

Effects of Elastic Tape on Balance Ability in Athletes with Ankle Instability: A Pilot Study

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Abstract

Background: Ankle instability may lead to a loss of stability during the static states as well as during movement. Elastic tape may increase balance ability in participants displaying ankle instability.

Objective: To study the effect of elastic tape application on the static state and dynamic balance in athletes with ankle instability.

Method: Ten participants exhibiting ankle instability were included in the study. They received elastic taping at the ankle joint (affected side). The researcher assessed static balance and dynamic balance (the star excursion balance test) before and immediately after the test.

Results: There were no significant differences within the group in terms of static and dynamic balance - except for dynamic balance at the posterolateral direction. However, balance ability showed an increase after taping. These results demonstrate that elastic taping could improve dynamic balance in the posterolateral direction. Moreover, the elastic taping tended to increase balance ability.

Conclusion: Elastic tape may be employed as an alternative treatment in order to increase balance ability in the posterolateral direction.

Keywords: ankle instability, elastic tape, balance ability

Introduction

Knee and ankle injuries are the most frequently occurring sports injuries among athletes.¹ Spraining of the ankle occurring at 5 - 45 percent of total injuries, commonly leads to ankle instability (AKI)², particularly with injury to the lateral tendon of the ankle³ which leads to injury re-occurrence. Those exhibiting AKI experience instability during movement or weight bearing,⁴ predominantly in the anterior direction when tested using the Y balance test⁵. Subjects demonstrating ankle instability present deficits amid both static and dynamic

conditions⁶. A plethora of methods aimed at treating ankle instability among athletes incorporate medical treatment, i.e. surgery as well as conservative treatment, for instance, physical therapy. Physical therapy integrates a variety of approaches such as exercise to elevate ankle stability, modalities to decrease pain, proprioceptive training to increase proprioceptive function, and utilising taping in order to maintain and enhance sports performance⁷. In a previous study which discussed the effect of employing elastic tape, it was discovered that taping had the ability to enhance ankle stability at the point of testing via the Y balance test⁸. Although taping can boost ankle stability, a greater effect on PNF and muscle activation over a focus on ankle support may occur⁹.

Athletic performance however, employs both static and dynamic balance ability. To date this aspect has not been sufficiently studied, hence, the objective of this research was to study the effect of elastic tape application

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on static as well as dynamic balance among athletes displaying ankle instability.

Materials and Methods

Study Population

This study was a cross-sectional study in design. Subjects were recruited at Burapha University Muang district, Chonburi province, Thailand. All subjects were athletes presenting ankle instability.

As this was a preliminary study, ten participants (2 women, 8 men; aged 21.20 ± 0.44 ; height 171.7 ± 7.24 cm; weight 70.9 ± 13.81 kg; BMI 23.91 ± 3.47 ; leg length 89.05 ± 5.12 cm) exhibiting AI were recruited primarily from athletes within Burapha University. For the purpose of the study, ankle instability was defined as the Foot and Ankle Ability Measure (FAAM - Thai version)¹⁰ and positive special test. The special test consisted of the Anterior drawer test and the talar tilt test. Subjects were also required to have had at least one ankle sprain within the twelve months prior; but not within the six months preceding testing.

All subjects reported good health, normal body mass index (BMI), no contraindication concerning the elastic taping, no history of pain at the lower extremities, nor any orthopedic or neurologic disorders within the previous 6 months.

Equipment and protocol

The measurements of outcome in this study were assessed via the star excursion balance tests (SEBT) before and immediately after taping by the same investigators.

The examiner visually demonstrated the SEBT in the antero-medial, medial and postero-medial directions of the star¹¹, whereby the SEBT test was conducted in all 8 directions. Volunteers stood barefoot at the center of all 8 directions using the right foot to reach and the left to stand on in order to test balance. During the test the participant should not place their weight onto the reaching foot when touching the line. Both of the athlete's hands are placed at the hip area. The subject then stretches the other leg as far as they can using the toes. This was done three times in each direction, with a 5 second break between lines, and a ten second break between each set of three reaches. This process

was carried out before, and immediately after taping. For each individual, a 20 minute gap was included from taping or removal of tape prior to testing. The same researcher carried out all measurements.

Static balance was evaluated using time to balance loss using single balance tests on stable and unstable surfaces. All tests on the unstable surface were done using a foam pad. They were conducted in eight conditions for each surface: without tape eye-open (EO) on a firm and foam surface, with tape eye-closed (EC), and with tape EO on a firm and foam surface. Participants were asked to stand on the affected foot with hands on hips. The assessor recorded the maximum time for each test.

