change in ground reaction force \((r = 0.63 \ p = 0.05)\), but not to change in knee adduction moment \((r = 0.12, \ p = 0.74)\).

**Conclusions:** These findings suggest patients with varus alignment and medial compartment knee osteoarthritis can experience substantial improvements in body composition and muscular strength, resulting in modest improvements in pain and function, without concomitant decreases in knee joint loading. Although potential decreases in internal loading not assessed with the present methods cannot be ruled out, these results are consistent with the major role that malalignment plays in dynamic loading of the medial compartment of the tibiofemoral joint. The findings also emphasize the potential benefit of supplementing programs that improve body composition with interventions intended to improve malalignment.

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**THE EFFECTS OF NORDIC WALKING POLES ON MECHANICAL KNEE JOINT LOADING IN INDIVIDUALS WITH MEDIAL COMPARTMENT KNEE OSTEOARTHRITIS**

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**Purpose:** Walking poles have become popular devices promoted to lessen the load on the knee while enabling increased physical activity. The purposes of this study were to (1) evaluate the effect of walking poles on the knee adduction moment in patients with knee OA compared to unaided gait, and (2) explore the effect of various pole-walking techniques. We hypothesized that using poles would decrease the knee adduction moment due to reductions in vertical ground reaction force, and that the degree of reduction would depend on the force and angle of the pole.

**Methods:** We assessed 3-dimensional kinematics and kinetics during walking of 34 patients with medial compartment knee OA. We randomly allocated the order of walking trials with and without poles and controlled walking speed to ±5%. We considered the knee adduction moment the primary outcome measure. We also analysed vertical ground reaction force, frontal plane lever arm, trunk lean, and the kinematics and kinetics of the pole at the time of first peak knee adduction moment. We evaluated changes with paired t-tests and 95% confidence intervals. We also explored the relationships among changes in knee adduction moment, sagittal plane pole angle and vertical pole force using Pearson correlation coefficients.

**Results:** There was a significant increase in first peak knee adduction moment \((2.88 \pm 0.79 \text{ vs. } 2.71 \pm 0.75 \text{BW*Ht}, \ p = 0.001)\) and impulse \((1.53 \pm 0.46 \text{ vs. } 1.37 \pm 0.42 \text{BW*Ht}, \ p = 0.001)\) with the poles. Although vertical ground reaction force decreased with poles at the time of first peak knee adduction moment \((0.99 \pm 0.09 \text{ vs. } 1.02 \pm 0.08 \text{ BW}, \ p = 0.015)\), lever arm increased \((5.27 \pm 1.45 \text{ vs. } 4.97 \pm 1.35 \text{ cm}, \ p < 0.001)\), likely due to a decrease in trunk lean \((0.12 \pm 0.70 \text{ vs. } 1.33 \pm 1.65 \text{ degrees, } \ p < 0.001)\). Change in first peak knee adduction moment was significantly correlated with the force applied through the pole in the vertical direction \((r = 0.34, \ p = 0.05)\), but not with sagittal plane pole angle \((r = 0.25, \ p = 0.16)\).

**Conclusions:** These results suggest walking poles cause a small increase in knee joint load (mean difference = 0.17%BW*Ht, 95% CI = 0.08, 0.27), despite a reduction in vertical ground reaction force. This increase may vary with how the force applied through the poles, suggesting that future research evaluating technique is warranted. Users of these devices should weigh the benefit of increased activity to the slightly higher knee joint load.

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**ASSOCIATION BETWEEN TRUNK CONTROL AND GAIT SPEED IN KNEE OSTEOARTHRITIS: A CROSS-SECTIONAL STUDY**


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**Purpose:** Knee osteoarthritis (OA) adversely affects walking ability in older adults more than any other diseases, and a constellation of OA-related physical impairments affects walking speed, in which knee pain, muscle weakness and loss of knee range-of-motion have been implicated. Thus far, no knee OA studies have investigated the role of trunk control – that is, the strategic posturing and re-positioning of the upper body – in influencing gait performance; yet, there are good neurobiomechanical reasons to think that trunk control may be an important correlate. The purposes of this study were (i) to determine the discriminatory ability of trunk control in assessing poor gait speed, and (ii) to evaluate whether trunk control was a multivariate predictor of gait speed, over and above the effects of conventional knee impairments in patients with end-stage knee osteoarthritis.

**Methods:** Eighty-four adults with end-stage knee osteoarthritis awaiting total knee replacement (mean age, 68 years) participated. Trunk control was quantified by the centre of pressure (COP) displacements during quiet sitting on a portable forceplate (Nintendo Wii Balance Board) placed on a height-adjustable plinth. The seated position was chosen to allow better isolation of the postural control of the lumbar spine from that of the lower limbs. Kinematic knee extensor strength was measured using an isokinetic dynamometer; knee flexion range of motion, an extendable goniometer; and knee pain, a numeric pain rating scale. Fast-paced gait speed was assessed by the 10-meter walk test and a poor gait speed was defined at a cutoff value of 1.0meter/second.

**Results:** Patients with poor gait speed had higher seated COP excursions compared with patients without poor gait speed (Table 1). The area under the receiver operating characteristic curve (ROC area) of the seated-balance measures ranged between 0.62 and 0.65 (Table 2). In the multivariable regression models, greater seated COP mediolateral excursions – but not anteroposterior excursions – were significantly, or nearly significantly \((P = 0.07)\) associated with slower gait speed (Table 3 & Figure 1).

**Conclusions:** The influence of trunk control on functional activities of the lower limb is a much discussed but seldom investigated concept. Our findings illustrate for the first time that in patients with knee OA, active trunk control – particularly in the frontal plane – influence gait performance. These findings are of importance in developing assessment and intervention strategies, but they call for further study. Additionally,