

# THE DIFFERENCE OF THE BALANCE ABILITY BETWEEN THE FUNCTIONAL ANKLE INSTABILITY AND HEALTHY SUBJECTS

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**KEY WORDS:** ankle instability, center of pressure, EMG activity, brace

**INTRODUCTION:** Ankle inversion sprains are one of the most common injuries occurring in sports activities. Repeated ankle sprains may lead to chronic ankle instability. In order to prevent the occurrence of ankle instability, it is necessary to understand the difference in the physiological characteristics of the subjects who have chronic ankle instability and those who do not. However, there is little known about the differences between the two. It has been reported that there are two types of ankle instability: mechanical ankle instability (MAI) and functional ankle instability (FAI) which is the disability to which patients refer when they say that their foot tends to "giving way". In this study, we have attempted to uncover the difference in the center of pressure (COP) and muscle activities during a single leg standing between FAI subjects and healthy subjects with or without an ankle brace.

**METHODS:** Nine FAI male subjects and 13 healthy male subjects participated in this study. FAI criteria were according to the Karlsson's Scoring scale of ankle instability. All FAI subjects had experienced an ankle inversion sprain and they felt that they had ankle instability. The COP was measured by a force plate UM-BAR (Unimec Co., Tokyo, Japan) and the total length of COP trajectory was calculated. In the EMG measurement, the use of a surface electrode system aided EMG measurements- Personal-EMG (Oisaka electric Co., Fukuyama, Japan). The EMG system was used to measure the Normalized integrated EMG (IEMG) of the Peroneus longus (PL), Gastrocnemius (GC), and Tibialis anterior (TA) muscles. Both FAI and healthy subjects wore a custom made ankle brace (Asics Co., Kobe, Japan). This brace has a single axis joint to allow the ankle to have free planter-dorsal flexion yet prevented ankle inversion movements. The COP and muscle activities while standing on a single leg were compared between the FAI subjects and healthy subjects with or without the ankle brace. We used the non-paired t test to quantitate the COP deviation between the FAI and the healthy. The paired t test was used between the COP with the brace and without the brace in the FAI and healthy subjects. The Statistical significance level was set as 0.05 in this study.

**RESULTS:** The length of COP trajectory was larger in the FAI as compared with the healthy subjects with open eyes ( $p < 0.05$ ). The subjects with the brace showed the smaller COP deviation than those without the brace in healthy subjects ( $p < 0.01$ ), while no significant difference in FAI subjects was observed. EMG activity showed no significant difference between the FAI and healthy subjects. However, EMG with the brace had larger tendency than without the brace both the FAI and the healthy.

**DISCUSSIONS:** There is little known about the physiological characteristic differences in the subjects who have chronic ankle instability. It was not influenced by treatment after the injury, age, gender, and type of sports. Only body weight was a risk factor that could lead to recurrent ankle sprains. This study demonstrated the differences in FAI and healthy subjects. The FAI showed large COP deviation.

**CONCLUSIONS:** We confirm the Karlsson's Scoring scale was a reasonable choice for categorizing FAI subjects. Recently, many athletes use the ankle brace to prevent reoccurring sprains. This study showed the ankle brace has the effect to maintain the stability of the ankle and that; repeated occurrences of ankle sprains might lead to chronic ankle instability. This study is presenting preliminary results, we will need to continue to measure more subjects and compare many varied physical conditions.

## REFERENCE:

Karlsson, J. and Peterson, L. (1991). Evaluation of ankle joint function: the use of scoring scale. *The foot* 1(1):15-19