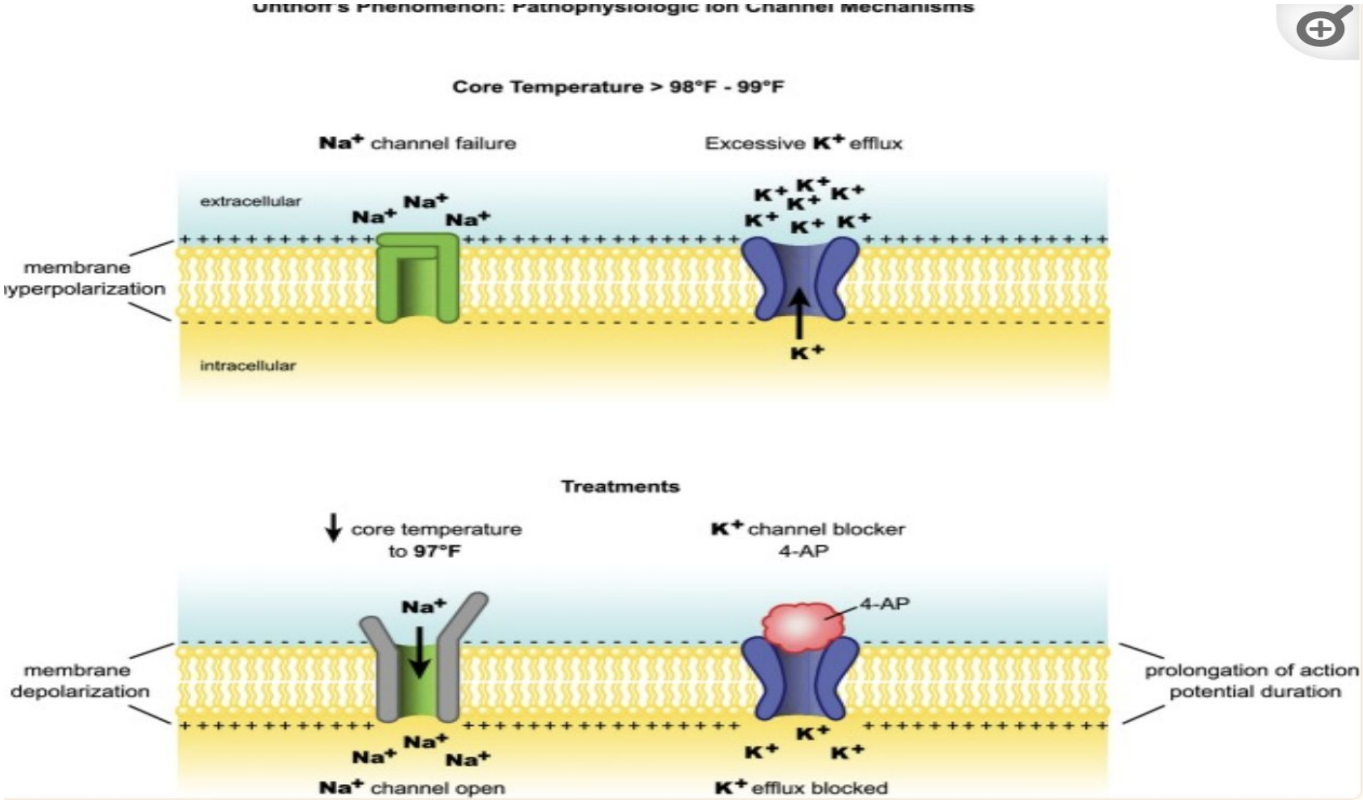
Background

What is Multiple Sclerosis?



Krieger, Stephen & Sorrells, Shawn & Nickerson, Molly & Pace, Thaddeus. (2014). Mechanistic insights into corticosteroids in multiple sclerosis: War horse or chameleon?. Clinical neurology and neurosurgery. 119. 6-16.

