

**Hello AOPT and Foot and Ankle SIG members, we hope you are all having a wonderful summer!**

The FASIG continues to be energized by some great initiatives in 2021. These are well aligned with the AOPT strategic plan. We will highlight a few in this newsletter but would also encourage anyone who would like to get more FASIG news to make sure you are signed up as a FASIG member (easy and free to join at [www.orthopt.org](http://www.orthopt.org)) and also join our Facebook page: [www.facebook.com/groups/FASIG/](https://www.facebook.com/groups/FASIG/)

Our partnership with the American Orthopaedic Foot and Ankle Society (AOFAS) continues to bring new webinars including a recent one titled, "Getting Athletes Back on their Feet" that was live this past April 2021. Our speakers Drs. Ashley Waite, Lindsay Wasserman, and Stephen Paulseth did an outstanding job discussing Achilles Tendinopathy, Running Injuries, and Forefoot Pain, respectively. Keep an eye out for future webinars via our webpage, Facebook page, or email blasts.

The FASIG submitted our pilot practice analysis to the American Board of Physical Therapy Residency and Fellowship Education (ABPTRFE) for review in April 2021. We anticipate a review in May and then the final steps to complete the process will be in sight. This has been a huge effort by many over the last 2 years. We are very excited to receive the final review and then send out the practice analysis survey at the end of 2021. Although there is just a bit more work to do, it is exciting to think about the first fellowship trained foot and ankle specialists that could be joining the community in the very near future!

The FASIG is happy to bring to our members, "Author Spotlights" showcasing exciting new research. These can be found on our website if you missed one. We hope you enjoy this medium for exploring new research and getting a *behind-the-scenes* peek with the author. The SIG plans to continue to share new research via our newsletter and additional author spotlights.

Infographics are visual images that are used to represent information or data. They can be helpful to visually summarize information and share it with others. The FASIG practice committee is working to develop infographics about common foot and ankle topics that could be used by patients and/or providers. Check out our website for a few of the developed infographics and there are more on the way!

A special thanks to Drs. Hutchins, Smith, and Cornwall for sharing their results from a recent study investigating the impact of using Leukotape to control foot posture. The FASIG is happy to share these results in this issue of *OP* for our membership.

Finally, I shared in the last newsletter that my tenure as President of the FASIG is over at the conclusion of the CSM 2022 and elections for the next leaders will occur this Fall 2021. I would welcome the opportunity to work with any interested individuals now to facilitate the transition for the next President to join the FASIG leadership.

Put your best foot forward.

Christopher Neville and the FA SIG leadership  
<https://www.orthopt.org/content/special-interest-groups/foot-ankle>

## Control of Foot Pronation Over Time Using the Low-Dye Taping Technique and Leukotape

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### INTRODUCTION

Excessive foot pronation is commonly associated with over-use injuries of the lower extremity such as plantar fasciitis<sup>1</sup> and "Shin Splints".<sup>2</sup> Foot strapping is one method by which health care professionals can temporarily alter foot posture in order to reduce pain and improve function. The Low-Dye (LD) taping procedure is a common technique used to effect this change and was first documented by Ralph Dye in 1938. Since 1938, the LD taping technique has been modified in several ways making comparison between studies somewhat difficult. The common element with almost all of these modified methods is the strip of tape around the calcaneus from the first metatarsal head to the base of the fifth metatarsal.

Previous research using the LD technique with individuals demonstrating mild to moderate calcaneal eversion and a mild to moderate decrease in the height of the medial longitudinal arch on weight bearing have reported a mean change in the height of the medial longitudinal arch ranging from 3.1 mm to 7.2 mm.<sup>3,4</sup> In addition, research using the various modified LD taping techniques has reported a decrease in pain coincident with the reduction of calcaneal eversion and increased medial longitudinal arch height.<sup>1,5-7</sup>

Although the LD taping technique has shown that there is an initial significant increase in both arch height and calcaneal eversion, its effects can be lost following as little as 10 to 20 minutes of light exercise.<sup>4,8</sup> The decreased longevity of the tape's effect is thought to be the result of the tape stretching that reduces its initial effects. Because of this stretching, the use of a stiffer tape rather than the cloth athletic tape may increase the duration of the taping's effects. If the use of a stiffer tape with the LD taping technique could be shown to maintain the altered foot posture for several hours or days, it would be clinically important and useful. It would give clinicians a way to not only relieve acute symptoms, but it would also provide a way for the individual to remain relatively active without aggravating their symptoms. Finally, if the person's symptoms were reduced or alleviated with the tape, a more permanent solution, such as footwear or foot orthoses could be pursued with confidence. Therefore, the purpose of this study was to determine if using the LD taping procedure using as stiff tape such as Leukotape would not only immediately alter foot posture but would also maintain that change over several days. Our hypothesis

was that the LD taping with Leukotape will allow the effects to last over several days.

