

Effect Of Orthotics On Balance And The Muscle Activity Of Selected Leg Muscles During Bilateral Stance

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The purpose of this study was to investigate the effect of orthotics on balance and muscle activity of selected leg muscles during bilateral stance. The research design for postural stability values consisted of a one between (group) and two within (time and orthotic intervention) mixed design analysis of variance (ANOVA). The independent variables were: Group (control vs. malaligned), Time (initial and four-week testing session), and Intervention (orthotic and non-orthotic). The dependent variable was balance assessed as an equilibrium score (expressed as a percentage score). The research design for EMG consisted of a one between (group), and three within (time, orthotic intervention, and muscle) repeated measures ANOVA. The independent variables were: Group (control vs. malaligned), Time (initial and four-week testing session), Condition (orthotic and non-orthotic), and Muscle (tibialis anterior, gastrocnemius, and fibularis longus). The dependent variables were RMS amplitude, and activation duration. Tibialis posterior activity was obtained by indwelling, fine-wire electrodes, therefore a separate one between (group) and two within (time and condition) ANOVA was run for the tibialis posterior. An alpha level of $p \leq .05$ was considered to be statistically significant for all ANOVA. A Holm-Bonferoni post hoc analysis was performed when appropriate. Nineteen subjects, twelve males and seven females (age = 22.94 ± 3.35 years, wt = 77.28 ± 17.28 kg, ht = 174.16 ± 10.16 cm) were divided into two groups (control and malaligned). Inclusion criteria included navicular drop of 9mm or greater when moving from subtalar joint neutral position (STJN) to relaxed standing foot posture (RSFP), and rearfoot valgus of 5 degrees or greater. Subjects were fitted for orthotics in subtalar neutral position and impressions were sent to Foot Management Inc. (Pittsville, MD) for construction. Subjects were fitted for the semi-rigid orthotics, provided an adjustment period, and instructed to wear the orthotics 8-10 hr/day for 4 weeks. Subjects reported for testing on the NeuroCom SMART Balance Master (Neurocom Inc. Clackamas, OR) for two different occasions (Initial and 4 weeks after orthotic intervention). Three-20 sec, bilateral trials were completed for each test condition. Equilibrium scores increased from the initial test (88.63) to week four (90.5) following the orthotic intervention for the malaligned group in the eyes open static stance condition. Equilibrium scores were significantly higher for the control group (92.26) versus the malaligned group (89.34) for the eyes-closed sway referenced condition. The use of orthotics did not significantly affect the RMS amplitudes or muscle activation durations of the muscles tested. In conclusion, the use of orthotics may improve balance scores without affecting the way the muscles of the leg function.