McMaster Universities Osteoarthritis Index- Pain sub-score. Isokinetic strength was measured with the *Biodex System III,* in a concentric/concentric mode at 60o/s. The range of motion for testing was pre determined from 20o to 80o.

Results: A factorial analyze was used to investigate the relation of pain, obesity and extension peak torque (PkT) (independent variables) on gait temporal parameters, and the maximum vertical force (N) of ground reaction forces (GRF-V) during heel-strike and push-off phases (dependent variables). PkT (N) was treated separately according to the most affected leg (MAL) and least affected leg (LAL).PkT, didn't influence gait temporal parameters, neither alone nor associated with pain or BMI. Pain and BMI only influenced stance and swing (% of stride), in the MAL, when associated together explaining 23,1% of stance (% stride) with a power of 99,3% ($F_{(9;\ 60)} = 4{,}432$; $p < 0{,}001$), and 23,2% of Swing (% stride) with a power of 99,3% ($F_{(9;\ 60)} = 4{,}438$; $p < 0{,}001$).During heel-strike, GRF-V, was explained by BMI in 55,5% ($F_{(4;\ 56)} = 3{,}427$; $p < 0{,}05$), with 66,5 of power; and PkT 56,6% ($F_{(3;\ 56)} = 4{,}756$; $p < 0{,}05$), with a power of 76%. No significant influence were observed in LAL.During the push-off phase, GRF-V was influenced by BMI 57,2% ($F_{(4;\ 56)} = 3{,}677$; $p < 0{,}05$) with a power of 70%, pain 52,8% ($F_{(3;\ 56)} = 4{,}114$; $p < 0{,}05$) with a power of 69,2%; and PkT explains 75,3% ($F_{(3;\ 56)} = 11{,}181$; $p < 0{,}01$) with a power of 98,8%.

Conclusions: No influence was observed between peak torque and temporal parameters. Neither pain nor BMI influenced gait temporal outcomes unless they co-exist together, subjects have to simultaneously have higher BMI and pain to manifest such alterations. Interestingly this influence was only observed in MAL. During heel-strike of MAL, GRF-V was explained in 55,5% by BMI alone, and 56,6% by PkT. Although these values are similar the confidence measured by power is higher in PkT corresponding to 74,8% (more 9,5% than BMI).

During push-off PkT was also found to be important. GRF-V during push-off was influenced 57,2% by BMI, 52,8% by pain and 75,3% by PkT (98,9% of power) independently.

While pain and BMI play an important role on gait temporal parameters quadriceps strength seems to have an important role in absolute maximum vertical force of ground reaction forces, during both heel-strike and push-off gait phases.

204
COMPARISON OF RANGE OF MOTION OF THE DISTAL LIMB JOINTS OF HEALTHY HORSES WHEN WALKING ON THREE CONVENTIONAL SURFACES

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Purpose: The horse is currently used as a model for the development, progression, and treatment of osteoarthritis (OA). In animal models, various exercise regimens have been used to promote OA development and establish rehabilitation protocols. However, there is a lack of knowledge on the effect of various footing surfaces on the range of motion (ROM) of distal limb joints that are commonly studied. The purpose of this study was to evaluate the range of motion of the carpus, tarsus, metacarpophalangeal (MCP), and metatarsophalangeal (MTP) joints of healthy horses when walking on soft ground, hard ground, and a land treadmill. We hypothesized that each surface will affect the range of motion of each joint differently, and soft ground will provide the greatest range of motion for all joints.

Methods: Nine sound adult Quarter Horses were used. Four retroreflective markers were affixed on the proximal interphalangeal joint, MCP/MTP joints, and mid-distal radius/tibia of the left forelimb and hind limb (markers placed here for future comparison to movement in an underwater treadmill) of each horse to track movement (Fig. 1a & 1b). Horses were filmed with a digital video camera from the left side of the horse at 60 frames/sec while walking on soft ground (arena, SF), hard ground (cement, HD), and on a land treadmill (LT). Ten complete strides were videotaped without interruptions on each surface (velocity of 0.9-1.7 m/s ± 10% acceleration). The 2-D palmar angles of the carpus and MCP, dorsal angle of the tarsus, and plantar angle of the MTP (Fig. 1a & b) were calculated for each joint in each surface (5 strides per surface) using DMAS Equine Gait Trax system (Motion Imaging Corporation). For each stride, the maximal and minimal joint angles and overall ROM were calculated. Differences between surfaces were determined using ANOVA with multiple pairwise comparisons (Tukey's), and significance was set at $P<0.05$.