Elastic tape was applied to the instable ankle. The participant was then set in the prone position. Firstly, the ankle was taped on the side of the lateral malleolus side, then dragged down through the lateral malleolus, passing through the heel to the medial malleolus with a U-shaped pattern and stirrups attached. Both lines were approximately 2/3 tape width, with 75 percent tensile strength. Tape was attached to the inner side of the medial malleolus, then detoured to the outside of the heel, then passed through the heel - back to the end of the lateral malleolus. In addition, further tape was attached to the achilles tendon area, with the two tapes separated by a hole in the muscle. The gastrocnemius medial head incorporated 50 percent tensile strength.

Finally, the subject lies on their back. The foot is then dragged along by the tibialis anterior muscle with 50 percent tension.

Statistics

All data were analyzed using SPSS version 19. Descriptive data was expressed as mean with standard deviation. The paired t-test was implemented to compare balance ability at pre and post-test. A p-value of less than 0.05 was considered statistically significant. All data are presented as mean \pm standard deviation.

Results and Discussion

Subjects' demographic and clinical characteristics are shown in Table 1. There were no significant differences within the group

Table 1: Subjects' baseline characteristics.

Characteristic	Participants (n=10)
Age (years)	21.20±0.44
Height (cm)	171.7 ± 7.24
Weight (kg)	70.9 ± 13.81
Body mass index (kg/m ²)	23.91± 3.47
Leg length (cm)	89.05 ± 5.12

Dynamic Balance ability

Comparison between volunteer groups before and after thousands of Anterior, Anteromedial, Medial, Posteromedial, Posterior, Posterolateral, Lateral and Anterolateral tape application types revealed that there were no significant differences in all directions - except in the postero-lateral direction. The balance star excursion test outcomes are shown in Table 2.

Table 2 Dynamic balance ability comparison before and after elastic taping within the group.

Balance ability in each direction (cm)	Participants (n=10)		P
	Baseline	Immediate reading	
Anterior	80.85±11.81	82.55±13.53	0.51
Antero-medial	89.55±11.76	92.75±11.45	0.17
Medial	93.50±14.32	93.90±13.28	0.84
Postero-medial	80.75±15.96	81.65±14.51	0.77
Posterior	72.35±16.17	76.80±15.26	0.87
Postero-lateral	71.50±17.06	75.60±16.22	0.20
Lateral	66.27±16.92	71.25±15.26	0.02
Antero-lateral	70.95±8.38	71.45±10.29	0.81

Static Balance Ability

Static balance ability is shown in Table 3. There were no significant differences in all conditions.

Table 3: Static balance ability comparison before and after elastic taping within the group.

Balance ability in each condition (Second)	Participants (n=10)		P
	Baseline	Immediate reading	
Eyes open on firm surface	24.47±7.52	25.39±6.92	0.12
Eyes closed on firm surface	9.07±8.53	11.69±5.34	0.32
Eyes open on foam surface	11.65±9.67	11.65±5.34	0.77
Eyes closed on foam surface	1.99±.71	2.33±0.61	0.25

Results of the effects of tape conditioning showed more extended static balance ability with tape compared to no tape conditioning amid ankle instability, yet there was no significant difference. This indicates improved balance in subjects with ankle instability due to elastic taping application.

After taping recording, there was an increased change observed in the Star exclusion balance test (SEBT) in all directions. Especially in the posterolateral direction, a statistically significant increase was revealed. Balance ability during static condition was not significantly different in all conditions.

The suggested explanation for improved balance in subjects suffering from ankle instability with the elastic tape application in this study is likely due to improved proprioception of the ankle region. Proprioception is enhanced by the elastic tape due to stimulation of the cutaneous mechanoreceptors. Enhanced proprioception is likely responsible for improved postural control and better response to perturbations^{12,13}.

The current study showed outcomes that agree with Jackson et al. in that 18 subjects demonstrated balance improvement in 48 hours post KT application, which remained even 72 hours later¹⁹. Therefore, in this study the test for the immediate effect of the elastic tape on balance ability may be insufficient to represent the true effect of taping.

This study observed significant enhancement of

dynamic balance in the posterolateral direction. For this reason, elastic taping may increase ankle stability. Moreover, participants experienced difficulty in reaching the posterolateral lateral and posterior positions (table 2). For these reasons, participants exhibited little base support amid the lateral side of the foot. Thus, taping may increase the ankle's lateral stability.

Conclusion

Future studies ought to incorporate a greater number of participants in each group in order to compare different taping techniques. These results demonstrate that elastic taping can improve dynamic balance in the posterolateral direction. Hence, additional taping procedures should be compared in relation to dynamic and static balance.

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Ethical Clearance: this study was a pilot study and conducted with certified ICH Good Clinical Practice

Conflict of Interest No conflict of interest is declared

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