Demyelination Adaptations



Frohman AN, Okuda DT, Beh S, Treadaway K, Mooi C, Davis SL, Shah A, Frohman TC, Frohman EM. Aquatic training in MS: neurotherapeutic impact upon quality of life. Ann Clin Transl Neurol. 2015 Aug;2(8):864-72. doi: 10.1002/acn3.220. Epub 2015 Jun 26. PMID: 26339680; PMCID: PMC4554447.

Why aquatic therapy?

1. Reduced conditioning impacts ADLs
2. Properties of water allow for easier and safer exercise
3. *Thermal properties of water may be the most important factor for aquatic exercise in MS patients*.

Purpose

The purpose of this study aims to evaluate the influence on aquatic exercise on physical condition measured by walk, lower limb strength, and balance tests, in patients with MS.

Methods

Participants

- 28 individuals with MS
- Randomly allocated to 2 groups: 14 control and 14 experimental

Patient Demographics

Inclusion criteria:

- Diagnosed with MS for over a year
- Received medical clearance to participate in study

TABLE I.—*Sample characteristics.*

	Mean±SD experimental group	Mean±SD control group
Age (years)	41.3±7.3	43.6±7.6
Age (years) — male	40.8±9.6	44.5±8.0
Age (average±SD) — female	41.6±7.6	43.2±5.8
Gender (male/female) (%)	4 (30.1)/9 (69.9)	5 (38.5)/8 (61.5)

SD: standard deviation.

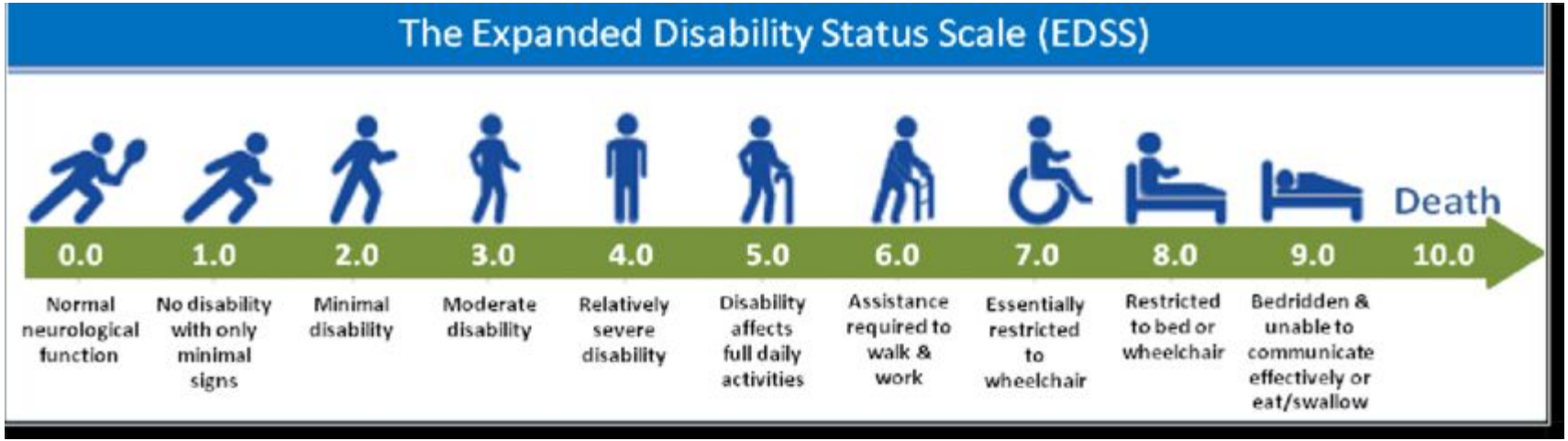
Disability:

- EDSS

	Occurrence experimental group	Occurrence control group
Mild disability (male/female) (%)	2 (100)/0 (00)	1 (25)/2 (75)
Moderate disability (male/female) (%)	3 (30)/7 (70)	2 (25)/6 (75)
High disability (male/female) (%)	0 (00)/1 (100)	1 (50)/1 (50)

