Mindfulness Meditation Effects on Spasticity and Quality of Life in Stroke Survivors

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Motivation

- 30% of stroke survivors experience spasticity, velocity-dependent tone, which negatively affects quality of life and activities of daily living.[1]
- Stress and anxiety are thought to increase spasticity.[2] Anecdotal research has linked meditation, a technique that has been used to reduce anxiety, to decreased post-stroke spasticity.[2]
- The objective of this pilot study was to investigate the effects of a two-week mindfulness meditation intervention on spasticity and quality of life in stroke survivors.

Methods

- 10 chronic stroke survivors with spasticity listened to two weeks of mindfulness meditation recordings in a pre-post repeated measures design (Figure 1).
- The primary outcome was change in spasticity (Figures 2, 3). Secondary outcomes included quality of life, mindfulness, and anxiety, along with qualitative journal data (Figure 1, Table 1).

Conclusions

- If larger studies with a control group show similar results, mindfulness meditation may be a low-cost, accessible, and safe technique to manage spasticity and quality of life for individuals with chronic stroke.
- Future studies should explore how reduction in stress or anxiety affect spasticity and incorporate neural recording measures (EEG or fMRI) to elucidate the mechanism.

Figure 1. Study Design. Description of meditations and measures used are shown. *Denotes the primary measure.

Lab Visit
Day 1
- Introduction to Mindfulness
- Modified Ashworth Scale*
- Freiburg Mindfulness Inventory
- Hospital Anxiety and Depression Scale
- Stroke Specific Quality of Life
- Fugl-Meyer Upper Extremity
- *39-minute Body Scan Meditation*[3]
- Introduction to daily journal

At Home
Day 2-7
- *3-minute Body Scan meditation, daily*
- *Daily journal*

Day 8
- *39-minute Breathing meditation*
- *Daily journal*

Day 9-14
- *5-minute Sitting mediation, daily*
- *Daily journal*

Lab Visit
Day 15
- All Assessments Conducted on Day 1
- *39-minute Body Scan Meditation*
- Collected journals

PRIMARY OUTCOME, MODIFIED ASHWORTH SCALE:

Figure 2. Modified Ashworth Spasticity Scale and pictorial representation of spasticity.

MAS – Testing Spasticity[4]

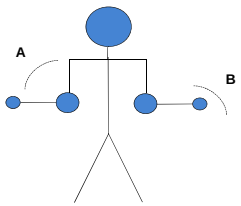
Scoring:

0	No increase in muscle tone
1	Slight increase in muscle tone, manifested by a catch and release or by minimal resistance at the end of the range of motion when the affected part(s) is moved in flexion or extension
1+	Slight increase in muscle tone, manifested by a catch, followed by minimal resistance throughout the remainder (less than half) of the ROM
2	More marked increase in muscle tone through most of the ROM, but affected part(s) easily moved
3	Considerable increase in muscle tone, passive movement difficult
4	Affected part(s) rigid in flexion or extension

Spasticity is a velocity dependent muscle tightness.[2]

A. Hold elbow still and move forearm quickly to test bicep spasticity

B. Hold wrist still and move hand quickly to test wrist spasticity



- **Adherence to the meditation protocol:** Seven of the ten participants wrote comments in their journals. On average, participants reported meditating 12.5 days of the full 15 (Mean: 12.5, SD: 0.94, range: 8-15).
- **Subject Characteristics:** 9 Men, 1 Woman. Average Age = 59.8 (45-75). Average years post-stroke = 7.3 years (4-13).

Figure 3. Spasticity results. Comparison of mean values for the Modified Ashworth shown for wrist (left) and elbow (right) at Day 1 (green) and Day 15 (blue). Higher score indicates worse spasticity. * Denotes a $p < 0.05$.

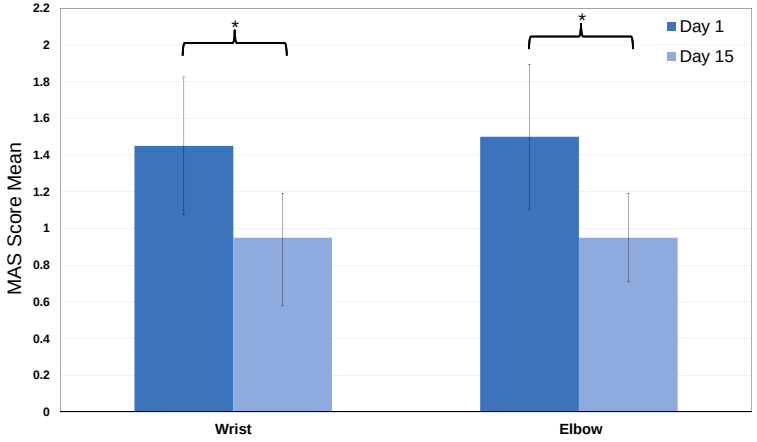


Table 1. Study results. MAS (spasticity), Fugl-Meyer (motor impairment), Stroke-Specific Quality of Life (not all subscores are represented), HADS (anxiety and depression), and FMI (self-perceived mindfulness ability) scores. Paired t-tests are shown with t statistic (degrees of freedom) and p-value; * indicates a p value of $p<0.05$.

Scale	Subscore	Day 1 mean ± SD	Day 15 mean ± SD	Day 15 vs Day 1 T (df)	p
Modified Ashworth Scale					
	Elbow	1.5 ± 1.25	0.95 ± 0.76	2.5 (9)	0.032*
	Wrist	1.45 ± 1.19	0.95 ± 1.17	2.7 (9)	0.023*
Stroke Specific Quality of Life					
	Energy	9.22 ± 10.19	12.22 ± 7.44	-2.7 (8)	0.025*
	Personality	9.50 ± 2.67	11.70 ± 2.71	-2.7 (9)	0.026*
	Work/Productivity	11.0 ± 3.27	12.1 ± 2.73	-2.5 (9)	0.032*
Freiburg Mindfulness Inventory		43.1 ± 8.61	42.3 ± 7.69	0.58 (9)	0.579
Hospital Anxiety and Depression Scale					
	Anxiety	6.0 ± 3.77	5.5 ± 3.95	1.2 (9)	0.244
	Depression	4.5 ± 4.28	4.1 ± 3.14	0.45 (9)	0.666
Fugl-Meyer Upper Extremity	Motor Function	40.4 ± 19.43	40.4 ± 20.11	0.0 (9)	1.0

Qualitative Results: Qualitative analysis of the participants' written comments about the meditations revealed three themes. Themes and representative quotes are shown:

- 1) ***Mindfulness Competency:*** "The awareness of the different sensation on my body were [sic] more noticeable. I was alert of not just my body noises but all the surrounding noises in the places I chose to meditate. I focused on the hemiplegic side of my body."
- 2) ***Spasticity Effects:*** "My arm (elbow, wrist, and fingers) were looser and softer after meditation, and also felt much relaxed [sic]."
- 3) ***General Effects:*** "Longer spaces caught my mind wondering [sic] but relaxed."

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