

Objective

To develop an objective measure of performance fatigability in MS and provide a descriptive measure of patient fatigue and their potential improvement.

Background

Because fatigue is typically defined by subjective self-report, objective measures of performance fatigability are needed. Hand grip fatigability is easily-administered and accessible across a wide range of disability levels. We included intra-individual change in output as a measure that is independent of reduced strength output.

To evaluate the sensitivity of the grip measure as a treatment outcome, we measured grip before and after transcranial direct current stimulation (tDCS), which uses mild electrical stimulation to aid symptom management in MS.

Methods

MS and healthy control (HC) participants performed repetitive contractions thirty times on an analog Vernier grip meter. A dynamic measure was calculated based on this difference between the first and last three contractions. Static motor output was measured with a maintained maximal contraction for thirty seconds.

The Fatigue Severity Scale (FSS) was administered as a measure of subjective fatigue.

A subset of MS participants (n = 19) performed this protocol at baseline and then following ten 20-minute sessions of active (1.5 mA) tDCS or comparison condition.

Results

Static fatigue from both dominant and nondominant handed conditions significantly distinguishes MS from HCs participants (see Table 1 and Figure 1). Dynamic grip fatigue was found to correlate with patient's Fatigue Severity Scale (FSS) [r = 0.30, n = 19] (as shown in Figure 2). In addition, active tDCS treatment was found to improve average dynamic grip fatigue to a greater extent than control treatment (26% reduction in dynamic fatigue in active vs. 7.8% reduction in control treatment).

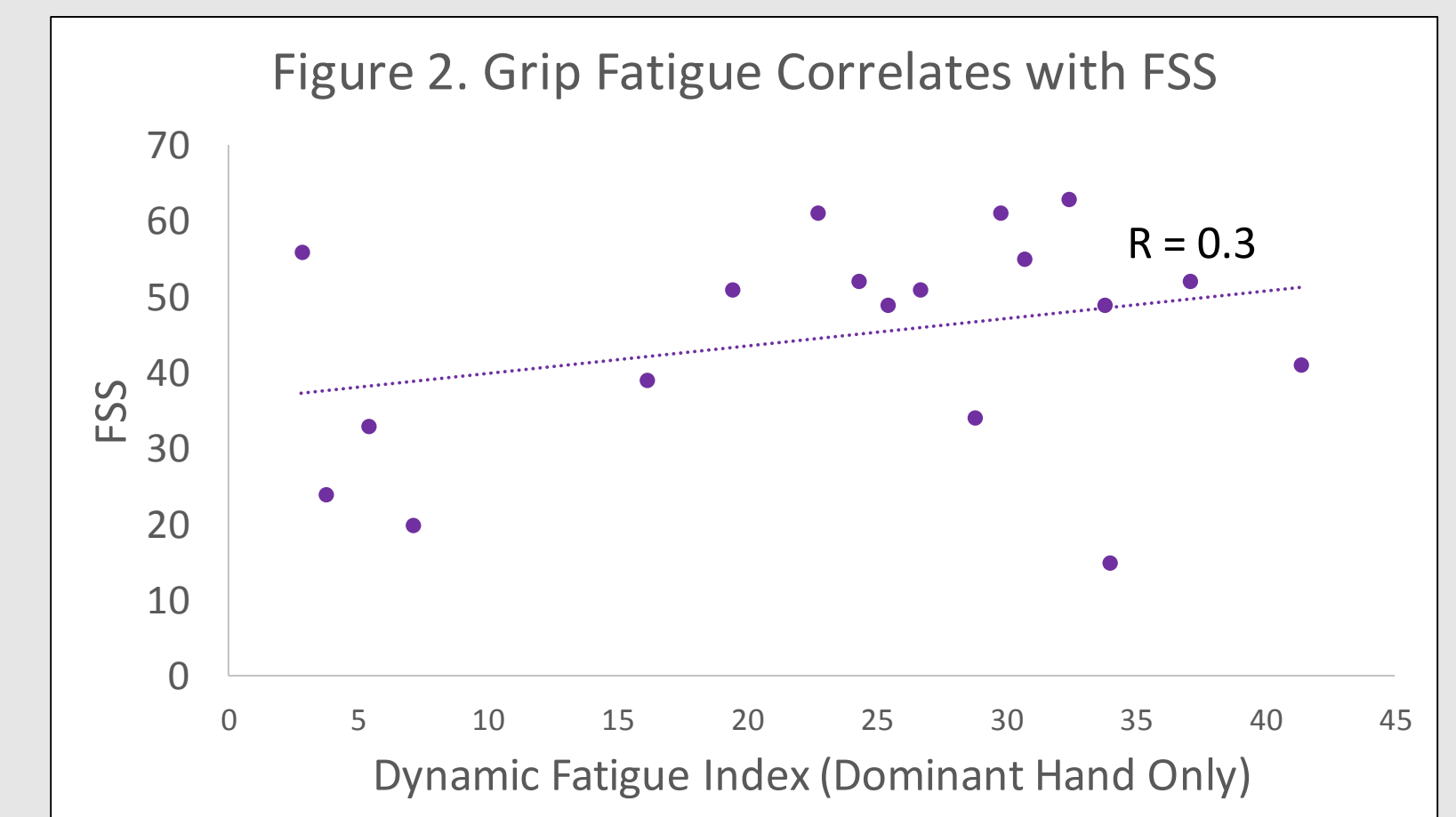
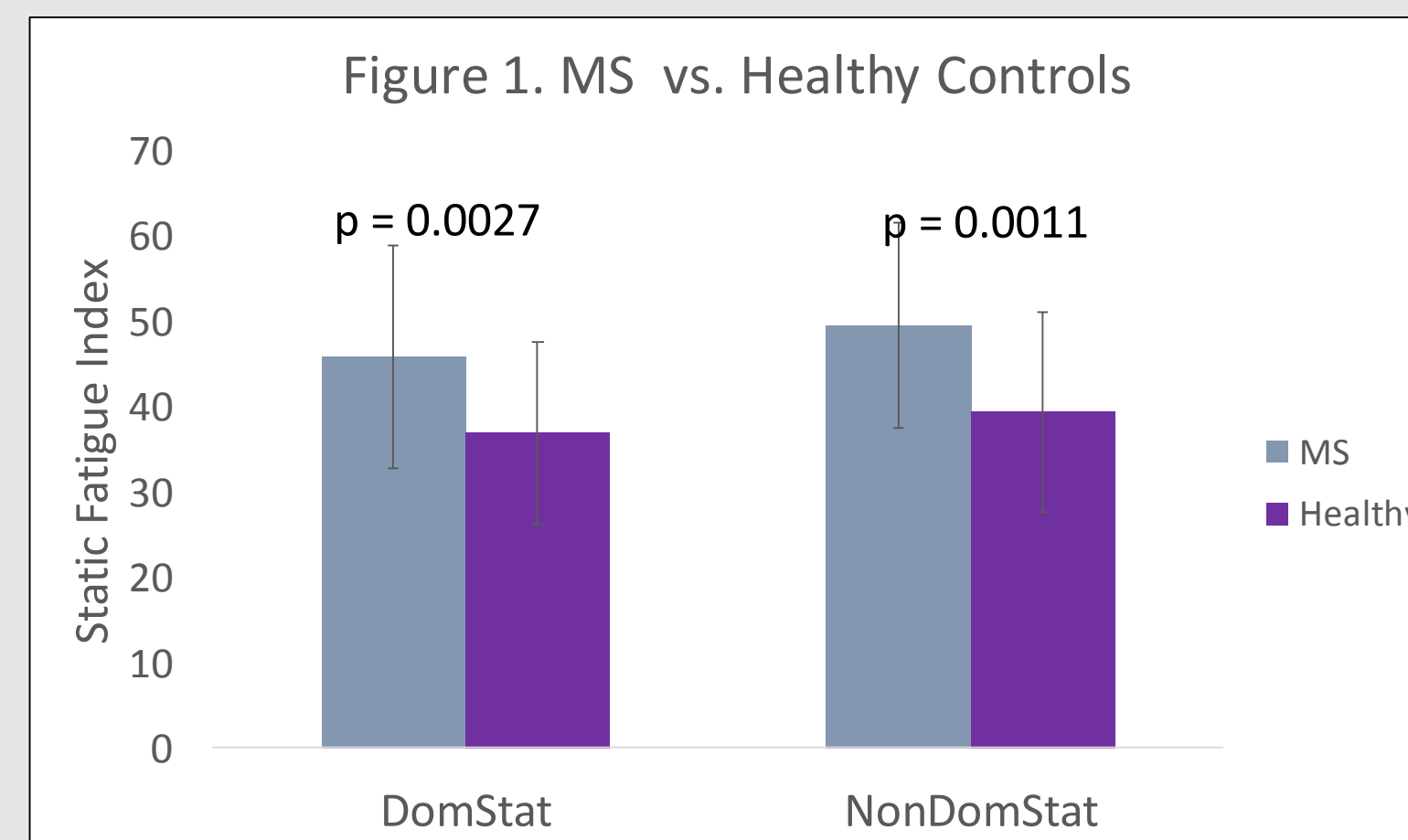


