

Study overview of selected results

Function of the MalleoLoc® ankle orthosis during simulated ankle inversion

Freiburg University Department of Sport and Sport Science –
Gehring, D., Leukel, C., Lauber, B., Wißler, S., Gollhofer, A.

Abstract

The most common injuries in sports are injuries to the ligaments of the upper ankle joint (UAJ) with 25 to 40% of all traumas.¹ About 85% of all cases are supination trauma of the forefoot with inversion of the hindfoot.² This applies particularly to the lateral ligaments of UAJ.³ Up to 30% of all patients with acute ankle sprain develop chronic symptoms within the framework of structural or functional ankle instability.⁴ In addition to physiotherapy and tape, bandages and orthoses are used for acute care and later in the rehabilitation phase.⁵ The use and benefits of these devices is demonstrated and confirmed.^{6, 7, 8, 9}

The aim of this study was to evaluate the function of MalleoLoc® ankle orthosis during simulated ankle inversion in consideration of a dynamic injury scenario.

The results show a reduction of the peak ankle inversion and maximum velocity of the ankle inversion. The reduction is more distinct without anticipation than with anticipated behavior of the trapdoor. The brace has no effect on the plantar flexion during simulated ankle inversion while walking and thus the normal gait.

Study structure

controlled laboratory study

Methodology

Random sample:	n = 15 men, age: 25,7 ± 4,4 years
Test orthosis:	MalleoLoc® (Bauerfeind)
Measuring systems:	3D Kinematics (Vicon MX), Elektromyographie
Test method:	Participants were requested to walk with normal speed through the trap-door under braced and unbraced conditions. The procedure was repeated with and without anticipation of the (open or closed) door behavior. Muscle activity during activation (inversion phase) was recorded and M. Peroneus response compared under all conditions.
Inclusion criteria:	physically active men aged 18-35 years with unilateral chronic ankle instability (FAAM-G-Score < 95%)

¹ Hølmer P, Søndergaard L, Konradsen L, Nielsen PT, Jørgensen LN.

Epidemiology of sprains in the lateral ankle and foot. *Foot Ankle Int.* 1994 Feb;15(2):72-4.

² Leumann A, Frigg A, Valderrabano V (2009). Ligamentäre Instabilität am oberen Sprunggelenk.

In: Fuß & Sprunggelenk und Sport. Valderrabano V, Engelhardt M, Küster H.-H. (Hrsg.), Deutscher Ärzteverlag, Köln

³ Leumann et. al.

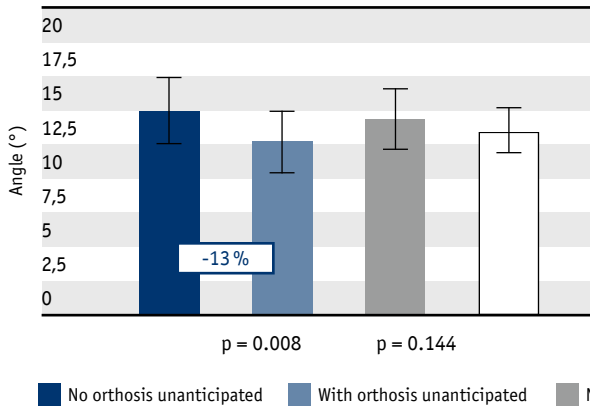
⁴ Hubbard TJ, Hicks-Little CA. Ankle ligament healing after an acute ankle sprain: an evidence-based approach.

J Athl Train. 2008 Sep-Oct;43(5):523-9.

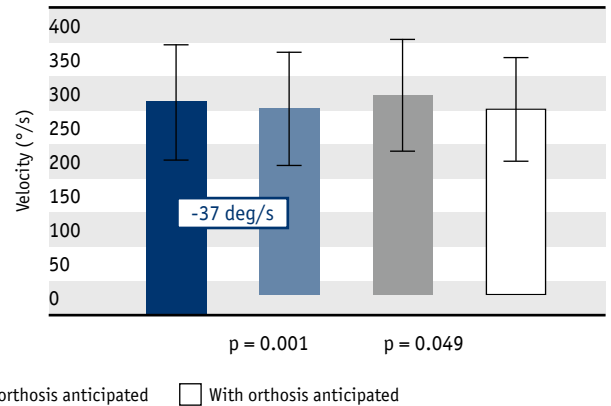
⁵ Leumann et. al.

Results (selection)

Peak ankle inversion



Max. velocity of inversion



A reduction of the peak ankle inversion is observed in all experiments. Without anticipating the trapdoor behavior, the inversion degree decreased significantly (Fig.1). Figure 2 shows a reduction of the maximum velocity of the joint inversion, which is more distinct without anticipation. The orthosis has no influence on the plantar flexion when simulating the ankle sprain movement during gait. The activation of the M. peroneus muscle was reduced by 10% under expected and by 14% in case of unexpected conditions after the inclination of the platform. The EMG amplitude in relation to the range of motion was not increased, since the activation of the M. tibialis was not changed by the MalleoLoc®.

Discussion

This study examines the role of MalleoLoc® during simulated ankle inversion taking the dynamic scenario into account. The simulation of movements similar to an ankle sprain in a functional situation is closer to the conditions that prevail in everyday activities and sports.

The measurements demonstrate that the MalleoLoc® orthosis restricts and slows the inversion movement and does not affect the normal gait. The limitations of the inversion speed and degree are referred to a decreased activity of the antagonistic muscles.

Although the load is much lower on the joint and the speed of movement during walking than during running or typical sporting activities, the study shows that the MalleoLoc® stabilizes the ankle joint and reduces the risk of damaging supination movements significantly.

⁶ Kerkhoffs GM, Rowe BH, Assendelft WJ, Kelly KD, Struijs PA, van Dijk CN. Immobilisation for acute ankle sprain. A systematic review. Arch Orthop Trauma Surg. 2001 Sep;121(8):462-71.

⁷ Jones MH, Amendola AS. Acute treatment of inversion ankle sprains: immobilization versus functional treatment. Clin Orthop Relat Res. 2007 Feb;455:169-72.

⁸ Handoll HH, Rowe BH, Quinn KM, de Bie R. Interventions for preventing ankle ligament injuries. Cochrane Database Syst Rev. 2001;(3):CD000018.

⁹ Verhagen EA, van Mechelen W, de Vente W. The effect of preventive measures on the incidence of ankle sprains. Clin J Sport Med. 2000 Oct;10(4):291-6.