The changes in knee joint adduction moments were consistent with the changes observed in less severe OA (Figure 2), as were the changes in the sagittal plane moments.

**Conclusions:** This study shows that pain induced changes in knee joint mechanics during walking replicate changes observed in less severe patients. The experimental model may be used to study knee OA pathomechanics and possible preventive measures against abnormal joint loading in knee OA. It is suggested that pain management regimes be tested on the basis of their influence on knee OA pathomechanics.

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**RELATIONSHIP BETWEEN SUBMAXIMAL QUADRICEPS FORCE CONTROL AND JOINT LOADS DURING WALKING IN KNEE OSTEOARTHRITIS**

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**Purpose:** Knee joint biomechanics during walking is a well established factor in the pathogenesis of knee osteoarthritis (OA). In particular, the external knee adduction moment is related to presence, severity and progression of the disease. Also, neuromuscular dysfunctions, such as submaximal quadriceps force steadiness, have been reported in knee OA, and are suspected to have importance for the development of knee OA. Submaximal force control is important when performing activities such as walking, yet its relationship with joint mechanics during walking has not previously been investigated. Force steadiness is a commonly used way of quantifying submaximal force control, and is generally defined as the ability to produce and maintain a steady submaximal force output. The purpose of this study was to investigate the relationship between submaximal knee-extension force steadiness and external knee adduction moments during walking, and how radiographic disease severity influence this relationship.

**Methods:** 41 patients with knee OA (34 females∼83%) with mean (SD) age 62 y (6.9), body mass 87.9 kg (13.2), height 1.66 m (0.08), and BMI 31.9 kg/m² (4.2) were studied. Based on Kellgren-Lawrence (K-L) grading of standard weight bearing radiographs patients were classified as either “less severe”, K-L ≤2, or “severe”, K-L > 2. From standard 3D gait analyses, peak knee adduction mo-
ments were extracted and averaged across 5 trials. Gait analyses were performed barefooted at the patients' self-selected walking speed. Pain was registered using KOOS and a VAS scale. Isometric knee-extension force-steadiness was measured with patients seated with hips and knees flexed 90 degrees. A linear strain gauge attached to the patient's ankles measured knee extension force. The exerted force signal was displayed in real-time along with target forces of 20 and 50 N on a screen placed 1-m in front of the patients. The patients were required to produce and maintain the target forces as steady as possible. Force steadiness was expressed as the standard deviation of the force fluctuations (fig) and averaged over 5 trials. Pearson correlations were used to assess relationships between peak knee adduction moments and force steadiness. The independent relationship between force steadiness and adduction moments, and the impact of disease severity, were assessed by multiple linear regression analyses, with and without covariates (gender, age, pain, KOOS pain, BMI, height, walking speed).

Results: 23 patients (20 females—91%) had K-L≤2 and 18 patients (13 females—72%) K-L>2. Force-steadiness correlated with neither of the peak adduction moments (Fig. 1) The correlations remained non-significant when the patients were divided according to radiographic disease severity (fig). Regression analyses showed that force-steadiness did not predict peak adduction moments (adj. R²=0.03, P=0.28). Inclusion of covariates did not change the results (adj. R²=0.02, P=0.41).

Conclusions: We found no relationship between knee-extension force-steadiness and peak adduction moments, and the relationship was not influenced by radiographic disease severity. These data suggest that force control and joint loads during walking represent two distinctive factors, which may have independent influence on knee OA pathogenesis.

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INTERFERENCE OF CHANGES IN BODY WEIGHT ON THE WEIGHT BEARING OF DOGS WITH NATURALLY OCCURRING OSTEOARTHRITIS

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Purpose: Naturally occurring osteoarthritis (OA) is a common degenerative process in dogs leading to gait disability and functional impairment. Force platform gait analysis is the recognised gold standard to determine therapeutic efficacy in dogs with OA. However, the impact of an increase in body weight (BW) toward the functional outcome of OA dogs remains unclear. It was thought that normalizing peak vertical force (PVF) values relatively to the dog's BW (so PVF expressed in %BW) would allow counteracting any influence of BW change on PVF. Our goal was to evaluate the influence of a change in BW on PVF values in lame client-owned dogs. An increase in BW is hypothesized to induce a major bias on PVF recording (even expressed in %BW), a drawback particularly meaningful when performing clinical trials in dogs with OA.

Methods: Twenty-six lame client-owned dogs were evaluated. In all dogs, lameness was supported by orthopaedic examination performed by a board-certified surgeon and later confirmed by radiographic evidences of the elbow, stifle or hip OA. Force platform gait analysis was performed at Day (D) 0 at a constant velocity (1.9-2.2 m/s) and acceleration (0.5 m/s²). Abnormally low PVF generated by at least one limb was documented in all dogs. Following baseline data acquisition, dogs were fed a specific diet (supposed to have no effect on BW or PVF) until D30, and a different diet was given from D30 to D90 to induce increase in both BW and PVF. Gait analysis was also performed at D30 and at D90. Significance level was set at 5%. Data were expressed as mean (standard deviation).

Results: Although there was no significant change in PVF (P=0.05, ANOVA) values between D0 [63.9 (17.2)% BW], D30 [65.5 (17.4)% BW] and D90 [66.5 (20.1)% BW], a significant increase in BW was observed (P<0.001, ANOVA). Dogs had a significant increase in BW at D90 [41.3 (7.9) kg] when compared to D30 [39.9 (8.4) kg] and to D0 [40.0 (8.7) kg] (P<0.001). Figure 1 illustrates that the changes in BW against the changes in PVF during the D 30-90 period result in a significant negative correlation (P<0.001, Spearman correlation test). This indicates that an increase in BW potentially has a counter effect on an improvement of PVF, and vice-versa. In spite of PVF values already expressed in %BW, a significant effect of BW (P=0.013, ANCOVA) was recorded. In addition, adjusted PVF to BW resulted in values of 63.4 (17.1)% BW at D0, 65.0 (17.3)% BW at D30 and 67.6 (20.5)% BW at D90. Therefore, in contrary to the raw PVF values (i.e. uncorrected for BW), a significant increase in PVF (P=0.018, ANCOVA) was recorded between D0 and D90 when BW was considered a covariable in the ANCOVA analysis.

Figure 1. Change in body weight versus peak vertical force (D30 to D90 period).

Conclusions: This study demonstrated that a gain in weight was detrimental in dogs afflicted with OA and highlights the need to keep BW constant when using kinetic parameters to document treatment effects. These findings are inline with the deleterious gain in BW for joint integrity and joint support, and its potential to exacerbate lameness associated to OA.

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DIFFERENCES IN GAIT PARAMETERS BETWEEN HEALTHY SUBJECTS AND PERSONS WITH MODERATE AND SEVERE KNEE OSTEOARTHRITIS: A RESULT OF ALTERED WALKING SPEED?

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Purpose: While knee osteoarthritis has been shown to affect a multitude of kinematic, kinetic and temporospatial gait parameters, few investigations have examined the effect of increasing levels of radiographic osteoarthritis severity on these gait parameters. Fewer still have investigated the effect of walking speed on gait variables in persons with knee osteoarthritis. The objective of this study was to investigate the influence of walking speed on biomechanical variables associated with joint loading in persons with varying severities of medial compartment knee osteoarthritis.

Methods: Twenty-one persons with moderate osteoarthritis (Kellgren-Lawrence score 2-3) and 13 persons with severe os-