

Effects of various athletic taping techniques on pronation

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Introduction

Soft tissue injuries (including sprains, strains, bruises, and stress injuries) commonly occur in sports-related activities. Thirty million children and adolescents participate in youth sports in the U.S. alone, and of those 30 million, 15% incur injuries, accounting for 500 thousand doctor visits, and 30 thousand hospitalizations each year (Weinstein, 2019).

Overpronation, a manner of walking categorized by excess weight constantly being upheld by the medial aspect (arch) of the foot, can cause pain in the heel, ankle, shin, knee, hip, and back as well as damage to tendons, muscles, and ligaments, all of which are key components of lower extremity movement. Because overpronation is nearly impossible to eliminate entirely, athletic taping is utilized to reduce the excess ankle eversion caused by overpronation.

This project investigated multiple taping methods as a means of reducing overpronation. In this study, three taping methods were evaluated using the calculated area (mm^2) of participants' footprints (Figure 1).



Figure 1: From left to right the LowDye, Reverse 6, and Ewalt taping methods.

Methods

Participants were recruited via a visual inspection that looked for overpronation tendencies in arch height, navicular drop, and everted ankles during walking ($n = 30$). Excel, a Samsung Galaxy S22 camera (Model SM-S901U), athletic tape, a bin of water, and brown poster paper were used. Participants were given a survey to include name, sex, age, knee and ankle pain injury history, foot posture, height, weight, gender, and history of athletic participation, which further determined inclusion in the study. Each participant was instructed to remove both shoes along with the dominant foot's sock, step into a bucket of water, and then walk on a brown paper path (Wet Foot test). The wet footprint was recorded and used for data analysis. The Wet Foot test was repeated after each taping method was applied with the addition

Methods (continued)

of a two-minute walk. The walk was at a subject-set pace immediately after being taped to help develop a sense of normalcy in their gait before being recorded. The taping methods were applied in a randomized order.

The online tool, SketchAndCalc, was utilized for measuring how much foot area (mm^2) was in contact with the ground for each taping method and for the control. Pictures of Wet Foot test prints were uploaded and set to scale. The foot perimeter was hand traced and the web tool calculated the area within the enclosed shape in mm^2 (Figure 2). Data was transferred to Excel and post-processed for analysis.

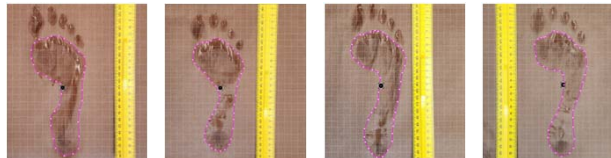
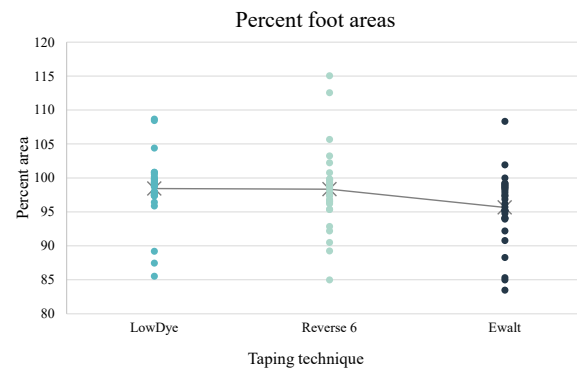


Figure 2: From left to right a subject's wet foot tests traced in SketchAndCalc for no tape ($8,210 \text{ mm}^2$), LowDye ($8,000 \text{ mm}^2$), Reverse 6 (8020 mm^2), and Ewalt ($7,350 \text{ mm}^2$). Notice the changes in area for each taping method. In this example the area in contact with the ground in the Ewalt taping method is less than the area in the control (no tape) and other taping methods. Picture quality was limited by the capabilities of SketchandCalc.

Results



Graph 1: Results from the Wet Foot test show that the Ewalt taping technique had the most significant reduction in percent area of the foot in contact with the ground.

$$\text{percent area} = \frac{\text{taped foot area}}{\text{control foot area}} \times 100$$

Results (continued)

A one-way ANOVA revealed that there was a statistically significant difference in percent of foot area (Graph 1) in contact with the floor between LowDye taping technique, Reverse 6 taping technique, and Ewalt taping technique ($F(1,3) = 4.61, p = .004$). Dunnett post-hoc test results revealed that the mean value of the percent foot area in contact with the floor during the Ewalt taping method ($M = 95.7, SD = 5.178$ [CI 94.0, 97.3]) was significantly lower than the no tape control ($M = 100, SD = 0$ [CI 98.3, 101.7]). There was no statistically significant difference in the percent foot area in contact with the floor between the control and LowDye ($M = 98.4, SD = 4.755$) or Reverse 6 ($M = 98.4, SD = 5.92$) taping methods.

Discussion

The purpose of this study was to determine if LowDye, Reverse 6, or Ewalt taping methods reduce overpronation. Results determined the Ewalt taping method significantly reduced footprint area, whereas LowDye and Reverse 6 methods did not. The results support the use of athletic tape to reduce overpronation, but only if the Ewalt technique is applied. Furthermore, additional research is recommended to determine if LowDye and Reverse 6 should even be considered for preventing injury due to overpronation.

Original methods of measuring participant's calcaneal angle, truncated foot length, arch height, and metatarsal calcaneal angle, proved to be unreliable even though they were done in accordance with multiple verified research articles and methods used in orthopedic practice (Vicenzino et al., 2005). Therefore, the Wet Foot test and area measurement technique were developed, showing reliable trends in paired analysis.

References

- Vicenzino, B., Franettovich, M., McPoil, T., Russel, T., & Skardoon, G. (2005). Initial effects of anti-pronation tape on the medial longitudinal arch during walking and running. *British Journal of Sports Medicine*, 39(12), 939–943. <https://doi.org/dckc73>
- Weinstein, J. (2019, January 1). Surprising statistics about injuries in high school sports. *Weinstein Legal*. <https://www.weinsteininjurylawyer.com/personal-injury-blog/surprising-statistics-sports-injuries/#:~:text=High%20school%20athletes%20alone%20account,nearly%2040%20percent%20of%20injuries>