and 4.2% in the ECC RX, CONC RX and CON, respectively. The Functional subscores decreased by 31.0% (ECC RX), 34.7% (CONC RX) and 8% (CON). The changes in the NRSpain ratings reported by participants during chair rise and stair time tasks were not significantly different between groups by week 16. Pain decreased by 32% (CONC RX) and 52% (ECC RX) in chair rise and by 50% (CONC RX) and 34% (ECC RX). The CON group pain increased 30% in chair rise and decreased 35% in stair climb.
Chair rise time, stair climb time and walking endurance were not different between groups over time. Daily steps were measured using a seven day StepWatch® monitoring of ambulatory activity. The six minute walk distance did not significantly improve over time; but peak walking pain decreased from 2.9 to 1.5 points in CONC RX and from 1.7 to 1.1 points in ECC RX by week 16. There was a faster weekly program progression with CONC RX versus ECC RX in leg press and leg curl, but not leg extension exercise. Attrition rates were the same for the three groups (~33%). Adverse events were higher with ECC RX when compared to CONC RX and were related to musculoskeletal discomforts and pain (CONC RX=2, ECC RX=8).
Conclusions: Both modes of RX improved physical function and leg strength in persons with knee OA. Due to the slower progression in the ECC RX program and potential for higher musculoskeletal discomforts, it may be recommended to use CONC RX until prescriptions for ECC RX are optimized for patient comfort.

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GAIT AND CLINICAL IMPROVEMENT WITH A NOVEL KNEE BRACE FOR KNEE OA

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Abstract
Introduction: Knee osteoarthritis causes debilitating pain and structural deformity, resulting in characteristic gait changes, including decreased peak flexion angles, increased knee flexion angle at heel strike, decreased cadence and walking speed, as well as increased adduction moments. Some authors believe that a system of neuromuscular retraining may improve these parameters. We therefore evaluated a novel brace that combines pneumatic joint unloading and active swing-assist to assess whether usage compared to a matching group of knee osteoarthritis patients led to: (1) differences in pain levels or medication usage; (2) reductions in additional interventions such as injections or progression to total knee arthroplasty; (3) changes in quadriceps muscle strength; and (4) improvements in specific gait measurements after a minimum of three months of use.
Patients and methods: A prospective pilot series of 10 knee osteoarthritis patients who had exhausted other non-operative treatment measures were enrolled to wear the brace a minimum of 30 minutes 3 times per day. These patients were compared to the previous 15 knee osteoarthritis patients who met similar criteria, but who did not receive the brace. All patients had less than 10 degrees of varus or valgus deformity. Quadriceps muscle strength was measured, as were pain levels using a visual analog pain scale, and additional interventions such as injections or total knee arthroplasty procedures.. Gait parameters measured included: walking speed, total range-of-motion, knee flexion at foot-strike, and knee adduction moment.
Results: Of the compliant patients, all but one reported a decrease of at least two pain points after three months of use. There was one additional intervention in the brace cohort versus a statistical increase of 10 additional interventions in the non-brace cohort. All patients who were compliant with the brace showed an increase in thigh girth measurements, compared to none in the non-brace cohort. Braced patients experienced retained improvements in at least one gait parameter including improved walking speed, total range of motion, and improved knee angle at heel strike. The mean improvement in knee adduction moment was a decrease of 0.2255 Nm/kg (range, 0.56 to 0.564 Nm/kg), showing a mean improvement of 48% (range, 16 to 76% of original peak moment).
Conclusions: The use of a brace that has features including a combination of unloader characteristics along with active swing-assist, provided neuromuscular retraining benefits for patients who have knee osteoarthritis. In summary, although quite encouraging, future larger scale and prospective randomized studies need to assess the potential benefits of this brace for treating knee osteoarthritis.
Level of Evidence: Level II

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DOES SELF-REPORTED KNEE INSTABILITY CORRELATE WITH BIOMECHANICAL OR NEUROMUSCULAR PERFORMANCE CHARACTERISTICS DURING KNEE JOINT LOADING IN PATIENTS WITH KNEE OSTEOARTHRITIS?