## METHODS

### Participant Characteristics

The Northern Arizona University institutional review board approved the study. All of the participants provided informed written consent prior to any testing. Based on a-priori sample size estimates, a minimum of 10 participants was necessary to show statistical significance at the .01 level with a power of 0.80. Fourteen participants (7 females and 7 males) recruited from the Northern Arizona University population volunteered to participate in this study. All participants demonstrated at least 10° dorsiflexion, 20° plantarflexion, and 65° first metatarsophalangeal extension. The mean age was 25.6 years (+2.3) for the males and 24.3 years (+2.5) for the females. The mean foot posture of their right foot as measured by the Foot Posture Index (FPI) was 6.0 (+2.9) for the males and 5.1 (+2.1) for the females. Positive FPI values indicate a pronatory foot posture with values greater than 4.7 indicating significant pronation.<sup>9</sup> As such, all of the participants had foot postures consistent with the use of the LD taping procedure with the goal to reduce pronation.

### Procedures

Each participant's dorsal arch height (DAH) and midfoot width (MFW) was measured at 50% of their total foot length using the protocol described previously in the literature.<sup>10</sup> Following these measurements, the LD taping procedure using Leukotape was applied to both feet. Leukotape was chosen because it is fairly stiff with minimal stretch. It was felt that such qualities would therefore result in a longer lasting change in foot posture.

Using the method described by Cornwall et al,<sup>10</sup> the participant was positioned on a padded treatment table in the long sit position with their foot in slight plantarflexion and the calcaneus in a "neutral" position (neither inverted nor everted). Two inch wide Cover-Roll stretch tape (BSN Medical, Hamburg, Germany) was first applied beginning at the 1st metatarsophalangeal (MTP) joint, wrapping around the heel, and covering the lateral foot just distal to the base of the 5th metatarsal. A second strip running medial to lateral from the 1st MTP joint, over the plantar surface of the foot and overlapping the ends of the first strip of tape was then applied. A third strip of Cover-Roll stretch tape was placed running medial to lateral from the 1st MTP joint, over the dorsum of the foot the base of the 5th metatarsal. One and one-half inch wide Leukotape (BSN Medical, Hamburg, Germany) was then applied in the same manner over the Cover-Roll. The tape was applied to both feet to avoid any effect due to asymmetry. A single person (NH) applied the tape in the study.

Following the tape application, the DAH and MFW measurements were repeated using the same protocol as that used with the initial measurements. Participants were then instructed to run 2 (and only 2) miles each day for the next 5 days. The DAH and MDW measurements were repeated each morning at 8 a.m. and evening at 5 p.m. for the next 5 days. Participants wore the same tape throughout the entire week. The tape

was not replaced, augmented, or reinforced during this time. Showering was permitted, but all were instructed to avoid soaking in a bath.