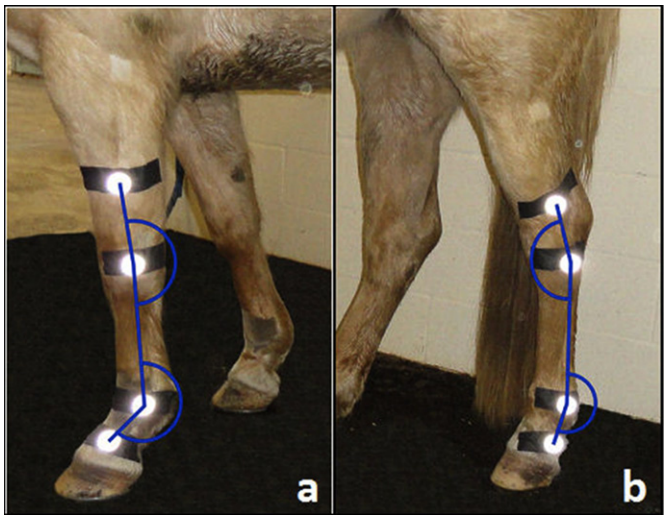
Results: Maximal flexion for all joints was attained when horses were walked on LT, although no significant differences were found between surfaces.

Maximal extension of the carpus was significantly greater when horses were walked on HD [183.2 ± 1.6 (mean degrees ± SD)] compared to SF (181.0 ± 1.5; $P<0.05$) and LT (180.1 ± 1.5; $P<0.01$). The tarsus achieved the greatest extension when walking on HD, and the MCP/MTP joints when walking on LT, although no statistical differences were found between surfaces.

ROM for the tarsal joint was significantly greater when horses walked on SF (39.1 ± 5.5) compared to HD (33.7 ± 3.9; $P<0.05$). ROM of the MTP joint was greater when walking on LT (77.0 ± 9.4) compared to both HD (65.4 ± 5.6; $P<0.05$) and SF (67.8 ± 7.5; $P<0.05$). The carpal and MCP joints had the greatest ROM when walking on LT, although no statistical differences were found between surfaces.

Conclusions: Walking surface (soft, hard and land treadmill) influences the flexion and extension of the distal limb joints to a different extent. Therefore, this data should be considered when designing exercise or rehabilitation programs for horses used in OA studies depending upon the joint of interest.

Figure 1: Photographs showing retroreflective markers on the fore (a) and hind (b) limbs of a horse. Measured angles are represented.



205
EFFECT OF CORONAL-PLANE FOOT CENTER OF PRESSURE MANIPULATION ON HIP JOINT BIOMECHANICS DURING GAIT

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Purpose: Manipulation of foot center of pressure (COP) influences knee mechanics and gait patterns in healthy subjects. Footwear allowing change in COP may reduce pain and increase functionality and quality of life in knee OA patients by unloading the diseased joint compartment and provoking more normal gait. There is a lack of controlled trials assessing effects of footwear used to treat OA on the hip. The goal of this study was to establish a relationship between specific coronal-plane COP changes and resulting gait parameters associated with the hip in healthy subjects, and to provide a foundation for future study in the hip OA population. We hypothesized that coronal-plane shift of COP would significantly affect gait parameters associated with the hip.

Methods: Ten healthy young males underwent gait analysis in a lateral COP (L-COP) and medial COP (M-COP) condition. COP was manipulated using a novel biomechanical device (Apos System) (Figure 1). Dependence of coronal-plane kinematics and kinetics on COP location was determined using Wilcoxin signed ranks tests ($p<0.05$).

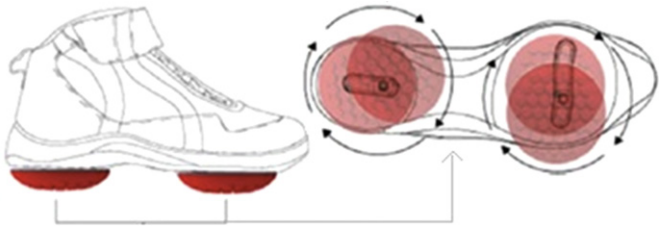

Figure 1: COP manipulation was accomplished using a platform in the form of a shoe in which 2 adjustable convex-shaped biomechanical elements are attached to the feet by means of a shoe sole specially designed with 2 mounting rails. One element is located under the hindfoot and the other under the forefoot, enabling continuous positioning of each element in multiple planes.

Results: Peak one of stance phase external adduction moment was not significant, however adduction angle at the time of peak moment decreased 115% (p=0.008) from L-COP to M-COP. In addition a significant correlation was found between peak one of the adduction moment and the associated adduction/abduction angle (p=0.005, r=0.81). Peak stance phase adduction angle decreased 106% (p=0.012) from L-COP to M-COP (Table 1).

Table 1
Mean(SD) of coronal-plane gait kinematics [o] for L-COP and M-COP.

