# THE EFFECT OF ANKLE JOINT TAPING ON THE MOTION OF THE ANKLE JOINT DURING TREADMILL RUNNING

**M. Quirke, A.J. Harrison**
**Department of Physical Education and Sport Sciences, University of Limerick, Limerick, Ireland**

Prophylactic ankle taping is frequently used to restrict joint range of motion and prevent further injury. Most studies on this procedure have used quasi-static measures of joint motion and few intervention studies have controlled the exercise load applied to the taped joint. This study examined the effect of protective ankle joint taping on restricting range of motion of the ankle joint using dynamic measures of joint range and controlled exercise intensity, i.e. treadmill running. Eight subjects were video taped whilst running and a moderate speed on a treadmill for 20 minutes. The results indicated that the tape significantly restricted motion in the frontal and sagittal planes. However, after less than 5 minutes exercise the range of motion returned to normal (i.e. untaped motion).

**KEY WORDS:** prophylactic taping, ankle injuries, treadmill running.

**INTRODUCTION:** Ankle injuries are amongst the most common injuries sustained by sports people. There are various methods of treatment. The practice of prophylactic ankle taping in reducing the incidence of ankle injury and preventing re-injury is controversial. Taping is widely advocated in the belief that it enhances the stability of the ankle by decreasing the range of motion (ROM) about the injured joint. Many studies have documented this mechanical role of tape. Myburgh (1984) and Manfroy et al. (1997) found that tape loses its ability to restrict ROM after a bout of exercise. Manfroy documented a significant decrease in effectiveness after just 1 hour of squash, while Myburgh found tape restriction became insignificant after 40 minutes of vigorous exercise. Others have documented that the greatest loosening occurs within the first 10 minutes (Glick, 1976). All of these studies have employed quasi-static methods to measure ankle ROM, and often the intensity of the exercise was not standardised. The objective of this study was to ascertain the effectiveness of taping in limiting ranges of motion about the ankle joint using dynamic measures of joint motion during fixed speed treadmill running. The study also determined how long the tape remained effective in restricting the ROM.

**METHODS:** Eight healthy, asymptomatic subjects took part in this investigation. Subjects were aged between 20 – 35 years. Screening criteria required that subjects had no history of ankle injury during the 6 months prior to testing. All subjects were experienced in treadmill running and all running trials all trials were performed in the subject's own running shoes. The study carried University Research Ethics Committee approval. Subjects wore lightweight retro reflective markers attached to the skin of the foot and leg with double-sided adhesive pads. The marker set up is shown in Figure 1. During all running trials, subjects were videotaped using two genlocked Panasonic DP800H camcorders placed orthogonally to the frontal and sagittal planes. SVHS (50Hz) video sequences were digitised using the Peak Motus 5.0 ® motion analysis system. The inversion/eversion and dorsi/plantar flexion motion of the ankle joint complex during the stance phase of gait were obtained from the optimally filtered coordinate data. Each subject was required to run for 5 minutes on the treadmill at 3.13 $m.s^{-1}$. The dominant ankle (i.e. preferred kicking leg) of each subject was then taped with the ankle in neutral position according the method recommended by Austin et al. (1996). Steroplast zinc oxide non-stretch tape 5cm tape was used for anchoring the ankle in neutral position and the procedure was completed with figure-of-eight strapping using elastoplast tape. All taping was carried out by the principal investigator who had undergone extensive training in ankle taping procedures. The reflective markers were re-applied to the joint and the subjects resumed their run on the treadmill at the same speed for a further 20 minutes. Ten consecutive gait cycles were analysed at each time interval: pre-tape, 0, 5, 10, 15 and 20 minutes after taping.

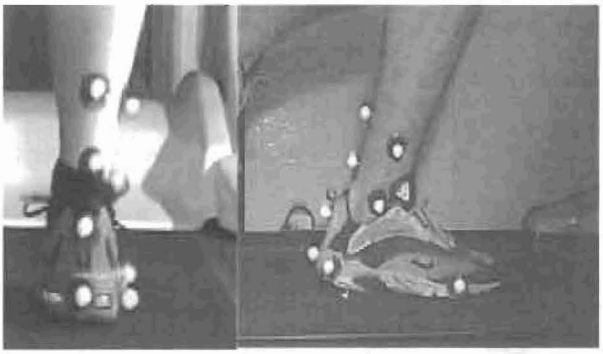

**Figure 1.** Marker set up for video analysis.

A repeated measures ANOVA design was used to determine if significant differences in ROM existed between the pre-taped and post tape measures. Tukey's HSD post-hoc test was used to determine specific pair-wise significant differences between the times of taping. The experiment-wise Type I error level was maintained at $p < 0.05$ for all tests.

