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Original research

Immediate effect of walking with talus-stabilizing taping on ankle kinematics in subjects with limited ankle dorsiflexion

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ABSTRACT

Objective: To determine the effects of walking with talus-stabilizing taping (TST) on ankle dorsiflexion (DF) and heel-off time in the stance phase of gait and ankle DF passive range of motion (PROM).
Design: Pre- and post-intervention study.
Setting: University motion analysis laboratory.
Participants: Ten subjects participated in this study. Sixteen ankles with limited ankle DF PROM were tested.
Main outcome measures: Ankle DF PROM was measured using a goniometer, and maximum ankle DF before heel-off and time to heel-off in the stance phase of gait were measured using a 3D motion analysis system before and after walking with TST. Data were analyzed using a paired *t*-test.
Results: Ankle maximum DF before heel-off ($p = 0.001$), time to heel-off during the stance phase of gait ($p = 0.005$), and ankle DF PROM ($p < 0.001$) were significantly increased post-intervention compared with pre-intervention.
Conclusions: Walking with TST is an effective self-exercise for improving ankle kinematics during gait and increasing ankle DF PROM in individuals with limited ankle DF PROM.

1. Introduction

Ankle dorsiflexion (DF) with at least 10° of passive range of motion (PROM) is required to prevent ankle injuries (Johanson et al., 2006; Kibler, Goldberg, & Chandler, 1991; Willems et al., 2005). Limited ankle DF PROM is associated with ankle injuries such as plantar fasciitis, Achilles tendinitis, and ankle sprain (Kibler et al., 1991; Schepsis, Jones, & Haas, 2002; Willems et al., 2005). Tightness of the triceps surae muscle and lack of posterior gliding of the talus are risk factors for limited ankle DF PROM (Sahrmann, 2010). Such limited ankle DF PROM allows altered foot alignment and abnormal ankle movement, which may induce ankle injuries (Donatelli & Wooden, 1996; Willems et al., 2005).

Limited ankle DF PROM may be responsible not only for ankle injuries but also for abnormal gait patterns (Cornwall & McPoil, 1999; Johanson, Cooksey, Hillier, Kobbeman, & Stambaugh, 2006; Johanson, Cuda, Koontz, Stell, & Abelew, 2009). Maximum ankle DF with the knee in nearly full extension generally occurs just before heel-off during the stance phase of gait (Johanson, Cooksey, et al., 2006, 2009). Limited ankle DF PROM with the knee in nearly full extension could restrict the function of the ankle rocker, referred to as tibial advancement over the foot, which leads to early heel-off during the stance phase of gait (Perry & Burnfield, 2010; Sahrmann, 2010). Cornwall and McPoil (1999) reported that individuals with limited ankle DF PROM showed significant early heel-off compared to individuals with normal ankle DF PROM. Early heel-off may increase the time of weight bearing on the forefoot and subsequent tissue stress during the stance phase of gait, resulting in lower-extremity overuse injuries (Donatelli & Wooden, 1996; Johanson et al., 2006). Therefore, clinicians should consider interventions that increase ankle DF PROM to prevent an abnormal gait pattern and secondary lower-extremity overuse injuries in individuals with limited ankle DF PROM.

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