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The Effects of an Ankle Destabilization Device on Muscular Activity while Walking

Abstract

Chronic Ankle Instability sprain causes are unclear and many factors or mechanisms may contribute to recurrence of this injury. The aim of the study was to investigate how an ankle destabilization device affects the EMG patterns of the ankle muscles during ankle stabilization against inversion. The left foot was equipped with a mechanical device mounted under the heel of the shoe. This mechanical device induces subtalar joint destabilization necessitating the control of ankle muscles. Surface electrodes were placed over the tibialis anterior, the peroneus longus, the peroneus brevis, the gastrocnemius lateral, and the gastrocnemius medial. Nine healthy subjects (mean age 37 ± 12 yr; mean mass 68 ± 17 kg; mean height 1.73 ± 0.7 m) were instructed to walk

normally along a tape fixed on the floor. The ankle destabilization device altered the walking pattern of all subjects. More specifically, the walking pattern is disturbed resulting in higher amplitude of the EMG activity of the peroneal muscles and the Tibialis Anterior and anticipatory reactions in the peroneal muscles. The results suggest that the ankle destabilization device could be beneficial for rehabilitation programs especially during the training of walking. Using this material may help to a specific reinforcement of muscles involved in anti-inversion ankle movement.

Key words

Electromyography · orthosis

Introduction

Lateral ankle sprain (LAS) account for fifteen to forty-five percent of injuries encountered in athletes especially when sports activities required jumps, jump reception, or abrupt change in direction like soccer [16], volleyball [22], basketball, or handball. The recurrence rate of such injury is estimated at eighty per cent [24]. Moreover, ten to twenty percent of persons with LAS may later develop chronic lateral ankle instability [10]. Two main hypotheses explain the mechanisms which may contribute to Chronic Ankle Instability (CAI).

Firstly, CAI may be related to neuromuscular causes herein called neuromuscular instability. The main cause of CAI would be a reduced ankle proprioception [6]. Proprioception arises from various specialized receptors in muscles, tendons, skin, and articular structures [17]. The lateral ligament and the joint capsule of the talocrural and subtalar joints but also muscles and tendons acting at the ankle, are strongly innervated by sensory receptors. When tension in lateral ligaments excessively increases, mechanoreceptors inform the Central Nervous System (CNS) and a motor response is generated to slow down or reverse the direction of the movement. When the ankle is twisted, some of muscular

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Bibliography

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