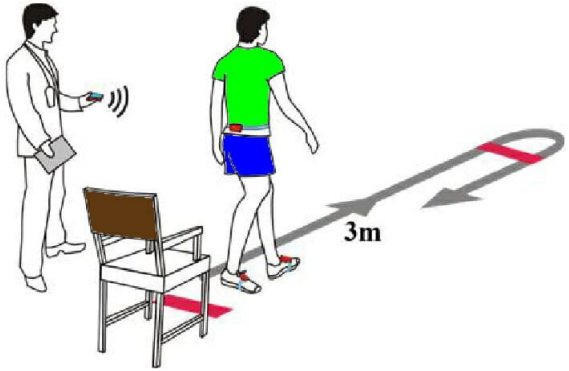
EDSS: Expanded Disability Status Scale.
Mild disability: 0 to 3.0; moderate disability: 3.5 to 5.5; high disability: 6.0 to 7.5; very high disability: -8.0 to 10.0 (not addressed in the study).

EDSS



Spiteri, Stefan. (2018). The neural correlates of effort-related and effort-unrelated fatigue in patients with multiple sclerosis.

Measures



- Timed Up and Go test
- Timed 7.62 Meter Walk
- 30 Second STS
- Berg Balance Scale
- Scale of Perceived Exertion (OMNI)

Procedure

- All participants underwent pre-test and post-test after 12 weeks of intervention
- Control group did not undergo any prescribed exercise
- Aquatic exercise performed in a 25m x 12.5m unheated pool with avg depth 1.5m
- Equipment used: water dumbbells, buoys/floats, water noodles
- EG underwent aquatic therapy program:
  - 45-60 minute sessions 3 times a week for 12 weeks
  - Warm-up: walking out of water for 5-10 min
  - Walking in chest-high water for 5-10 min
  - Water bicycle using noodle for 5-10 min
  - Exercises for upper and lower limbs 5-10 min
  - Breathing exercises for 5 min
  - Swimming for 10 min
  - Recovery period 5 min

Results

TABLE III.—*Functional measures of physical condition pre- and post-intervention in the experimental (EG) and control (CG) groups.*

Test	EG pre	EG post	CG pre	CG post	P	Cohen's f^2
Up and Go	13.96±4.33	9.54±3.81*	14.01±4.23	14.17±4.54	0.043	0.334
7.62 m	8.41±4.32	6.91±4.44*	8.35±3.80	8.36±4.12	0.031	0.348
Lower limb strength	12.12±3.11	13.72±3.23*	12.33±3.54	12.31±3.44	0.042	0.323
Balance Test	41.83±5.19	44.61±5.22*	41.58±6.18	41.44±6.13	0.012	0.670

*$P \leq 0.05$ (two-way ANOVA and Tukey HSD *post-hoc* test).

Discussion

Strongly supports the recommendation of aquatic exercise for people with MS.

The functional tests that required more strength to perform showed better improvements than the walking tests.

Balance results is consistent with other literature, therefore highly recommended for individuals with increased fear and risk of falling.

Strengths

- This study provides strong evidence for addressing key impairments that impact functional mobility.

- Gave a detailed exercise plan that could be implemented during physical therapy sessions.

- Utilizing more functional and land-based measure to ensure the transfer of gains made in the water translate to real-world conditions.

Limitations

- Generalizability - small sample size
- Did not discuss other medical conditions/comorbidities that participants may have. Very vague description of inclusion criteria and did not include exclusion criteria.
- Did not discuss any adverse events or symptom exacerbations. What were symptoms that patients had?
- Only measured in the short-term.
- QOL measure? Did patients notice a difference in physical condition and/or symptoms? Did it impact their activity and participation?
- Endurance measure?

Clinical Application & Future Research

Future Research

- Comparing physical condition aquatic vs. land?
- Combination of aquatic AND land vs. just aquatic of just land?
- Does aquatic therapy actually decrease exacerbation of symptoms?

Clinical Application

- People with MS often exhibit muscle weakness and heat intolerance that is associated with fatigue, reduced functional capacity, and increased disability. Aquatic therapy is an effective method to address these impairments.

- Intervention ideas of how to use properties of water to your advantage to address lower limb strength and balance.

Questions?