Table 1. Demographic Information and Static Fatigue Scores

Descriptor	Measure	MS (n = 29)	Control (n = 31)
Gender (%)	Male	40.7 (n = 27)	43.3 (n = 30)
	Female	59.3	56.7
Mean±SD	Age (years)	42.4 ± 18.0	21.3 ± 4.44
Reading Level	WRAT-3 (median)	107 (n = 28)	111 (n = 21)
Neurologic Disability	EDSS (median)	3.5 (n=18)	
	Dom Static Fatigue Index*	45.9 ± 13.1	36.9 ± 10.6
	Non-Dom Static Fatigue Index*	49.6 ± 12.0	39.4 ± 11.7
Race (%)	Caucasian	78.6 (n = 28)	38.7 (n = 31)
	African American	14.3	9.68
	Unknown	3.57	9.68
	Asian	0	35.5

*p<0.05

Figure 3. A Vernier Hand Dynamometer



Conclusions

- MS participants had less endurance in static grip than controls.
- The dynamic grip fatigue index correlates with the subjective fatigue (FSS).
- Active tDCS treatment improves dynamic grip endurance.

References and Funding

Severijns D., Lamers I., Kerkhofs L., Feys P. *Hand grip fatigability in persons with multiple sclerosis according to hand dominance and disease progression*, Journal of Rehabilitation Medicine, February 2015: Vol. 47 (2), 143-160

Saiote C., et. al. *Impact of transcranial direct current stimulation on fatigue in multiple sclerosis*, Restorative Neurology and Neuroscience, 2014: Vol 32 (3), 423 – 436