Quantification of the Rockfloss® Floss Band Stretch Force at Different Elongation Lengths

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Context: Floss bands are a popular intervention used by sports medicine professionals to enhance myofascial function and mobility. The bands are often wrapped around a region of the body in an overlapping fashion (eg, 50%) and then tensioned by stretching the band to a desired length (eg, 50%). To date, no research has investigated the stretch force of the bands at different elongation lengths. **Objective:** The purpose of this clinical study was to quantify the Rockfloss® band stretch force at 6 different elongation lengths (ie, 25%–150%) for the 5.08- and 10.16-cm width bands. **Design:** Controlled laboratory study. **Setting:** University kinesiology laboratory. **Participants:** One trained researcher conducted all measurements. **Procedures:** The stretch force of a floss band was measured at 6 different elongation lengths with a force gauge. **Main Outcome Measures:** Band tension force at different band elongation lengths. **Results:** The stretch force values for the 5.08-cm width (2 in) were as follows: 25% = 13.53 (0.25) N, 50% = 24.57 (0.28) N, 75% = 36.18 (0.39) N, 100% = 45.89 (0.62) N, 125% = 54.68 (0.26) N, and 150% = 62.54 (0.40) N. The stretch force values for the 10.16-cm width (4 in) were as follows: 25% = 16.70 (0.35) N, 50% = 31.90 (0.52) N, 75% = 47.45 (0.44) N, 100% = 57.75 (0.24) N, 125% = 69.02 (0.28) N, and 150% = 81.10 (0.67) N. Both bandwidths demonstrated a linear increase in stretch force as the bands became longer. **Conclusion:** These values may help professionals to understand and document the tension force being applied at different lengths to produce a more beneficial application during treatment. Future research should determine how the different length/tensions effect the local myofascia, arterial, and vascular systems.

Keywords: muscle, myofascia, recovery, soreness, wraps

Floss or compression bands are a popular myofascial compression intervention used by sports medicine professionals. Floss bands are typically made from latex and are available in different widths, densities, and lengths. Traditionally, professionals will teach the client to wrap a predetermined body part using a 50% overlapping (distal to proximal) pattern with a relative elongation or stretch force range of 50% to 90% of the band length.¹ After application, the client performs up to a 2-minute “tissue flossing” intervention that may include various active and passive movements of the wrapped bodily region.²

Despite the popularity, there is a lack of research on this intervention, and the few published studies have resulted in mixed outcomes. Several studies have documented improved postintervention ankle range of motion (ROM), jump, sprint performance for up to 45 minutes in healthy individuals,^{3,4} reduce the effects of edema in postsurgical patients,⁵ and improve pain and function in individuals suffering from Achilles tendinopathy.² Consequently, researchers have also found that healthy individuals reported an increase in perceived postintervention shoulder-flexion ROM despite not experiencing a measurable ROM increase. The authors concluded that the floss bands may have more of a psychological effect than a physical effect on flexibility.¹ The body of research on this topic is still emerging, with varied application procedures, which makes it difficult to provide best practice guidelines for using this intervention with clients.

The lack of evidence-based guidelines for floss bands has created many unanswered questions regarding the optimal floss band texture, dimensions, method of application, and stretch force needed to achieve a desired effect. Currently, research on the

quantification of the stretch force at various elongation lengths could not be found. Thus, professionals may prescribe a relative stretch length (eg, 50%) based upon clinical experience or personal preference without knowing the amount of stretch or tension force produced. Quantifying the stretch force produced at different elongation lengths may provide professionals a means to better prescribe the intervention in clinical practice and document use of the intervention to assess treatment effectiveness. The purpose of this study was to quantify floss band stretch force at 6 different elongation lengths (25%–150%) with the 5.08-cm (2-in) and 10.16-cm (4-in) width bands. The researchers hypothesized that there would be a linear increase in force as the band is stretched to longer lengths.

Methods

This controlled laboratory study was conducted in a kinesiology laboratory. The study was approved by the institutional review board at California State University Dominguez Hills. The floss bands (2 and 4 in) were used for this investigation. The floss bands were made of latex and had the following dimensions: 1.5 mm in thickness, 5.08 cm (2 in) or 10.16 cm (4 in) in width, and 2.1 m (7 ft) in length. For measuring stretch force, the Wagner (Midvale, UT) Force Ten™ FDX Digital force gauge was used. The manufacturer reports an accuracy error of $\leq \pm 0.3\%$ for this technology.⁶ A custom flat metal plate was attached to the tip of force gauge to provide an even attachment surface for the floss bands and to prevent the bands from rolling or bunching up during elongation (Figure 1).

Pilot Study

Prior to data collection, a 2-session pilot training was conducted to establish intrarater reliability for the procedures outlined in the

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following section. The primary investigator took all measurements using the force gauge, whereas a second investigator documented the measurements obtained during testing. The primary investigator completed 5 measurements for each of the 6 band lengths (ie, 25%, 50%, 75%, 100%, 125%, and 150%) across 2 testing sessions; a total of 30 measurements were completed at each session. The 2 separate sessions were conducted on consecutive days, and intrarater reliability was calculated using an intraclass correlation coefficient model (3, *k*). The primary investigator was found to have good intrarater reliability for measuring stretch force for all 6 lengths (intraclass correlation coefficient = .99; 95% confidence interval, .98–1.00).

