predictors of single limb standing balance in individuals with medial compartment knee OA. **Methods:** Fifty seven consecutive patients with radiographically-confirmed medial compartment knee OA underwent strength and balance testing of their diseased limb (most painful in cases of bilateral disease) during a single testing session. Lower limb alignment and radiographic disease severity (Kellgren and Lawrence (KL) grade dichotomized as mild (grade 2) or mod/severe (grades 3 and 4)) were also measured and participants completed the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) prior to testing. Maximal isometric torque of the hip and knee extensors as well as the hip abductors and adductors were measured with an isokinetic dynamometer (knee) or hand-held dynamometer (hip) and normalised to body mass (Nm/kg). For standing balance testing, participants were required to stand as still as possible on the affected limb for 10 seconds while centre of pressure (COP) data were collected from a force platform. An initial logistic regression was performed to identify differences between those who were able to perform three trials of balance from those who were unable. Multiple linear regression was also performed to identify anatomical and disease-specific predictors of total COP path length in those able to complete the three trials. **Results:** Thirty four participants (60%) were able to complete all standing balance trials, while twenty three were unable. Logistic regression indicated that only age and WOMAC pain were significant predictors of group classification (able/unable) with those participants able to complete the trials more likely to be younger (p = 0.04) and report less knee pain (p = 0.04). When examining standing balance data (n=34), our multiple regression model (Table 1) was able to explain 65.4% of the variance in COP path length with disease severity (p < 0.001), alignment (p = 0.03), and pain (p = 0.03) significantly contributing to the model. In particular, better standing balance (ie. smaller COP length values) was associated with more severe disease, less varus malalignment, and less pain. **Conclusions:** Whilst accounting for other independent variables, knee pain was a significant predictor of not only who was able to perform trials of single limb standing balance, but also the ability of those who could. Disease variables such as radiographic severity and lower limb alignment were also related to standing balance ability. Given the role of standing balance in physical functioning and risk for falls, balance training in those with knee OA should be conducted. Importantly, strategies targeting improvement of pain and malalignment should be advocated in this patient population.
the effect of a physiotherapy treatment on three-dimensional (3D) gait parameters of knee OA patients.

Methods: Three-dimensional knee kinematic and kinetic parameters were recorded during gait of 29 participants diagnosed with knee OA before and after they received 12 weeks of physiotherapy treatment. Kinematics data were obtained with an optoelectronic motion analysis system (Vicon 460, Oxford Metrics). Kinetic data were measured by Kistler force plates embedded in a treadmill (ADAL, Medical Development, France). The physiotherapy treatment included isometric quadriceps and hamstring strengthening exercises and was administered twice a week.

Statistical analysis: PCA was applied to extract clusters of knee flexion/extension, adduction/abduction and internal/external rotation angle and moment data. Parameters of interest were the peak and range values for angle data and the peak values and angular impulse (moment-time integrals) for joint moment data. The treatment’s effect on all parameters was assessed using paired t-tests on 1) the mean of the entire group data (n=29) and 2) the mean of each of the extracted OA clusters.

Results: Increased quadriceps and hamstring strength was observed after treatment (p<0.05). Except for the knee flexion/extension angle, two different clusters (C1 and C2) were extracted from the angle and moment data. When pre-post treatment analyses were performed on the clustered data, participants exhibiting a C2 knee moment pattern demonstrated a greater second peak flexion moment and lower adduction angular impulse post-treatment (p<0.05). Pre-post treatment comparisons for the entire group showed no treatment effect. Similarly, no effect was demonstrated in the C1 group.

Conclusions: The results indicate that the gait pattern of knee OA patients can be clustered with PCA. Low inter-subject variability in flexion/extension angle pattern may explain why the clusters for flexion/extension data were not different. The increase in lower limb muscle strength and knee extension moment observed following treatment may indicate that participants exhibiting a C2 gait pattern are more confident in using their quadriceps during the loading period of gait. The results of the present study suggest that the effect of increased isometric quadriceps and hamstring strength on gait mechanics may be masked if all participants are included in the mean when performing pre-post treatment comparisons.

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OBESITY AND BIOMECHANICS OF EVERY DAY MOVEMENTS: A SYSTEMATIC REVIEW

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Purpose: To give a systematic overview of the literature on the differences between obese and normal-weight subjects in biomechanics of the hip, knee and ankle during every day movements to summarize differences in joint load due to higher body weight and additional joint loads caused by differences in movement patterns.

Methods: A systematic search was performed in the Pubmed and Embase database up to April 2009. Search items included joints of interest, biomechanical items, every day movements (e.g. gait, posture) and population of interest (e.g. overweight, obesity). Studies had to be performed with 10 or more participants of 19 years or older, who did not suffer of any diseases affecting movement and describing biomechanical differences between obese and normal-weight subjects to be eligible.

Results: The search strategy resulted in 479 articles. After screening all articles on the inclusion criteria, 12 articles were eligible. Gait (8 articles)
Obese gait was consistently characterized by a significant greater step width (3 studies), shorter stride length (5 studies and no difference in 1 study), longer relative stance duration (5 studies), longer relative double support time (2 studies), shorter relative swing time (3 studies) and slower preferred walking speed (6 studies).

While walking at a slower speed, some clear (based on experimental protocol and consistency) differences between obese and normal-weight individuals were found. Knee adduction angle (1 study), ankle eversion angle (1 study), external foot rotation (3 studies) and absolute knee adduction moment (2 studies) were higher in obese individuals. Relative to body weight knee abduction moment was not significantly different (3 studies) and ankle inversion moment was (1 study). Inconsistent results were found for hip abduction angle (2 studies), plantarflexion angle (3 studies) and relative plantarflexion moment (2 studies).

Walking at standardized speed resulted in a higher ankle eversion angle (1 study), external foot rotation (1 study), absolute hip extension moment (1 study) and absolute knee adduction moment (1 study) in obese individuals. Hip extension moment relative to body weight was not significantly different (2 studies). Inconsistent results were found for hip, knee and ankle (plantar)flexion angles (2 studies) and knee and ankle (plantar)flexion moments relative to body weight (2 studies).

Sit-to-stand (3 articles)
Analysis of sit-to-stand movement in obese and normal-weight individuals consistently revealed different movement strategies between the two groups. Obese individuals initially moved their feet backward and had a significantly lower trunk flexion during rising. Hence, obese individuals show a lower hip flexion and higher knee extension moment relative to body weight.

Stair climbing (1 article)
The only study on differences between obese and normal-weight individuals during stair climbing found higher absolute mechanical power, lower velocity and lower mechanical power relative to body weight in obese compared to normal-weight individuals during stair climbing at maximal speed.

Conclusions: Because of a higher body weight, obese individuals suffer from higher loads on weight-bearing joints during every day movements. Besides that, these loads are altered in obese individuals, as shown by the higher joint moments relative to body weight, due to different strategies during walking and rising from a sitting position. Together with the rotation of the lower limb found during walking, this leads to higher loads on regions of the cartilage that are not conditioned to chronic ambulatory loading during these every day movements. This load shift has been associated with the initiation of osteoarthritis and may partly explain why obesity is a risk factor for the onset of osteoarthritis.