	L-COP	M-COP
Adduction/Abduction Angle@ Pk 1 Adduction Moment	3.62(3.23)	-0.56(10.78)
Peak Adduction Angle	3.88(3.13)	-0.22(10.55)

Conclusions: In accordance with our hypothesis, coronal COP manipulation significantly altered gait parameters associated with the hip. The results may have clinical implications for hip OA. Hip OA patients may walk with decreased external adduction moment, which may reduce load on the joint. In addition they may shift their center of mass over the affected joint in an effort to compensate for weak abductor muscles, better support the load, and avoid pain. These gait compensations may be implemented at a cost of an asymmetric gait that is detrimental to other joints of the trunk and lower limbs. A decrease in adduction angle was observed with a medial COP and was significantly correlated with decrease in peak one of the adduction moment. Thus, it is possible that a medial COP may provoke a more normal gait by supporting the patient during gait, providing more stability, and reducing pain. In later stages of rehabilitation, it may be beneficial to adopt a lateral COP which may provoke gait that more closely resembles gait of healthy subjects by increasing gait parameters that are decreased due to pathology. This remains to be shown in hip OA patients.

206
A NEW NON-INVASIVE BIOMECHANICAL THERAPY FOR KNEE OSTEOARTHRITIS IMPROVES CLINICAL SYMPTOMS AND GAIT PATTERNS

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Purpose: The management of knee osteoarthritis (OA) focuses on reducing the levels of pain and disability. Recently, a novel biomechanical device and treatment methodology (AposTherapy) was shown to reduce knee adduction moment while simultaneously challenging the neuromuscular control system through perturbation. The purpose of the study was to investigate the changes in gait patterns and clinical measurements following treatment with a novel biomechanical device on patients with knee OA.

Methods: 745 patients with bilateral knee OA were analyzed. Patients completed a gait test, Western Ontario and McMaster Osteoarthritis Index (WOMAC) questionnaire and SF-36 Health Survey at baseline and after 12 weeks. The biomechanical device was individually calibrated to each patient. Shifting the center of pressure, through changes in the location of the biomechanical elements causes realignment and reduction in knee adduction moment.. Furthermore the configuration of the biomechanical element allows training under controlled perturbation.

Results: A significant decrease was found in WOMAC pain (28.6%) and WOMAC function (25.2%) following three months of therapy ($p<0.001$). A significant increase was found in the patients' physical quality of life (17.8%) and mental quality of life (11.0%) ($p<0.001$). Gait velocity, cadence step length, stance phase and single limb support phase improved significantly following three months of therapy (7.6%, 4.0%, 3.7% and 1.6%, respectively).

Conclusions: Our results suggest an overall improvement in the gait patterns, level of pain, function and quality of life of patients with knee OA following three months of AposTherapy.

207
A NON-INVASIVE TREATMENT (APOSTHERAPY) ACCELERATES THE REHABILITATION TIME OF PATIENTS FOLLOWING TOTAL HIP ARTHROPLASTY. A PROSPECTIVE STUDY

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Purpose:Patients following total hip arthroplasty often do not restore normal gait patterns not do they return to normal levels of pain, function and quality of life. The purpose of the current study was to examine the effect of a new biomechanical rehabilitation therapy on the clinical measurements, gait patterns and gait symmetry of patients with total hip arthroplasty

Methods: Nineteen patients who were an average of 3 months post total hip arthroplasty were enrolled to the study. Patients underwent a computerized gait analysis and a time up and go test. Patients were also asked to complete the Western Ontario and McMaster Universities osteoarthritis index and the SF-36 health survey. Patients then began therapy with a non-invasive biomechanical device coupled with a treatment methodology (AposTherapy) that allows patients to exercise under reduced loads and promotes perturbations throughout the step cycle. Follow-up examinations were conducted after 4, 12 and 26 weeks of therapy.

Results: After 26 weeks of therapy a significant improvement was seen in most gait parameters, including velocity (50.3%), involved step length (22.9%) and involved single limb support (16.5%). A significant improvement was also found in the self-evaluation questionnaires, including a significant reduction in pain (85.4%) and improvement in function (81.1%) and quality of life (52.1%).

Conclusions: Based on the results of this study, the application of such a therapy should be considered in the rehabilitation of patients following total hip arthroplasty.

208
RELATIONSHIPS BETWEEN DEGENERATIONS OF ANTERIOR CRUCIATE LIGAMENT AND OSTEOARTHRITIS

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Purpose: To find out the relationships between the degenerations of anterior cruciate ligament (ACL) and cartilage of femur condyle.

Methods: Test 1: Immunohistochemical assay of asporin in the ACL of aged patients with knee osteoarthritis (OA) and young people without knee disease in Chinese Han population. Test 2: Measurement of varus angles of knees in 15 patients with ACL injury when they were taking a weight-bearing positions radiograph of the entire lower extremity. Test 3: Measurement of telomere lengths of medial femoral condyle, lateral femoral condyle and ACL by southern blot in the suffered knee of 6 knee osteoarthritis patients.

Results: Immunohistochemical studies of ACL revealed that aged patients with knee osteoarthritis showed higher expression levels of asporin than young people without knee disease. In 14 of 15 ACL rupture patients, the injured knee showed higher varus angle than the unharmed knee in the weight-bearing positions radiograph of the entire lower extremity; in one