

# THE INFLUENCE OF SENSORIMOTOR TRAINING MODALITIES ON BALANCE, STRENGTH, JOINT FUNCTION, AND PLANTAR FOOT SENSITIVITY IN RECREATIONAL ATHLETES WITH A HISTORY OF ANKLE SPRAIN: A RANDOMIZED CONTROLLED PILOT STUDY

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## ABSTRACT

**Background:** Ankle sprains frequently result in persistent sensorimotor deficits. Sufficient evidence of effects of sensorimotor training using unstable devices on physical functions is lacking. There is no insight as to whether simultaneous tactile stimulation of plantar foot mechanoreceptors using textured surfaces may influence outcomes in people with a history of ankle sprain.

**Purpose:** The purpose of this study was to investigate the potential effects of sensorimotor training using unstable textured surfaces on balance, strength, joint function, and plantar sensitivity in recreational athletes with a history of ankle sprain.

**Participants:** Nineteen recreational athletes (6 females, 13 males; mean age:  $29 \pm 7$  years) with a history of ankle sprain and self-reported sensation of instability participated.

**Methods:** Self-reported function of the ankle joint, plantar cutaneous detection threshold to light touch, balance during single-leg stance as well as maximal isometric strength of the ankle joint in eversion and inversion were measured. Participants were randomly allocated to either a training group using unstable textured surfaces or a training group using unstable smooth surfaces or a control group. Outcome measurements were repeated after six weeks of training and at follow-up after 10 weeks. Within and between group differences were analyzed using ANOVA, Friedman tests, or Kruskal Wallis tests ( $p < 0.05$ ) and post-hoc tests with Bonferroni correction. Correlations between outcome-parameters from baseline measurements were analyzed using Spearman's rho ( $p < 0.05$ ).

**Results:** No significant between-group differences in all outcome measures were detected. However, a significant increase of strength in eversion was found for the training group using textured surfaces after 10 weeks ( $p = 0.01$ ). A moderate correlation existed between plantar detection threshold of metatarsal head (MT) I and strength of inversion ( $r = 0.51$ ,  $p < 0.05$ ) before training across all groups. There were moderate negative correlations between balance parameters and strength in eversion ( $r = -0.57$  –  $-0.64$ ,  $p \leq 0.01$ ) as well as plantar detection thresholds at MT V ( $r = -0.48$  –  $-0.62$ ,  $p < 0.05$ ) at baseline across all groups.

**Conclusion:** A six-week sensorimotor training using unstable smooth and textured surfaces demonstrated no significant differences in balance, strength in eversion and inversion, plantar foot sensitivity, and self-reported ankle instability between training groups and the control group in recreational athletes with a history of ankle sprain. A better score on balance testing seems to correlate with an increase in eversion ankle strength and a decreased plantar sensitivity at MT V.

**Keywords:** ankle; balance training; movement system; sensorimotor deficits; textured surface

**Level of Evidence:** Level IIb

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## Conflict of Interest Statement

The authors state that there are no known conflicts of interest associated with this publication and that there has been no financial support for this work that could have influenced its results.

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