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Purpose: Patients with knee osteoarthritis (OA) often complain of knee instability (buckling, shifting or giving way) which is disabling for the patient and leads to excessive shear forces that are detrimental for further damage of the cartilage. Objective biomechanical characteristics associated with self-reported knee instability are needed to develop strategies oriented to decrease knee instability in those patients. Therefore, the aim of this study was to investigate the joint kinematics, kinetics and muscle activation patterns in patients with knee osteoarthritis (OA) during a stepping-down task, and to assess their associations with self-reported knee instability.
Methods: 13 patients with knee OA (age 68.2±3.5 years) and 10 healthy controls (68.3±6.3 years) performed a stepping-down task (3 times, 20cm box). None of the controls, but 4 (31%) of the patients with OA reported at least one episode of knee instability in the past three months. 3D motion analysis (Vicon) combined with surface electromyography (Zerowire, Aurion) was used to capture the movements. Knee joint kinematics and kinetics were analyzed at the peak knee flexion angle (PKFA) of the stance phase on the stepping-down leg. Muscle activity (Root Mean Square) was analyzed 50 milliseconds (ms) before and after the PKFA during joint loading. All parameters assessed were compared between patients with knee OA and control subjects. Additionally, the associations of knee joint kinematics, kinetics and muscle activity with self-reported knee instability were analysed. The statistical analyses were carried out using t-tests.
Results: Patients with knee OA showed greater vastus medialis (VM) activity compared with control subjects (p=0.02) 50ms post PKFA. Within the group with knee OA, 50ms pre PKFA patients with self-reported knee instability exhibited lower medial hamstring (MH) activity (p=0.04) and tended to have lower co-contraction of the vastus medialis-medial hamstrings (VMMH)(p=0.08) compared with patients without instability. There were no significant differences in kinematics and kinetics at the PKFA between control subjects and patients with knee OA, or between patients with and without self-reported knee instability.
Conclusions: The larger activation of VM 50ms after PKFA during the knee joint loading found during the stepping-down task in the whole group with OA corresponds with previous findings in patients with knee OA during stance, and during stair descent and ascent tasks. This altered movement strategy might suggest an intent to compensate greater medial knee laxity, usually present in this group of patients, or a less efficient use of the knee extensor muscles (less force per unit of EMG). Interestingly, patients with self-reported knee instability showed significantly lower MH activation and a borderline significant lower co-contraction of the VMMH prior to the deepest flexion point compared to "stable" patients. Lower MH muscle activation while joint loading might be considered a risk factor for dynamic joint instability in OA. These preliminary results suggest that assessing neuromuscular control during a stepping-down task might be useful to objectively identify knee instability in patients with knee OA. However, further research in a larger sample population is needed to confirm this altered MH activation and its implications for therapy.

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THE RELATIONSHIPS BETWEEN STRENGTH, POWER, AND PHYSICAL FUNCTION IN OLDER ADULTS WITH KNEE OSTEOARTHRITIS

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Purpose: Knee osteoarthritis (OA) is a significant cause of pain and disability in older adults. Age-related declines in muscle strength and power are exacerbated in patients with knee OA, and muscle weakness contributes to the decline in physical function associated with the disease. Traditionally, rehabilitation of knee OA has focused on

improving muscle strength. However, this approach has yielded only moderate improvements in pain and function. Muscle power, the product of force and velocity, is an important aspect of muscle performance that is critical for the performance of functional tasks. However the relationships among strength, power, and function in people with knee OA is unknown. Therefore, the purpose of this study is to quantify the relationship between physical function and lower extremity muscle 1) strength and 2) power, as well as the components of power (force and velocity).

Methods: Thirteen individuals (12F, 1M; 59.08±11.26yrs; 1.66±0.061m; 89.04±14.28kg) with physician-diagnosed knee OA participated. Physical function was assessed by the function subscore of the Western Ontario McMaster Osteoarthritis Index (WOMACf), along with the Get Up and Go (GUG), ascent and descent of 8 stairs (STAIR), and timed chair rise x 5 (CHAIR). Functional tasks were timed and recorded in seconds. Strength was determined as the one repetition maximum (1RM) during the leg press exercise. Power and its components (force and velocity) were determined at 40, 50, 60, 70, 80, and 90% of 1RM. During power testing, individuals were asked to perform the leg press as fast as possible during 3 individual repetitions at each load. Maximum values for force, velocity, and power were found during each trial, with the maximum values across all loads being used for analysis. Pearson Product Moment Correlations were used to assess relationships among 1RM, power, force, and velocity, and functional outcomes. Partial correlations were then used to assess the relationships while controlling for the influence of strength.

Results: Mean and range values were computed for physical function assessments (WOMACf mean = 30.54, range = 15-46; GUG mean = 11.43, range = 7.14-19.54; STAIR mean = 17.46, range = 8.5-45.71; CHAIR mean = 14.62, range = 7.03-23.66). 1RM was not significantly correlated with WOMACf, GUG, STAIR, or CHAIR. Maximum power was associated with the time needed to complete the GUG(r=-.636, P=.019), such that higher power was associated with faster performance. Maximum velocity was associated with the time to complete the GUG (r=-.601, P=.030) and CHAIR (r=-.600, P=.030). Maximum force during the power tests did not significantly correlate with any measure of physical function. After controlling for strength, the association between maximum power and the time to complete the GUG remained (r=-.627, P=.029), as did the association between maximum velocity and CHAIR (r=-.607, P=.036). No other partial correlations were significant.

Conclusions: In this small sample, strength and maximum force did not correlate with any measures of physical function. However, the negative correlations between maximum power and GUG, and between maximum velocity and STS, indicate that as power and velocity increase, the time needed to complete the functional tasks decreased. These associations remained strong even after accounting for strength. These results suggest that lower extremity muscle power is more closely related to function than is muscle strength. Furthermore, they suggest that improving strength alone may not be most beneficial at improving physical function in patients with knee OA. Interventions specifically designed to improve lower extremity muscle speed and power, rather than strength, may be more advantageous in improving overall physical function.

