

Acute Effects of Foam Rolling on Ankle Range of Motion and Mechanical Properties

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Background

- Limited range of motion (ROM) in ankle dorsiflexion (DF) will have higher risks of lower limbs injury and prone to injuries on associate joints (Bell et al. 2008, Wahlstedt & Rasmussen-Barr, 2015).
- Foam rolling (FR) is one of the self-myofascial release (SMR) techniques. Individuals can apply pressure on soft tissues through a foam roller and move constantly along muscle belly (Martinez-Cabrera & Núñez-Sánchez, 2016; Wiewelhove et al., 2019).
- Tensiomyography (TMG) can assess neuro-muscular activity non-invasively and deliver information on muscle response (Rey et al., 2012).

Research Objectives

- Investigate the acute effects of FR on ROM on ankles.
- Analyze the related mechanical properties by using TMG.

Methodology

- Acute effect, with-subject, repeated measure.
- 28 recreational sports players (age 18-30) with exercises twice a week, without lower limbs injury within a year are recruited.
- Only single session of FR on gastrocnemius medialis.
- Procedure lasted for around 30 minutes.

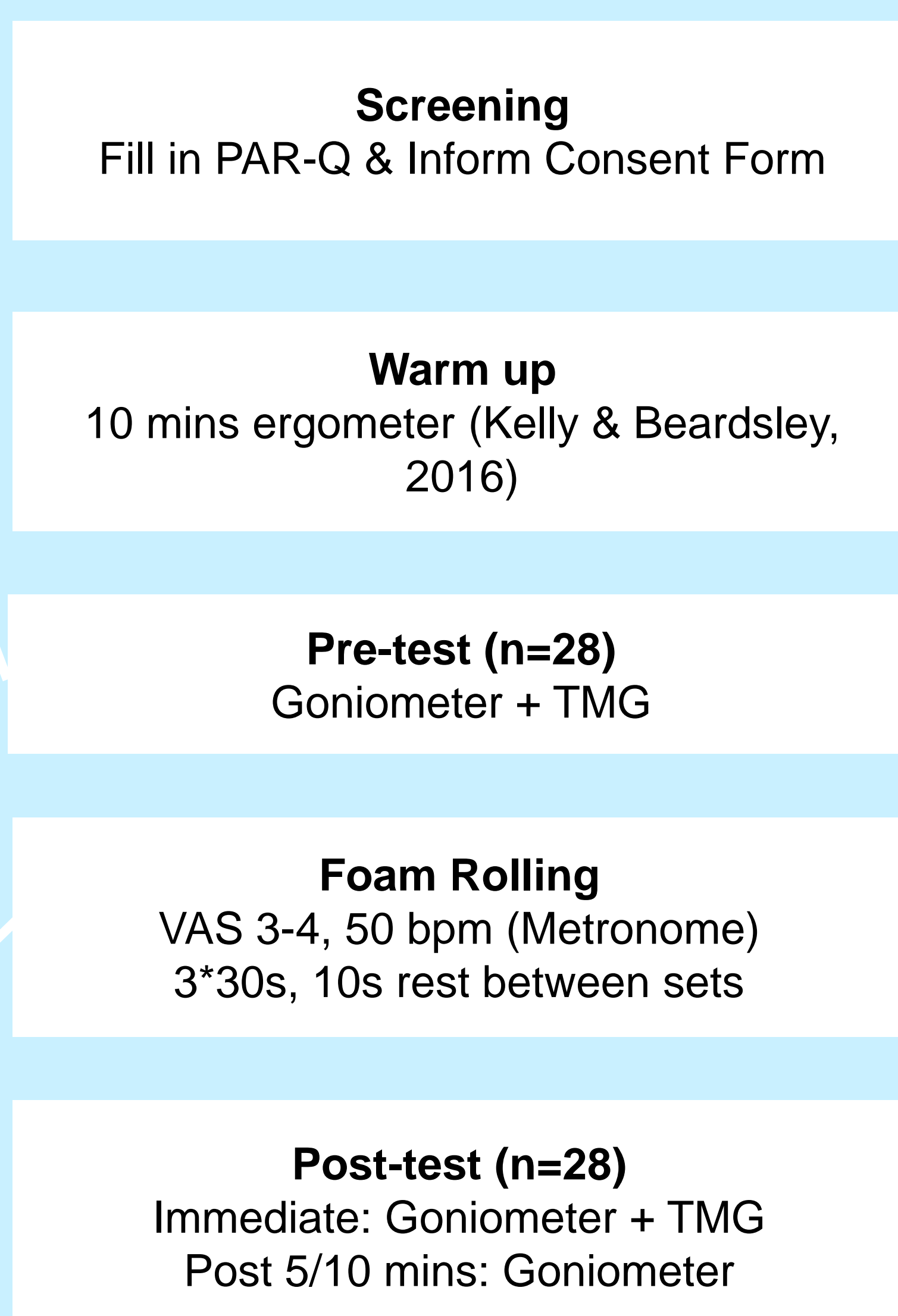
Position: Prone lying on the plinth and expose half of the calf.



Fig. 1

Distance: Top of calf musculature to Achilles tendon insertion (Kelly & Beardsley, 2016).

Position: Fig. 2



Findings

	Correlation Coefficient	Sig. (2-tailed)	N
Dm vs DF (Pre-test)	0.168	0.392	28
Dm vs DF (Post-test)	0.305	0.115	28

Table 1. Spearman's Rank Order Correlation result between Dm from TMG and ROM in pre- and post-test (n=28).

Compare between	Mean Difference (\pm SD)	Sig. (2-tailed)*
Pre vs Post	-2.750 \pm 0.764	0.008
Pre vs Post 5	-2.143 \pm 1.165	0.461
Pre vs Post 10	-1.964 \pm 0.838	0.16
Post vs Post 5	0.607 \pm 1.265	1
Post vs Post 10	0.786 \pm 0.713	1
Post 5 vs Post 10	0.179 \pm 1.185	1

*Significant difference: $p < 0.05$

Table 2 Pairwise Comparison by Repeated measure ANOVA among 4 measurements (n=28).

Mechanical Properties (Pre- vs Post-test)	Td	Tc	Ts	Tr	Dm
Z	-.729 ^b	-.911 ^b	-.820 ^b	-1.890 ^b	-1.594 ^b
Asymp. Sig. (2-tailed)*	.466	.362	.412	.059	.111

*Significant difference: $p < 0.05$

Table 3. Wilcoxon Signed-Rank Test result for mechanical properties of TMG between pre- and post-test (n=28).

ROM

- Positive improvement in ankle DF ROM after FR (\uparrow 41.5%, 3°).
- Pressure to foam roller \rightarrow fascicle length \uparrow after FR.
- Water content and temperature change \rightarrow \uparrow tissues extensibility (Yoshimura et al., 2020).
- Duration of FR will NOT affect the time for acute increase last.
- Acute increase can last for at least 10 minutes.

TMG

- No significant difference between pre- and post-test.
- Muscles contractile activity will NOT be affected by FR (Globokar et al., 2023).
- Due to a greater overall dose, the longer and multiple bouts of FR can lead to a more significant change.

ROM vs TMG

- There is a small to moderate relationship between ROM and TMG.
- The unchanged muscle belly stiffness may be due to muscle fatigue, small sample size, pressure or the duration of FR.

Conclusion

- FR can be beneficial for ankle DF ROM due to the increase in fascicle length.
- After FR, muscle contractile activity will not be affected, but there might be a significant change with longer bouts of FR.
- The increase of ROM does not reflect the muscle contractile activity.