



UNC CHARLOTTE

College of Health and Human Services

Department of Kinesiology

# SENSORY-TARGETED ANKLE REHABILITATION STRATEGIES IMPROVE OUTCOMES ASSOCIATED WITH CHRONIC ANKLE INSTABILITY

Erik Wikstrom<sup>1</sup>, Patrick McKeon<sup>2</sup>

<sup>1</sup>Department of Kinesiology, University of North Carolina at Charlotte, Charlotte, NC;

<sup>2</sup>Department of Exercise & Sport Sciences, Ithaca College, Ithaca, NY



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## INTRODUCTION

- Up to 75% of individuals who sprain their ankle subsequently develop chronic ankle instability (CAI); characterized by life-long residual symptoms,<sup>5</sup> recurrent injury,<sup>6</sup> and decreased physical activity.<sup>7</sup>
- Traditional rehabilitation strategies for this condition focus on motor pathway impairments (i.e. strength, coordination) with very little emphasis on the potential to intervene through sensory pathways.
- However, it has been demonstrated that the sensorimotor system dynamically shifts reliance on various sensory inputs depending on the demands placed on the system.<sup>2</sup>
- Sensory-targeted ankle rehabilitation strategies (STARS), such as triceps surae stretching, plantar massage, or ankle joint mobilization, that target sensory pathways may have beneficial effects on objective measures of sensorimotor in those with CAI.
- However, we do not yet understand the unique contributions of different STARS interventions.

## PURPOSE

- To evaluate the cumulative effects of 2-weeks of sensory-targeted rehabilitation strategies (STARS) on dorsiflexion range of motion (DFROM), single limb balance (SLB), and self-assessed function in those with CAI.

## METHODS

- 40 individuals with self-reported CAI were randomly assigned to four different STARS groups (10 per group). CAI was defined as a history of at least 1 ankle sprain with 2 episodes of giving way in the last 6 months, <90% on the Foot and Ankle Ability Measure (FAAM) and <80% on the FAAM-Sport (FAAM-S) Scale.

Table 1: Group demographics and self-reported disability levels.

Group	Age (years)	Height (cm)	Weight (kg)	FAAM (%)	FAAM-S (%)
Control	25.0±5.5	170.0±5.4	71.6±6.8	84.04±12.4	67.5±19.5
Joint Mobilization	24.9±8.1	173.7±5.4	79.8±6.8	86.4±6.0	70.0±4.9
Massage	22.6±3.02	175.7±7.3	78.4±16.0	76.4±11.6	59.1±15.1
Calf Stretching	22.5±2.3	175.4±15.1	75.4±17.8	77.3±12.6	65.5±14.5



Biodynamics Research Laboratory at  
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## METHODS

- All patients were tested prior to group allocation. Group allocation was prepared independently and placed in a sealed envelope opened after baseline testing.
- Following baseline testing, patients received 6, 5-minute treatments of their respective STARS over a 2-week period. Post-testing was done within 72-hours of the final treatment.



- Control:** 5 minutes of quiet resting in a seated position.
- Joint Mobilization:** Two 2-minute bouts of Grade 3 Anterior-to-Posterior Mobilizations.<sup>3</sup>
- Massage:** Two 2-minute bouts of plantar massage that combined petrissage and effleurage.
- Stretching:** Six 30-second stretches in max dorsiflexion with slight knee flexion.
- Primary outcomes included weight-bearing DFROM, SLB scored on a firm surface with eyes closed, and self-assessed function measured with the FAAM.
  - DFROM:** With the text heel firmly planted on the floor, patients flexed their knee to the wall. DFROM was defined as the furthest distance the foot (taken from the great toe) was able to be placed from the wall without the heel lifting off the ground while the knee was able to touch the wall.
  - SLB:** Three, 20-second trials of single limb stance with eyes closed were performed with a participants hands on their hips. The three trial average for total number of errors committed was used for further analysis. Errors included: lifted the hands of the hips, opened eyes, stepped or stumbled, moved the hips excessively, lifted the forefoot or heel, remained out of the test position for more than 5 seconds.
  - FAAM:** A 21 item scale (max score of 84) that quantifies a persons inability to complete activities of daily living based on their CAI associated impairments. Lower scores represent greater disability.
- Post to pre change scores ( $\Delta$ ) of the 3 STARS groups were compared to the CON using Hedge's g effect sizes (ES) with 95% confidence intervals (CI).

## RESULTS

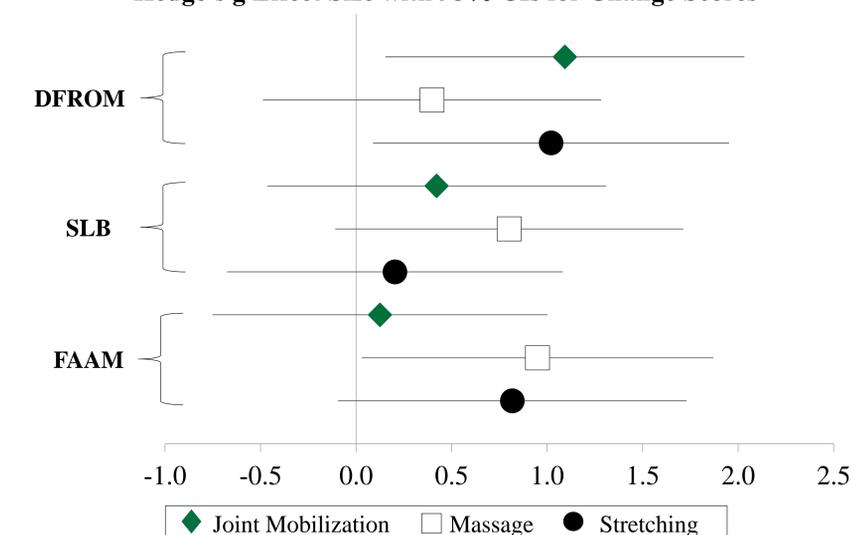
- Group change scores & standard deviations can be seen in Table 2. Effect sizes with 95% confidence intervals can be seen in Figures 2-4.

Table 2: Group demographics and self-reported disability levels.

Group	DFROM (cm)	SLB (errors)	FAAM (%)
Control	-0.10±1.49	-0.43±1.78	-0.07±6.74
Joint Mobilization	2.19±2.22*	0.27±1.15	1.17±10.70
Massage	0.52±1.32	1.20±1.89	7.01±7.89*
Stretching	1.42±1.18*	-0.07±1.39	7.18±9.09

\* Indicates a statistically significant difference ( $p \leq 0.05$ ) from the control group.

### Hedge's g Effect Size with 95% CIs for Change Scores



## CONCLUSIONS

- Joint mobilizations and calf stretching appear equally effective at improving DFROM over a two-week treatment period.
- Only massage appears effective at improving self-reported disability over a two-week treatment period.
- Each STARS appears to offer unique contributions to rehabilitation for those with CAI.

## ACKNOWLEDGEMENTS

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