Procedures

A 0.5-m sample of the Rockfloss® band was cut and prepared for this investigation. One end of the band was fixated to a T-square

ruler by 2 clamps. The other end was mounted to the metal plate of the force gauge. The initial resting length of the band was 0.3 m (minus both ends fixated), and the maximum stretched length tested was 0.75 m.⁷ The T-square ruler was premarked at 6 elongation points representing a percentage of the maximum length of the band (ie, 25%–150%). The T-square ruler was securely fastened during testing to prevent any aberrant movement. The temperature in the room was 22°C to 23°C, and the humidity was 38%.^{7,8}

Testing of the 5.08- and 10.16-cm width bands was conducted over 2 sessions. The primary investigator performed 10 measurements for each of the 6 elongation lengths (60 total measurements) and a second investigator documented each measurement. The primary investigator elongated the band at a rate of 2.54 cm (1 in) per second to the desired length using digital metronome to standardize the rate of band lengthening. When the desired length was reached, the second researcher documented the measurement.⁸ The force gauge was calibrated before each trial. The testing procedure was designed to replicate the common method of wrapping and stretching the band to the desired length during a floss band application.^{4,5}

Statistical Analysis

Statistical analysis was performed using SPSS (version 25.0; IBM SPSS, Chicago, IL). Descriptive data were calculated and reported as the mean and SD for the stretch force at the different lengths. The stretch force values were reported in newtons (N) and in pounds (lbs). The values in pounds were rounded to the nearest 0.5 lbs for ease of practical interpretation.⁸

Results

The stretch force values for the 5.08-cm width (2 in) were as follows: 25% = 13.53 (0.25) N, 50% = 24.57 (0.28) N, 75% = 36.18 (0.39) N, 100% = 45.89 (0.62) N, 125% = 54.68 (0.26) N, and 150 % = 62.54 (0.40) N. The stretch force values for the 10.16-cm width (4 in) were as follows: 25% = 16.70 (0.35) N, 50% = 31.90 (0.52) N, 75% = 47.45 (0.44) N, 100% = 57.75 (0.24) N, 125% = 69.02 (0.28) N, and 150 % = 81.10 (0.67) N (Tables 1 and 2). The floss band demonstrated a linear increase in stretch force as the bands became longer (Figure 2).

Figure 1 — (A and B) Digital force gauge.

Table 1 Rockfloss® (5.08-cm Width) Stretch Force at Different Elongation Lengths

Length	0% (0.30 m)	25% (0.38 m)	50% (0.45 m)	75% (0.53 m)	100% (0.60 m)	125% (0.68 m)	150% (0.75 m)
–		3 lbs (13.53 [0.25] N)	5.5 lbs (24.57 [0.28] N)	8 lbs (36.18 [0.39] N)	10 lbs (45.89 [0.62] N)	12 lbs (54.68 [0.26] N)	14 lbs (62.54 [0.40] N)

Abbreviations: lbs, pounds; N, newtons; m, meters. Note: Values are mean (SD).

Table 2 Rockfloss® (10.16-cm Width) Stretch Force at Different Elongation Lengths

Length	0% (0.30 m)	25% (0.38 m)	50% (0.45 m)	75% (0.53 m)	100% (0.60 m)	125% (0.68 m)	150% (0.75 m)
–		4 lbs (16.70 [0.35] N)	7 lbs (31.90 [0.52] N)	11 lbs (47.45 [0.44] N)	13 lbs (57.75 [0.24] N)	15.5 lbs (69.02 [0.28] N)	18 lbs (81.10 [0.67] N)

Abbreviations: lbs, pounds; N, newtons; m, meters. Note: Values are mean (SD).

Figure 2 — Linear increase in floss band stretch force.

Discussion

Floss or compression bands are an emerging myofascial intervention used by sports medicine professionals. Although many questions remain regarding the intervention, our efforts to quantify floss band stretch force at different elongation lengths will provide clinicians a starting point for understanding the stretch force produced. A recent literature search (December 2018) revealed studies measuring the stretch force of Theraband® elastic bands (Akron, OH) using similar methods.^{7,8} The researchers documented a linear relationship between the stretch force and elongation length of Thera-band®, which were similar to the findings of this investigation.^{7,8} The literature search revealed no studies examining stretch force using floss bands.

There are several limitations that warrant discussion. First, only 2 types of commercially manufactured latex floss bands from one manufacturer were tested. Floss bands from other manufacturers may yield different stretch force values at different elongation lengths. Second, 2 floss bands with specific dimensions were tested. Other bands with different widths, densities, and lengths may have produced different results. Third, testing was done by an investigator using a force gauge versus a mechanical device that measured band elongation force. These procedures were designed to replicate the common method of floss band application in clinical practice.^{4,5} Furthermore, the primary investigator completed pilot testing and achieved an acceptable level of reliability prior to data collection.

Clinical Implications and Future Research

When prescribing floss bands in clinical practice, professionals have few research studies to guide technique application, and instead must rely on their own preferred application technique. For example, approximate band stretch lengths (eg, 50%) may be commonly taught or recommended from nonpeer reviewed sources (eg, YouTube).² Using non-evidence-based approximations creates a gap in our knowledge regarding the amount of stretch force needed to achieve a desired effect with these bands. This limits the professional's ability to effectively assess treatment effectiveness and recommend safe application protocols. The stretch force values

reported in this investigation provide an initial step toward confirming the optimal band stretch force needed to achieve desired effects, such as increasing myofascial mobility, joint ROM, post-exercise recovery, or vessel occlusion.^{4,5} Future research should build upon these findings and develop more evidence-based guidelines for healthy and injured individuals.

Conclusion

This investigation should be considered the first step in developing evidence-based guidelines for the application of floss or compressions bands. Determining the optimal stretch force at a preset elongation length may perhaps be the most important step in the intervention. The values reported in this study should serve as a guide for professionals to begin to quantify and document the client's response to the intervention.

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