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No negative effects of prophylactic ankle bracing after 6 months

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SUMMARY

Elastic adhesive bandages, tapes or ankle orthoses are very common for prevention of ankle sprains especially in team sports like handball, volleyball or basketball. In this study we used a controlled randomized trial design in order to investigate neuromuscular effects after 6 months of usage. For this biomechanical investigation a set of four functional test conditions has been studied and muscular activity patterns have been measured by surface electromyography (EMG) before and after about 6 months. No statistically significant differences have been found when comparing baseline and follow up values. It seems that there are no negative effects to the neuromuscular system after 6 months of using ankle stabilizers during training and competition.

INTRODUCTION

Effective prevention of sports injuries requires understanding of etiology and risk factors and development and evaluation of preventive measures. The effectiveness of prophylactic ankle stabilizers (PAS) e.g. bracing or taping has been proved by epidemiological approaches [2]. In biomechanical studies the immediate neuromuscular and mechanical effects of PAS have been investigated [1, 4]. Athletes or physiotherapists frequently argue that regular application of PAS over a long period could cause damage to the neuromuscular system or the passive structures of the ankle joint. Little is known about long-term effects of PAS. The aim of this study was to investigate neuromuscular long term effects of PAS in male players of team sports before and after 6 months.

METHODS

58 male athletes have been randomly assigned into a treatment group (TG) or control group (CG).



Figure 1: Ankle injury simulation during single leg stance by a custom made tilt platform (University of Freiburg, Germany) to induce 25° of Inversion and 15° of Plantarflexion.

Athletes with a history of ankle or knee injuries or regular usage of PAS during the last 6 months have been excluded. Athletes of the TG selected one of three different ankle stabilizers (table 2) and were instructed to use it only during

every training session and game for the next six months. Functional biomechanical testing included four different functional conditions:

- Treadmill (Zebris® FDM-T, Germany) walking (5 km/h) and running (10 km/h);
- ankle injury simulation by tilt platform (Figure 1);
- a series of drop jumps (Figure 2);
- Postural sway by single leg stance (GKS1000, Germany).



Figure 2: Drop jumps from 38 cm height. Touchdown was detected during landing using a Kistler® force plate type 9286AA.

Neuromuscular activation of four lower leg muscles has been evaluated by surface EMG (Noraxon Telemetry 2400 T G2). EMG has been recorded from the m. peroneus, m. tibialis ant, the m. soleus and the m. gastrocnemius medialis at 3 kHz.

All methods have been used and validated in previous studies. A pre-post ratio has been calculated for every variable and results are presented as mean ± one standard deviation for both groups. A pre-post-ratio of 1.0 indicates no differences whereas greater ratios indicate increased values and ratios lower than 1.0 can be interpreted as decreased parameter. Injuries have been recorded by weekly interviews.

Table 1: Sample size and description of the treatment group (TG) and the control group (CG)

N	Age (years)	Body weight (kg)	Body height (cm)
Treatment 30	26.0 (± 4.6)	83.6 (±12.1)	185.6 (± 9.8)
Control 28	24.1 (± 3.9)	83.7 (±10.8)	186.2 (± 8.1)

RESULTS

During walking and running the average activation of 30 steps has been analyzed, no statistically significant differences between pre – post measurements could be found. All subjects performed 6 drop jumps and the pre-activation of all muscles, recorded 50 ms before touch down, was not different before and after 6 months. The pre-

post ratio of neuromuscular activation during simulated ankle injury was calculated within the medium latency phase 60-120 ms after platform release, No differences could be found. The distance of centre of pressure pathway during single leg stance did not differ before and after the treatment phase and was not different between groups. The absolute number of ankle injuries in the PAS group was 6 and 7 in the control group. However four athletes of the TG did not use the ankle stabilizer when the injury happened and two of them suffered from severe contact injuries that could not be prevented by bracing.

DISCUSSION

Effects of long term use of PAS are still unclear and the rare literature findings are not consistent. In this study no neuromuscular effects during functional testing could be found after 6 months in a group of male team sport athletes. Acute mechanical and neuromuscular effects of ankle tapes are well documented [4]. The inversion velocity as well as maximum inversion ankle was significantly reduced. Long term effects are not documented extensively.

Gondin et al. [3] investigated the effect of 2 weeks of ankle joint immobilization on triceps surae neural activation, with particular emphasis on the potential differences between the monoarticular soleus and the biarticular gastrocnemius muscles. Only in soleus a reduction of 6% could be found whereas gastrocnemius muscle remained unchanged. However in our study no neuromuscular changes were found. It is questionable if the results from immobilisation studies can be directly compared to the data of this study because the ankle joint is not strictly immobilized by orthoses during training and competition. During all other activities of daily life no orthoses had been used, therefore it might be that the intervention period has been too short in order to find evidence for negative effects. Another limit of this study is the large dropout rate within both groups and it is suggested to use larger sample sizes in future studies. Further studies are needed to answer the question if an additional positive effect can be induced by additional sensorimotor training.

Table 2: three types of prophylactic ankle orthoses used in this study an number of athletes who decided to use it for 6 months

 <p>Active Ankle® used by 6 athletes</p>	 <p>McDavid® used by 19 athletes</p>	 <p>Otto Bock Rehaband® used by 5 athletes</p>
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Reference List

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