### Statistical Analysis

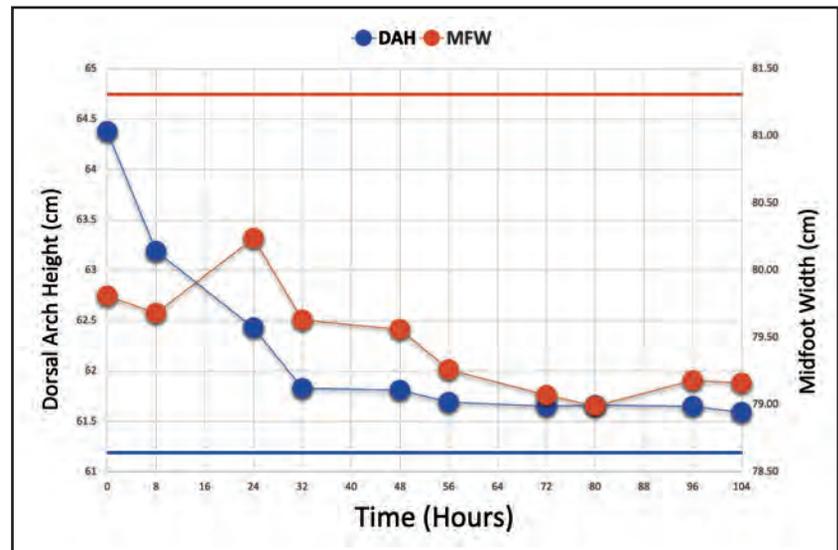
SAS statistical software, version 9.A was used for all tests of statistical significance. A repeated measures analyses of variance was used to analyze the difference between the initial pre-tape measurements and each subsequent post-tape measurement for both DAH and MFW. Post-hoc power was calculated to be 0.97, with  $n = 14$ . Because of the relatively large number of tests of significance needed for this analysis, the level of significance was set at 0.01 to reduce the possibility of committing a type 1 error.

## RESULTS

No one in this study complained of discomfort or skin irritation from having the tape applied to their feet over the 5 consecutive days it was worn. The repeated measures ANOVA showed that DAH remained significantly greater compared to the pre-tape measurement ( $p < 0.01$ ) for 32 hours, including two bouts of running 2 miles (Figure 1). Dorsal arch height remained elevated compared to the pre-tape measurement for the rest of the week but averaged less than 1mm and were not statistically significant from the pre-tape measurement ( $p < 0.01$ ). See Figure 1.

The MFW measurements were decreased an average of 1.5 mm immediately after taping but it was not significantly significant ( $p > 0.01$ ). The MFW values remained slightly decreased from the pre-tape measurement for the remainder of the week with the exception of 80 hours after the tape was applied. At this point, the decrease was found to be statistically significant from the pre-tape condition ( $p < 0.01$ ). Although significant, the mean MFW at 80 hours was just 0.82 mm less than that measured before the tape was applied. See Figure 1.

**Figure 1. Mean DAH and MFW Measurements Over 5 Days After Applying the LD Taping Technique Using Leukotape. All Participants Ran for 2 Miles Every 24 Hours.**



## DISCUSSION

### Dorsal Arch Height

Immediately after applying the LD taping technique, DAH was significantly increased by 3.2 mm. This observed amount is between 2.2mm and 4.8mm less than previous research looking at the effect of the LD taping technique on DAH.<sup>5</sup> The observed differences between the current study and that of previous research may be because the current study did not invert the calcaneus while the tape was applied, but rather the foot was maintained in a “neutral” position (neither inverted nor everted). The “neutral” position of the calcaneus during taping was chosen because it was found during preliminary studies, that individuals complained of discomfort and skin irritation when the stiff tape was applied to an inverted calcaneus.

The altered DAH measured in the current study remained significantly different from the pre-tape measurement until 32 hours after application. This is greater longevity than that reported by Cornwall et al using a combination of the LD and Modified Reverse-6 taping techniques.<sup>10</sup>

Future studies with more frequent measurements being taken would allow a more accurate estimate of when DAH is no longer statistically different from the non-tape condition. In addition, future research looking at whether placing the tape directly on the skin rather over the Cover-Roll may improve the amount of change observed as well as its durability. Not using the Cover-Roll, however, may result in skin irritation.

### Midfoot Width

After applying the Leukotape, MFW was initially reduced by an average of 1.5 mm, which is again similar to that reported by Cornwall et al.<sup>10</sup> Although not statistically significant from the pre-tape condition, the decrease in MFW indicates that the foot was slightly less pronated while standing compared to before it was taped. Over the next 104 hours of wear, the MFW values remained fairly constant, changing less than 1.0 mm over the course of the 5 days. Comparison of MFW change and durability is limited because only one previous study investigated this variable. When compared to that one previous study, the observed initial change in MFW is 0.5 mm less than that reported by Cornwall et al.<sup>10</sup> The current study and that by Cornwall et al<sup>10</sup> used different taping methods and different types of tape, yet they both yielded similar results. Clinicians could, therefore, use either method. The method used in the current study has the advantage, however, of taking less time to apply and using less tape.

