

Effects of Instruction on Foam Rolling: How Variations Influence Pain Reduction and Range of Motion

Student Researchers: Racheal Schmitt, Bryant Haas, Noah Buss, Zane Reinert
Faculty Advisor: Dr. Kory Zimney

Study Design

Pre-post quasi experimental design

Purpose

This study contributes to current literature by investigating the psychological mechanisms underlying instructional cueing aimed at increasing range of motion (ROM) or decreasing pain during a standardized foam rolling (FR) procedure.

Background

FR is a form of self-massage used in athletic and rehabilitation settings to increase joint and tissue ROM and reduce pain. Although physiological mechanisms such as increased blood flow and neuromuscular modulation have been proposed, other mechanisms may be involved. One parameter that remains underexplored is the psychological mechanisms.

Methods

Participant Selection & Assignment:

- Undergraduate and graduate students from the University of South Dakota were recruited via volunteer sampling.
- Participants were assigned to either the PAIN or ROM group using alternating study IDs.
- Demographic and FR previous knowledge and use were collected.

Inclusion Criteria:

- ≥18 years old
- Fluent in English
- No current lower extremity injury

Outcome measures:

- Hamstring ROM was measured using a passive straight leg raise and a goniometer in the supine position (photo 1)
- Pain pressure threshold (PPT) was assessed at the midpoint of the biceps femoris with a digital algometer. (photo 2)

Foam Rolling: (photo 3)

- Prior to FR, participants viewed an instructional video explaining the FR technique and emphasizing either PAIN or ROM benefits depending on group allocation.
- FR technique was the same between groups, consisting of three sets of 10 repetitions (2-second roll in each direction) over 3 minutes on the dominant leg, guided by a metronome and at maximal tolerable pressure.

Pre and Post-intervention ROM and PPT measurements were repeated by a blinded investigator.



Photo 1: SLR measurement



Photo 2: Hamstring Measurement for PPT



Photo 3: Foam Rolling Positioning

Data Analysis (p<.05)

- Independent T-Test: Baseline group differences
- Chi-Square: Previous FR knowledge and use between groups
- 2x2 Mixed Anova: Within-group and between-group comparison over time

Results

Demographics

Group		N	Min	Max	Mean	SD
ROM	Age (yrs)	9	22	24	22.67	0.71
	Height (in)	9	63	77	69.83	4.46
	Weight (lbs)	9	135	205	171.30	21.56
	BMI (kg/m ²)	9	23.71	26.31	24.62	0.91
PAIN	Age (yrs)	10	20	26	23.20	1.69
	Height (in)	10	67	79	70.90	3.84
	Weight (lbs)	10	135	230	178.80	27.61
	BMI (kg/m ²)	10	21.14	27.99	24.90	2.32

PPT Measurements

	Group	N	Mean	SD
Pre FR	ROM	9	3.39	0.85
	Pain	10	3.62	0.91
Post FR	ROM	9	3.92	1.18
	Pain	10	4.44	1.37
Δ pre/post	ROM		0.53	0.89
	Pain		0.81	0.80

ROM Measurements

	Group	N	Mean	SD
Pre FR	ROM	9	79.44	12.10
	Pain	10	82.03	11.09
Post FR	ROM	9	85.52	12.10
	Pain	10	86.58	9.61
Δ pre/post	ROM		6.08	6.57
	Pain		4.55	5.00

Conclusion

The purpose of this study was to investigate how two different sets of instructional cues affect ROM and PPT after a standardized FR procedure. Statistical analysis from our study showed ROM and PPT improved over time in both groups. However, the results were not dependent on instructional cues, and no between-group differences were found. Some factors that could've contributed to these results were a high level of prior knowledge and participants' use of FR. All participants, except 1, knew about pain benefits, and only 4 were unaware of ROM benefits. In addition, the small sample size may not have been able to detect smaller effect size differences between groups.

Limitations

The limitations of the study should be considered when interpreting the findings. The sample was limited to healthy university students, which reduces generalizability to broader and clinical populations. The sample size was underpowered to meet a priori calculations for a medium effect size. In addition, the study examined only short-term effects and did not include follow-up, so the intervention's lasting impact is unknown. Finally, because pressure was self-selected, treatment intensity may have varied between participants. Future research should include larger sample sizes to detect moderate to small effects, subjects without previous FR knowledge and experience, more diverse samples, standardized pressure, and longer-term follow-up.

Clinical Relevance

The clinical relevance of this study is that a standardized FR intervention improves ROM and pain, regardless of the specific instructional cues used in this population. This suggests that clinicians' instructions to a population with prior knowledge and experience using FR may not affect outcomes. The findings also indicate that the intervention itself may be more important than the exact wording of the cues, particularly in healthy individuals who are already familiar with foam rolling. Further research is needed to determine whether these findings apply to less experienced individuals and clinical populations.

References

Please scan the QR code for references.

