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COMBINED EFFECTS OF A VALGUS KNEE BRACE AND LATERAL WEDGE ORTHOTIC ON DYNAMIC KNEE JOINT LOADING IN PATIENTS WITH MEDIAL COMPARTMENT KNEE OSTEOARTHRITIS

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Purpose: A number of conservative strategies are suggested to modify the external knee adduction moment and potentially decrease the rate of disease progression for patients with medial compartment knee osteoarthritis (OA). The aim of this study was to compare the effects of a custom-fit knee brace and foot orthotic, when used separately and together, on frontal plane lever arm and external adduction moment about the knee in patients with knee OA.

Methods: 11 patients completed three-dimensional gait analysis with an optical motion capture system. Using a balanced latine square design, all participants were tested in each of four conditions: (1) neither knee brace nor foot orthotic, (2) knee brace only, (3) foot orthotic only, and (4) knee brace and foot orthotic combined. Static lower limb alignment was measured using hip-to-ankle standing radiographs. The mechanical axis angle was compared between conditions when each participant wore both the knee brace and foot orthotic and without either intervention.

Results: Although differences between conditions did not reach statistical significance, the decrease in frontal plane lever arm with knee brace and foot orthotic together [mean decrease (95%CI) = 0.50 (−0.04, 1.05) cm] was greater than the decrease for knee brace [0.16 (−0.37, 0.60) cm] or foot orthotic [0.10 (−0.24, 0.44) cm] alone. Similarly, the decrease in peak knee adduction moment with knee brace and foot orthotic together [0.28 (−0.08, 0.65) %BWxHT] was greater than the decrease for knee brace [0.14 (−0.22, 0.49) %BWxHT] or foot orthotic [0.04 (−0.20, 0.28) %BWxHT] alone (Figure 1). There were no statistically significant differences in static alignment.

Conclusions: These findings suggest that some of the biomechanical effects of valgus bracing and lateral wedge orthotics may interact, and wearing both devices may provide greater benefits than either one on its own.

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PERTURBATION OF LOWER LIMB DURING DYNAMIC LOADING

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Purpose: Perturbation training programs have been shown to have positive therapeutic results in patients with knee osteoarthritis. Most programs are carried out during static movements on stationary balance boards. The benefit of perturbation training may improve if it can be carried out during dynamic loading activities such as walking. The purpose of this study was to determine if perturbation can be induced during walking.

Methods: Twelve healthy male volunteers were fitted with foot-worn devices to which two convex-shaped biomechanical elements can be attached at the soles (Figure 1) (AposTherapy System, Herzlia, Israel). The subjects were asked to walk in a gait lab under three conditions: (1) Device without elements, (2) Device with 9.2 mm high elements, (3) Device with 10.8 mm high elements. Kinetic and kinematic measurements were made during each walk using the Vicon motion analysis system. The standard deviations of the kinetic and kinematic measurements were recorded during walks in each condition and the changes in standard deviations were evaluated across the three conditions. An increase in perturbation was defined as a significant increase in the standard deviations of the measurements.

Results: Significant changes in standard deviations across the three conditions were observed in the peak ankle adduction moment (p = 0.034), peak knee flexion angle (p = 0.041), peak knee flexion moment (p = 0.049), peak hip adduction angle (p = 0.008) and peak hip adduction moment (p = 0.045).

Conclusions: The results of this study show that perturbation of the lower limb can be achieved during walking. This effect might enhance the current treatments for patients with knee osteoarthritis.