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The Effect of Ankle Foot Orthotics on Collegiate Athletes' Sprint Biomechanics

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OBJECTIVE
Carbon composite dynamic response ankle foot orthotics (CCDRAFOs) are lightweight ankle braces originally made to help pathologically involved legs walk more efficiently¹. Since CCDRAFOs are traditionally not used on able-bodied individuals, there is limited information on the effects of CCDRAFOs on sprint performance of able-bodied athletes. However, the technology behind CCDRAFOs effectiveness has been suggested to have ergogenic aid properties²-⁵. This study’s purpose was to evaluate the effects of CCDRAFOs on collegiate athletes’ lower extremity biomechanics, specifically ankle and knee joint angles.

STUDY DESIGN AND SETTING
Healthy, pre-season, spring sport athletes from one, division II university ran sprints in an indoor fieldhouse.

PARTICIPANTS
Twenty-eight baseball (N=19; M=19.11 ± 1.05 years) and softball (N=9; M=20.11 ±1.27 years) players participated in this study.

INTERVENTION
Each athlete ran four 20-yard sprints on artificial turf. The athletes sprinted under the following four conditions: 1) no CCDRAFOs on, 2) a left leg CCDRAFO on, 3) a right leg CCDRAFO on, and 4) both left leg and right leg CCDRAFOs on.

MAIN OUTCOME MEASURE
The variables measured included ankle and knee joint angles. Multi- and univariate ANOVA’s were used to analyze the interactions between variables. Also, a post hoc Tukey test was completed.

RESULTS
Significant differences between the total maximum ankle plantar flexion and knee extension angles per body part, $F(1,124) = 225.98, p = 0.000, \eta^2 = 0.51$, and ankle dorsiflexion and knee flexion joint angles per body part were found, $F(1,124) = 660.85, p = 0.000, \eta^2 = 0.76$. A post hoc Tukey test revealed significant differences between the total maximum ankle plantar flexion and knee extension joint angles between wearing no CCDRAFOs and the CCDRAFO wearing conditions, $p < 0.05$. Ankle plantar flexion angles decreased significantly throughout the conditions, $F(3,107) = 35.39, p = 0.000$. Ankle dorsiflexion angles showed a general increase when comparing the conditions, but it was not found to be a statistically significant difference, $F(3,107) = 2.14, p = 0.099$. Knee extension angles decreased while knee flexion angles increased, although these changes in knee joint angles were not found to be statistically significant either, $F(3,107) = 1.09, p = 0.355$ and $F(3,107) = 1.67, p = 0.179$.

CONCLUSIONS
Wearing CCDRAFOs decreased maximal and overall ankle plantar flexion joint angles. While knee extension decreased and knee flexion increased overall while the athletes were wearing CCDRAFOs, these biomechanical changes were not effective in overcoming loss of ankle plantarflexion. As plantarflexion is critical in overall sprint performance⁶-⁸, the loss of plantarflexion by the CCDRAFOs hindered able-bodied athletes’ sprinting performance. Therefore, short-term use of CCDRAFOs does not improve able-bodied individuals sprint biomechanics.

KEY WORDS: Ankle Foot Orthotics, Sprint Biomechanics, Ergogenic Aid
REFERENCES