The small fluctuation in MFW measurements over the course of the 5 data collection days in the current study is most likely because of measurement error (**Figure 1**). The small temporary increase in MFW at hour 24 may be the result of increased fluid retention secondary to the participants running 2 miles shortly prior to the time the measurement was taken.

Since foot pronation is multiplanar in nature, restricted MFW may also be beneficial in alleviating symptoms for various conditions. For example, previous research has suggested a connection between MFW and patellofemoral pain syndrome.<sup>12</sup> Controlling MFW could therefore be useful in treating those with patellofemoral dysfunction or other conditions where transverse movement of the midfoot, and thus the lower leg, is desired.

The current study is not without limitations. Although all of the participants were required to run 2 miles each day, it is not possible to extrapolate our finds to athletes or individuals that partici-

pate activities of longer duration or more medial-lateral motions. It does, however, have application to situations where pronation control is desired in a sub-acute phase of healing or when the person is beginning to return to activity and needs some pronation control.

Another limitation to the current study is that none of the participants complained of pain or discomfort. As such, it is unknown if the amount and durability of pronation control from the tape would be effective in symptom alleviation, altering muscle activation patterns, or changing poor lower extremity mechanics. There is evidence, however, suggesting that a 2.6 mm increase in DAH may be sufficient for symptom relief due to decreased tissue loading.<sup>13,14</sup> Further research is warranted to better answer this question.

A third limitation of this study is that DAH and MFW were not measured during walking or running. As such, although static foot posture was altered, it is unclear whether this translates to the same changes during locomotion.

## CONCLUSION

Based on the results of this study, the LD taping technique using Leukotape is able to increase arch height for at least 32 hours with the individual participating in 2 bouts of moderate exercise (running 2 miles) within that time period. In addition, MFW is initially decreased and there is little or no change over 5 days of wear and daily bouts of running 2 miles.

## REFERENCES

- Landorf KB, Radford JA, Keenan A-M, Redmond AC. Effectiveness of low-Dye taping for the short-term management of plantar fasciitis. *J Am Podiatr Med Assoc.* 2005;95(6):525-530.
- Loudon JK, Reiman M. Lower extremity kinematics in running athletes with and without a history of medial shin pain. *Int J Sports Phys Ther.* 2012;7(4):356-364.
- Whitaker JM, Augustus K, Ishii S. Effect of the low-Dye strap on pronation-sensitive mechanical attributes of the foot. *J Am Podiatr Med Assoc.* 2003;93(2):118-123.
- Holmes CF, Wilcox D, Fletcher JP. Effect of a modified, low-dye medial longitudinal arch taping procedure on the subtalar joint neutral position before and after light exercise. *J Orthop Sports Phys Ther.* 2002;32(5):194-201.
- Franettovich MM, CHAPMAN A, Chapman A, Vicenzino B. Tape that increases medial longitudinal arch height also reduces leg muscle activity: a preliminary study. *Med Sci Sports Exerc.* 2008;40(4):593-600. doi:10.1249/MSS.0b013e318162134f
- Cheung RTH, Chung RCK, Ng GYF. Efficacies of different external controls for excessive foot pronation: a meta-analysis. *Br J Sports Med.* 2011;45(9):743-751. doi:10.1136/bjsm.2010.079780
- Radford JA, Burns J, Buchbinder R, Landorf KB, Cook C. The effect of low-Dye taping on kinematic, kinetic, and electromyographic variables: a systematic review. *J Orthop Sports Phys Ther.* 2006;36(4):232-241.
- Ator R, Gunn K, McPoil TG, Knecht HG. The Effect of Adhesive Strapping on Medial Longitudinal Arch Support before and after Exercise. *J Orthop Sports Phys Ther.* 1991;14(1):18-23.
- Redmond AC, Crane YZ, Menz HB. Normative values for the Foot Posture Index. *J Foot Ankle Res.* 2008;1(6):1-9.
- Cornwall MW, McPoil TG, Fair A. The effect of exercise

