EFFECT OF DIFFERENT WEDGE CONDITIONS ON JOINT ANGLE CHANGES DURING SINGLE-LIMB STANCE

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INTRODUCTION

Wedged foot orthotics are widely prescribed to promote the mechanical alignment of foot joints. However, wedged orthoses can also affect lower limb proximal joints and axial segment as an effect of the weight-bearing closed chain. Therefore, the wedged orthoses prescription should consider the functional relationship between the foot and proximal segments [1]. Conversely, the effect of wedged orthoses on the lower limb proximal joints and axial segment alignment is still unclear. The purpose of this study was to assess the effect of different wedge conditions on angle changes in the subtalar joint, ankle, knee, hip, pelvis, and upper trunk.

METHODS

Fourteen able-bodied young male participated in this study. Participants were tested in single-limb stance under five wedge placements: no wedge (NW); anterior (AW); posterior (PW); lateral heel (LW); medial heel (MW). A Motion Analysis System using five cameras with EVaRT software was used to capture (3 trials of 60s each) joint angle in the trunk and pelvis in horizontal plane, ankle, knee, hip in sagittal plane, and subtalar and hip joint in the frontal plane.

RESULTS AND DISCUSSION

Two repeated-factor (wedge by joint) ANOVA revealed main effect of wedge condition ($F_{4,52}$=5.76, p=0.002). Protected t test comparison was conducted on the main effect of wedge condition to detect the significant difference between no wedge condition and the wedge conditions.

In horizontal plane, angle changes in the upper trunk were revealed for all conditions (AW>PW>LW>MW>NW), whereas in pelvis rotation (Fig. 1) were shown in AW and PW conditions (AW>PW>NW).

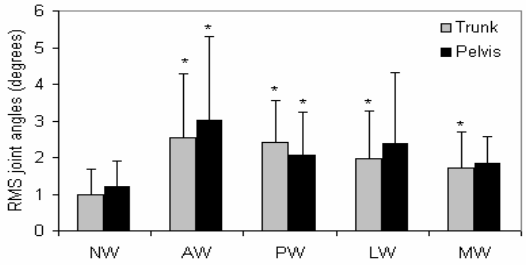

Figure 1: RMS value and standard deviation of upper trunk and pelvis in the horizontal plane across wedge conditions. *statistical difference compared to NW.
NW (no wedge), AW (Anterior wedge), PW (posterior wedge), LW (lateral wedge), MW (medial wedge).

In the sagittal plane (Fig. 2), ankle joint was affected by all wedge conditions (AW>PW>LW>MW>NW). Angle changes in the hip joint was shown in MW, LW and PW conditions (PW>MW>LW>NW) while knee joint revealed in LW (LW>NW) only.

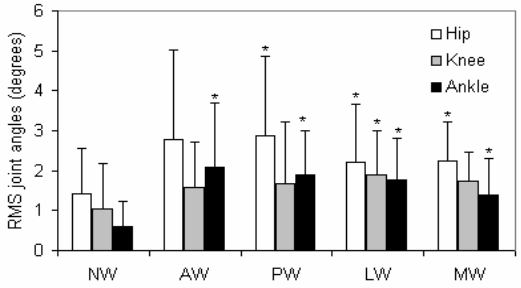

Figure 2: RMS value and standard deviation of hip, knee and ankle joints in the sagittal plane across conditions. *statistical difference compared to NW.

In the frontal plane (Fig. 3), the subtalar joint consistently exhibited angle changes for all wedge conditions (MW>PW>AW>LW>NW), while the hip joint in AW and MW conditions (MW>AW>NW) only.

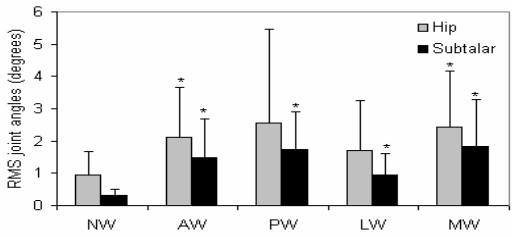

Figure 3: RMS value and standard deviation of hip and subtalar joints in the frontal plane across conditions. *statistical difference compared to NW.

CONCLUSION

Upper trunk, ankle and subtalar joint showed statistically significant changes regardless the wedge conditions. This shows the participation of different planes of movement to compensate a wedge placement. Furthermore, a particular wedge condition changes differently the especial proximal joints in a weight-bearing chain. Thus, it is essential to notice the effect of different posted orthotic on proximal joints and three planes of movement.

REFERENCE

1.Nicolopoulos C.S, et al. Biomechanical basis of foot orthotic prescription: Foot and ankle 2000; 14: 464-469.