INTRODUCTION

Ankle ligament sprains are the most common injury in collegiate athletes [1] and ankle taping is often used by athletes during rehabilitation after a sprain. Many athletes also continue to tape their ankles as a preventative measure. Taping has been shown to enhance ankle proprioception [2] which, in theory, should improve balance, thereby potentially aiding in injury prevention. Yet most studies have found ankle taping to either have no effect on or to worsen balance [3]. A factor that has not been studied, however, is whether the effects of ankle taping on balance change with regular, long-term use. It has been suggested that ankle taping is most effective at preventing ankle sprains in previously injured athletes [4]. Thus, it may be that, with long-term use of taping, the body better adapts to the associated changes in sensory input and ankle stiffness. This study therefore compared the effects of ankle taping on balance between athletes who regularly tape their ankles and those who do not tape their ankles.

METHODS

Fourteen NCAA Division 1 gymnasts were tested after they provided informed consent. Gymnasts were studied because balance plays a large role in the sport and because long-term, regular use of ankle taping is common. Six participants always taped one or both ankles for gymnastics over the preceding three months (“tapers” group) and eight never did (“non-tapers” group). No participant had sprained an ankle in the six weeks preceding testing.

The participants’ ability to balance on one foot was measured using a force platform (Bertec, Columbus, OH). Participants who tape only one ankle were tested on that foot. Non-tapers, as well as tapers who tape both ankles, were tested on the foot with the more “normal” ankle. If both ankles were similar with regards to these criteria, the foot tested was selected randomly.

Each participant was tested with and without ankle taping under each of four conditions: with eyes open and eyes closed, both with and without a 5 cm-thick block of foam between the foot and force platform. Participants performed three trials for each condition. They were to try to remain still, with the other foot raised slightly by flexing the hip and knee, legs apart, and hands on the hips, as best they could. A trial continued until the participant touched the other foot to the ground or 30 s elapsed, whichever occurred first. Trials of less than 15 s were repeated. Whether participants were tested with or without taping first and the order in which the conditions were tested were counterbalanced. An athletic trainer performed the taping.

Ground reaction force data were collected at 100 Hz during each trial and low-pass filtered at 12 Hz. Balance measures analyzed were the extent of center of pressure (COP) motion, quantified by the standard deviation of COP position, and the mean speed of the COP in the anteroposterior (AP) and mediolateral (ML) directions, with the 2 s before ground contact by the other foot excluded. Values were averaged across the three like trials. Mixed four-factor analyses of variance (ANOVA) were performed to assess the effects of ankle taping as a function of group, vision condition, and surface. Effects were considered significant at p<.05 in the ANOVA and at p<.025 in the post hoc testing.

RESULTS AND DISCUSSION

For all four balance measures investigated, the effects of ankle taping differed between eyes-open and eyes-closed conditions. When the eyes were open, ankle taping had no effect on the extent or speed of COP motion (p>.025). However, ankle
taping had a generally negative effect on balancing with the eyes closed. Under eyes-closed conditions, taping was associated with greater COP AP motion, regardless of surface, and greater COP ML motion when on solid ground (Figure 1). These effects did not differ between tapers and non-tapers.

In contrast, effects of ankle taping on the speed of COP motion differed between groups. Under eyes-closed conditions, tapers exhibited faster COP AP motion and non-tapers exhibited slower COP ML motion with the ankle taped versus without tape, regardless of surface (Figure 2). No corresponding effects were seen in the other group. Otherwise, the two groups differed only in that tapers exhibited lesser COP AP motion than non-tapers, regardless of taping, vision, or surface (Figure 1).

The present results are consistent with those of other studies in finding that ankle taping did not improve balance [3]. That negative effects of taping were observed only with the eyes closed suggests that participants had difficulty integrating into their control of balance changes in somatosensory input that resulted from the presence of the taping. Furthermore, as is seen in the results for the speed of COP motion, the effects of taping on balance differed between tapers and non-tapers in a manner suggestive of greater negative effects of ankle taping with long-term, regular use. Of interest, however, is that the extent and speed of COP motion in the tapers when taped appear to have been similar to those of non-tapers without taping. It may thus be that the tapers had adapted their control of balance over time in such a way as to compensate for the negative effects of the ankle taping.

CONCLUSIONS

In general, the results support the conclusion that ankle taping is detrimental to balancing ability. The results also support the conclusion that the negative effects of ankle taping on balance increase with long-term, regular use. However, long-term ankle tapers may adjust their balancing technique to account for the negative effects of taping.

REFERENCES


ACKNOWLEDGEMENTS

Funded through the HHMI Summer Undergraduate Research Program and the URISC program at OSU.