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6. Schuh R, Hofstaetter SG, Adams SB, Pichler F, Kristen K-H, Trnka H-J. Rehabilitation after hallux valgus surgery: importance of physical therapy to restore weight bearing of the first ray during the stance phase. *Phys Ther.* 2009;89(9):934-945. doi:10.2522/ptj.20080375
7. Angirasa AK, Augoyard M, Coughlin MJ, Fridman R, Ruch J, Weil L. Hammer toe, mallet toe, and claw toe. *Foot Ankle Spec.* 2011;4(3):182-187. doi:10.1177/1938640011409010
8. Baravarian B. Current concepts in hammertoe correction. *Podiatry Today.* 2015;28(9):36-44.
9. Sims AL. Painful sesamoid of the great toe. *World J Orthop.* 2014;5(2):146-150. doi:10.5312/wjo.v5.i2.146
10. Dedmond BT, Cory JW, McBryde A. The Hallucal Sesamoid Complex. *J Am Acad Orthop Surg.* 2006;14(13):745-753. doi:10.5435/00124635-200612000-00006
11. Aper RL, Saltzman CL, Brown TD. The effect of hallux sesamoid resection on the effective moment of the flexor hallucis brevis. *Foot Ankle Int.* 1994;15(9):462-470. doi:10.1177/107110079401500902
12. Dollahite JA, Packard BD, & Miller RA. Complete great toe sesamoid excision: a case series. *Univ NM Orthop Res J.* 2019;8:55-58.
13. Saxena A, Krisdakumtorn T. Return to activity after sesamoidectomy in athletically active individuals. *Foot Ankle Int.* 2003;24(5):415-419. doi:10.1177/107110070302400507
14. Bichara DA, Henn RF, Theodore GH. Sesamoidectomy for hallux sesamoid fractures. *Foot Ankle Int.* 2012;33(9):704-706. doi:10.3113/fai.2012.0704
15. Biedert R, Hintermann B. Stress fractures of the medial great toe sesamoids in athletes. *Foot Ankle Int.* 2003;24(2):137-141. doi:10.1177/107110070302400207
16. Binkley JM, Stratford PW, Lott SA, Riddle DL. The lower extremity functional scale (LEFS): scale development, measurement properties, and clinical application. *Phys Ther.* 1999;79(4):371-383. doi: 10.1093/ptj/79.4.371
17. Gerhardt JJ, Cocchiarella L, Lea RD. *The Practical Guide to Range of Motion Assessment.* AMA Press; 2002.
18. Kendall FP. *Muscles Testing and Function.* Williams & Wilkins; 2005.
19. Cipriano JJ. *Photographic Manual of Regional Orthopaedic and Neurological Tests.* Lippincott, Williams, & Wilkins; 2012.
20. Wise CH. Chapter 7: The Paris approach. In: *Orthopaedic Manual Physical Therapy: from Art to Evidence.* F.A. Davis Company; 2015.

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and time on the height and width of the medial longitudinal arch following the modified reverse-6 and the modified augmented low-dye taping procedures. *Int J Sports Phys Ther.* 2014;9(5):635-643.

11. Nolan D, Kennedy N. Effects of low-dye taping on plantar pressure pre and post exercise: an exploratory study. *BMC Musculoskelet Disord.* 2009;10(1):40. doi:10.1186/1471-2474-10-40
12. Vicenzino B, Collins N, Cleland J, McPoil T. A clinical prediction rule for identifying patients with patellofemoral pain who are likely to benefit from foot orthoses: a preliminary determination. *Br J Sports Med.* 2010;44(12):862-866.
13. Meier K, McPoil TG, Cornwall MW, Lyle T. Use of antipronation taping to determine foot orthoses prescription: a case series. *Res Sports Med.* 2008;16(257):257-271. doi:10.1080/15438620802310842
14. Kelly LA, Racinais S, Tanner CM, Grantham J, Chalabi H. Augmented low dye taping changes muscle activation patterns and plantar pressure during treadmill running. *J Orthop Sports Phys Ther.* 2010;40(10):648-655.

### AOPT Special Interest Groups 2021 Election - Call for Nominations

Are you a member of an AOPT Special Interest Group (SIG), and are you interested in running for SIG office? The AOPT SIG Call for Nominations period is open now through September 1, 2021.

Click on the following link to view the offices open for each of our 7 SIGs. You will also be able to access the Potential Candidate Form, SIG Rules of Order, and the AOPT SIG Leadership Orientation presentation:

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