**RESULTS AND DISCUSSION:** The effects of taping in restricting the range of motion around the frontal and sagittal planes are shown in Figures 2 and 3, respectively. Repeated measures ANOVA and post-hoc comparisons showed significant differences in ROM between the pre tape and immediately after taping ($p < 0.01$). However, after 5 minutes of exercise there was no significant difference in the sagittal and frontal plane movement compared with the pre-tape condition.

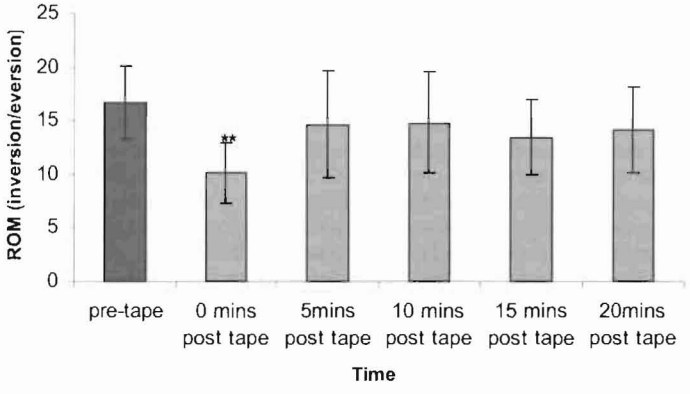


**Figure 2.** Effect of taping on ankle inversion-eversion.

The residual restriction after 10, 15 and 20 minutes was not significant in limiting the ROM. Figures 4 and 5 show the percentage reductions in dorsi-plantar flexion and inversion-eversion ROM following the application of tape and throughout the exercise period. The results indicated a significant loosening of the tape after 20 minutes of exercise. This is consistent with previous studies, which described a loosening after 1 hour (1), 40 minutes (2) and 10 minutes of exercise respectively. That tape loosens after exercise is an important effect, but a point of practical interest concerns the exact time that tape loses its effectiveness. Through dynamic continuous analysis of ROM the present study was able to

determine the point of greatest loosening. After 5 minutes the tape had lost 31% of it's original competence in restricting inversion and eversion. This effect is also apparent in the

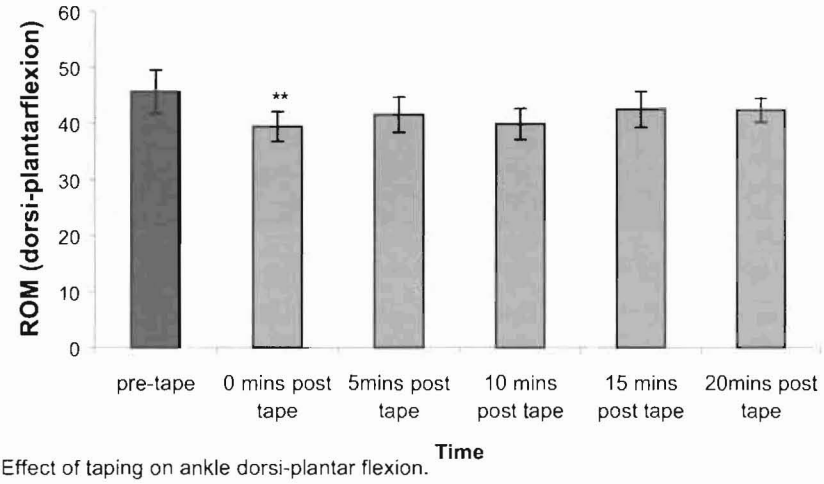


**Figure 3.** Effect of taping on ankle dorsi-plantar flexion.

sagittal plane where dorsiflexion and plantarflexion are initially restricted by 13.7% but the restriction is only 8.9% efficient after 5 minutes of exercise. Changes in the range of transverse plane motion were not analysed. This could be a useful parameter for further research. The data of this study clearly demonstrates that after less than 5 minutes of moderate intensity exercise, tape is not effective as a joint motion restrictor in the frontal plane or sagittal plane. This loosening characteristic of tape has important consequences for the athlete and sports physician alike. The athlete expects the tape to function in a prophylactic manner for the duration of the exercise. Although the tape loses its ability to mechanically restrict joint motion this may not necessarily render it useless. Tape has been documented to have other functions, such as enhancing proprioception, and decreasing everter muscle reaction times. It is recommended that future studies of the effects of ankle joint taping should investigate the effectiveness of the tape in enhancing proprioception before and after exercise.

**CONCLUSION:** The results of this study show that ankle joint taping provides only limited joint motion restriction during moderate speed treadmill running. After less than five minutes, the effectiveness of the tape was significantly reduced. The results suggest that ankle joint taping is of limited use in preventing further injury by restricting joint motion.

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