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RELATIONSHIP BETWEEN KNEE CONFIDENCE AND PHYSICAL FUNCTION IN PEOPLE WITH KNEE OSTEOARTHRITIS AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

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Purpose: Post-traumatic knee osteoarthritis (OA) is common after anterior cruciate ligament reconstruction. For individuals with OA after anterior cruciate ligament reconstruction, low knee confidence may be related to physical function. Knee confidence can be assessed with the Knee Injury and Osteoarthritis Outcome Score (KOOS) using a question concerning how much the individual is troubled by lack of confidence in their knee. Kinesiophobia, or fear of re-injury due to movement, has been reported to be lower after anterior cruciate ligament reconstruction, but no studies have evaluated this in those with post-traumatic knee OA.

AIMS: This study aimed to: (i) evaluate knee confidence and kinesiophobia in people with and without OA after anterior cruciate ligament reconstruction; and (ii) investigate the relationship between knee confidence and physical function in those with OA after anterior cruciate ligament reconstruction.

Methods: 50 participants, 5 - 12 years post anterior cruciate ligament reconstruction: 30 participants (14 male, 16 female, age 45 ± 11yrs, height 172 ± 8cm, and body weight 78 ± 14kg) with radiographic OA; and 20 people without OA (14 male, 6 female, age 40 ± 8yrs, height 171 ± 8cm, and body weight 79 ± 15kg). All participants completed the knee confidence question from the KOOS. All participants with OA also completed the KOOS-ADL to evaluate patient -reported function, the Tampa kinesiophobia scale, and physcial performance on three functional tasks (hop for distance, one leg rise, side to side hop test).

Results: People with knee OA after anterior cruciate ligament reconstruction had significantly worse knee confidence (p=0.014) and kinesiophobia (p=0.006) than those without OA. Lower knee confidence was associated with lower score on the KOOS-ADL and Tampa kinesiophobia scale, and reduced performance on the hop for distance (p=0.007), one leg rise (p=0.002) and the side to side hop (p=0.002) tests

Conclusions: Individuals with knee OA following anterior cruciate ligament reconstruction reported lower knee confidence than those without and lower knee confidence was associated with poorer self-reported and performance-based function. While the temporal relationship between knee confidence and function needs to be confirmed in future studies, it appears that addressing deficits in perceived confidence may aid in increasing functional performance.

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PATIENT-REPORTED OUTCOME SCORES FOR HIP ARTHROSCOPY DEMONSTRATE ADEQUATE PSYCHOMETRIC PROPERTIES

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Purpose: Hip arthroscopy is a relatively new procedure, commonly used to treat intra-articular hip pathology including early hip osteoarthritis. Patient reported outcomes (PROs) are considered to be the gold standard when evaluating outcomes in such surgical populations, yet the psychometric properties of commonly used PROs in people undergoing hip arthroscopy have not been established. Therefore the aim of this study was to evaluate the reliability, validity, acceptability and responsiveness, and determine the minimal clinically important change (MCIC) of five PROs which are commonly used for hip arthroscopy. PROs evaluated included the Copenhagen Hip and Groin Outcome Score (HAGOS), Hip Osteoarthritis Outcome Score (HOOS), Hip Outcome Score (HOS), International Hip Outcome Tool (iHOT-33) and Modified Harris Hip score (MHHS), in a hip arthroscopy population 12-24 months post arthroscopy.

Methods: Adults aged 18-60 years who had undergone hip arthroscopy 12-24 months previously (age 37±11 years; height 1.74±0.10 metres (m); weight 76±12 kilograms (kg); body mass index (BMI) 26.5±7.9 kg/m^2); and age-matched controls (age 35±11 years; height 1.71±10 m; weight 68±13 kg; BMI 23.2±3.6 kg/m^2) participated in this study. Questionnaires were completed on one occasion by both groups; on a second occasion by the hip arthroscopy group 3 to 10 days later to determine test-re-test reliability; and on a third occasion by the hip arthroscopy group 9 to 12 months later to determine responsiveness and calculate the MCIC. Those in the reliability and responsiveness arms were blinded to the results of the original questionnaires. Test-retest reliability (ICC) and standard error of measurement (SEM) of each PRO was evaluated, as well as content and construct validity of each PRO. The minimal detectable change (MDC), ability to detect a difference between groups, and acceptability (floor and ceiling effects) of each measure was calculated. Furthermore, the responsiveness of each measure was calculated and the MCIC determined.

Results: The test-retest reliability of all PROs was excellent (ICC 0.91 to 0.97), with the SEM less than 7% (range = 3.0-6.9%) and the MDC less than 20% (range = 8.3 - 19.1%). The construct validity of all PROs was acceptable. The content validity of the PROs was varied, with only the HOOS, HAGOS and iHOT-33 having known acceptable content validity. All PROs demonstrated a high ability to detect a difference between the hip arthroscopy and control groups. No measures demonstrated a floor effect; however the MHHS, as well as subscales relating to ADL of the HOOS, HOS and HAGOS, demonstrated ceiling effects. The HOOS, iHOT-