

Original Article

The effects of ankle joint taping on gait and balance ability of healthy adults

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Abstract. [Purpose] This study examined the effects of the application of elastic taping over the ankle joints of healthy subjects on their gait, balance ability, and muscle strength. [Subjects] Fifty healthy subjects with no orthopedic history of the ankle joint were selected and elastic taping was applied to their ankle joints. [Methods] Before and after application of the elastic taping, gait and balance ability of the subjects were evaluated. [Results] After the taping application, gait velocity significantly increased and there were significant differences in all variables of balance ability. [Conclusion] Application of elastic taping aimed at improving stability of the ankle joint had a positive effect on gait speed and balance ability.

Key words: Elastic taping, Ankle joint, Gait

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INTRODUCTION

Gait is not a movement learned in a short time period and it is the ability to move with continuous and repetitive motions while maintaining stability of the body¹⁾. Gait is the most basic and common daily activity, and in ideal gait, efficiency is required to minimize fatigue, and stability to prevent a fall or injury¹⁾. For humans, balance and gait ability are essential elements for daily life. The ankle joint provides the propulsion for the lower limbs, absorbs impact, and provides stability of support under heavy load conditions during gait. It also affects balance and performs the function of keeping the body upright against gravity or maintaining posture during movement²⁾. In the clinical field, elastic taping is applied to the ankle joints in order to maintain these functions and prevent secondary injury. Elastic taping restricts excessive movement of the joint and improves the proprioceptive feedback mechanism, providing stability to the ankles³⁾. Elastic taping has similar elasticity to the muscles and may reduce pain by making the space between the skin and the muscles large when attached to an area where peripheral nerves are pressed³⁾. Elastic taping increases circulation of the blood, lymph, and tissue fluids, improves reflexive inhibition of the Golgi tendon organ, alleviates excessive tension of the muscles and supports the stability of the ankle joints, all of

which are conducive to improvement of gait and balance ability³⁾. Therefore, the purpose of this study was to examine the effects of the application of elastic taping to the ankle joints on the gait and balance ability of healthy adults.

SUBJECTS AND METHODS

Fifty healthy subjects, 20 males and 30 females, without orthopedic history of the ankle joints were selected for the present study. Informed consent was obtained from each participant. Their average age, height, and weight were 19.50 ± 1.15 years old, 167.30 ± 7.34 cm, and 62.10 ± 10.39 kg, respectively. The Research Ethics Committee of Eulji University Hospital approved the study, and all participants provided their informed, written consent prior to involvement in the study. The elastic taping was applied by a physical therapist with five or more years of clinical experience to the tibialis anterior and calf muscle of the bilateral limbs of the subjects while they sat in a comfortable sitting posture. With the tibialis anterior muscle maximally extended, 5 cm elastic tape was attached from the lateral part of the tibia to the initial segment of the metatarsal bone. For the calf muscle, elastic tape was applied to the medial and lateral parts of the calf in a straight direction starting from the Achilles tendon.

For balance ability, the time taken to perform a task and the movement distance from left to right and from forward to backward, and balance ability score were evaluated using Good Balance (NCE GB8300, Metitur, Finland). The subjects stood on the footplate and practiced three times. For the test three consecutive measurements were taken and averaged⁴⁾. A pedometer (Gait Rite, K634-DB, Epson Inc, America) was used to collect data for quantitative gait analysis. For precise analysis of the subjects' gait, they were

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instructed to start gait 2 meters from the mat for gait. The subjects lifted their head and looked straight forward and walked barefoot while lightly shaking their upper limbs and data were collected by conducting the trial three times. Step length, stride length, velocity, and cadence were measured three times and averaged⁵⁾. The statistical software SPSS 20.0 (SPSS, Chicago, IL, USA) was used for the statistical analysis. Comparisons of variables before and after the intervention were made using the paired samples t-test. The statistical significance level was set at $\alpha = 0.05$.

RESULTS

After application of the ankle joint taping, gait velocity significantly increased ($p < 0.05$) and all variables of balance ability significantly differed ($p < 0.01$) (Table 1).

DISCUSSION

This study was conducted in order to examine gait and balance ability after the application of ankle joint elastic taping. Both gait speed and balance ability improved. In a previous study, elastic taping was applied to soccer players with ankle sprain and it increased their proprioceptive senses and stability of the ankle joint, improving their muscle strength and balance ability⁶⁾. Karlsson and Andreasson taping to the ankles of 24 healthy athletes and reported their ankle joints' position sense increased⁷⁾. They also reported that elastic taping applied to subjects with ankle sprain enhanced their muscle strength and gait ability⁷⁾. Their results are similar to those of the present study and it is our opinion that the application of ankle joint taping increased the subjects' proprioceptive senses and balance ability. In addition, the tape attached to the skin stimulated diverse sensory receptors, improving the contraction ability of the muscles. In gait ability, there was a significant increase in gait speed, but there was no change in the other variables. The reason for the lack of changes seems to be our failure to consider differences in the subjects' leg lengths and their individual gait characteristics. The limitations of this study are as follows. First, this study recruited healthy people without lesions of the ankle joint making it difficult to generalize the results to subjects with musculoskeletal system disease. Second, only the immediate effect of elastic taping application to the ankle joints was investigated. Therefore, future research should address these limitations, by increasing the number of subjects and applying elastic taping for a longer period. Elastic taping is a method of focusing on the muscles of

Table 1. Comparison of the experimental group and the control group results (N=50)

	Taping without	Taping with
Gait ability		
Step length of left (cm)	51.9±21.8 ^a	52.0±20.3
Step length of right (cm)	57.4±14.0	54.1±18.1
Stride length of left (cm)	110.7±30.9	107.0±30.8
Stride length of right (cm)	112.1±31.3	106.7±31.5
Velocity (cm/s) ^b	112.8±19.5	123.7±18.4
Cadence (steps/min)	129.1±40.3	148.1±49.7
Balance ability		
Left-right (mm/s) ^b	1,095.3±336.2	782.6±150.0
Anterior-Posterior (mm/s) ^b	693.6±185.0	524.7±105.9
Time (s) ^b	12.4±3.5	9.4±1.7
Balance index (score) ^b	78.7±6.3	84.8±4.0

^aMean±SD

^bSignificant difference in gains between the groups, $p < 0.05$

musculoskeletal system patients who do not need a surgery. It has almost no side effect, is easy to apply, and can be utilized anywhere⁸⁾. Therefore, application of elastic taping to the ankle joint muscles is helpful for enhancing gait, balance ability, and muscle strength as it improves the functions of the muscles and joints.

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