Abourezk MN, Ithurburn MP, Mcnally MP, et al. Hamstring Strength Asymmetry at 3 Years After Anterior Cruciate Ligament Reconstruction Alters Knee Mechanics During Gait and Jogging. Am J Sports Med. 2017;45(1):97-105.

Review Submitted by: Scott Resetar, PT, DPT

Objective: To determine if hamstring strength asymmetry caused by ACL reconstruction using hamstring tendon autograft has a long term effect on knee mechanics during gait and jogging.

Methods: N= 45, 22 male, 23 female, all at least 2 years post ACLR. Inclusion criteria = 18-35 years old, self identify as having been injured playing a sport, no history of surgery on contralateral knee, no greater than grade 2 sprain of the MCL, LCL, or PCL at the time of surgery, no other surgeries on the knee during follow up period. Exclusion criteria = pregnancy, or being deemed inappropriate to participate in hopping activities after examination by the surgeon, any health condition that would preclude physical activity.

All participants had peak knee flexion torque during MVIC tested for hamstring strength, and peak knee extension torque during MVIC tested for quad strength. A Limb Symmetry Index (LSI) was calculated for each persion. LSI = involved lumb peak knee flexion torque/ uninvolved limb, where 100% = perfectly symmetrical strength. Participants were then subdivided into a symmetrical hamstring (SH) group (LSI > 90%, n= 21) and an asymmetric hamstring (AH) group (LSI <85%, n=19). Five patients had LSI's between 85% and 90%, and their testing data was not included in the final analysis.The athletes then did walking and jogging trials on force plates with a ton of bioreflective markers and had all variables measured such as peak knee angles and moments for IR, knee ER, abd, add, flexion, and extension angles during initial contact, weight acceptance, midstance, push off, and toe off.

Results: Final analysis included 18 participants in each group due to marker malfunctions. Participants with hamstring strength asymmetry demonstrated lower peak tibial internal rotation on the involved leg during gait and greater peak tibial external rotation on the involved leg during jogging compared with those in the same cohort with symmetric hamstring strength. Additionally, during walking, the AH group demonstrated decreased internal knee flexion moments during the early stance; decreased internal knee extension moment at toe-off; and decreased knee energy absorbed during midstance, pushoff, and toe-off compared with the SH group. However, after controlling for gait speed in group comparisons for kinetics, only the group difference in knee energy absorbed during midstance persisted

Conclusions: 50% of the cohort had at least a 15% deficit in hamstring strength 3 year post ACLR. The involved limb of the AH group demonstrated an external rotation offset in the early stance during walking and jogging compared with the involved limb of the SH group. the AH group also had decreased knee energy absorbed during midstance of gait compared with the SH group, after controlling for gait speed. Future work is needed to elucidate the effects of hamstring asymmetry.

Commentary: There has been a plethora of research on quad asymmetry after ACLR, but few studies on hamstring asymmetry, which is why this study is important. In the process of hamstring graft harvest during ACLR, morphological changes in the hamstring muscles occur. Previous work has demonstrated that both a proximal shift of the muscle tendon junction and decreases in muscle volume occur when sections of the semitendinosus tendon are used in ACLR. Semitendinosus atrophy from graft usage is not accompanied by compensatory gracilis hypertrophy. However, increased strength contributions from the lateral hamstrings accommodate for strength loss in the medial hamstrings.

Coppieters, M. W., Andersen, L. S., Johansen, R., Giskegjerde, P. K., Høivik, M., Vestre, S., & Nee, R. J. (2015). Excursion of the sciatic nerve during nerve mobilization exercises: an in vivo cross-sectional study using dynamic ultrasound imaging. *JOSPT*, 45(10), 731-737.

Reviewed by: Erik Lineberry, PT, DPT

Objective: To determine whether different types of neurodynamic techniques result in differences in longitudinal sciatic nerve excursion.

Methods: High-resolution ultrasound imaging was used to quantify longitudinal sciatic nerve movement in the posterior thigh of 15 asymptomatic participants during 6 different mobilization techniques for the sciatic nerve involving the hip and knee. Healthy volunteers were selected to demonstrate normal nerve biomechanics and to eliminate potentially confounding variables associated with dysfunction. Repeated-measures analyses of variance were used to analyze the data.

Results: The techniques resulted in markedly different amounts of nerve movement (P<.001). The tensioning technique was associated with the smallest excursion (mean SD, 3.2 2.1 mm; P≤.004). The sliding technique resulted in the largest excursion (mean SD, 17.0 5.2 mm; P<.001), which was approximately 5 times larger than that resulting from the tensioning technique and, on average, twice as large as that resulting from individual hip or knee movements. Stabilizing the hip and knee compared to the opposing joint showed differences in excursion in a distal or proximal direction.

Conclusion: In agreement with clinical assumptions and previous findings for the nervous system in the upper limb, different neurodynamic techniques combining hip and knee movements result in markedly different sciatic nerve excursions. The magnitude of the differences may be of clinical relevance. Considering the continuity of the nervous system, the movement and position of adjacent joints have a large impact on nerve biomechanics. Until more efficacy studies are available, the insight into nerve biomechanics as revealed in this study may assist clinicians in designing biologically plausible management protocols.

Commentary: I reviewed this article to get ideas for a patient I was seeing with highly irritable neurodynamic symptoms of the lower extremity. It was helpful in giving ideas for modification of neurodynamic interventions in patients with sciatic neurodynamic symptoms. There are major limitations in the clinical applicability to the techniques studied in this article, but I think it is a beneficial first step in designing future research in the effectiveness of varied techniques. Using the data from the results on excursion distances and directions along with our talks on using neurodynamic intervention as a way to sensitize the system gave me a new perspective on how to utilize neurodynamic interventions. It will be interesting to see clinical results based on the biomechanical differences found in these techniques. It would have been interesting to see how adding motion at a distal segment (the cervical spine) would have affected the excursions since that is typically how the SLR test is administered.

John J. Mischke, Dhinu J. Jayaseelan, Josiah D. Sault & Alicia J. Emerson Kavchak (2017) The symptomatic and functional effects of manual physical therapy on plantar heel pain: a systematic review, Journal of Manual & Manipulative Therapy, 25:1, 3-10.

Review submitted by Nicolas Hoover

Purpose: The purpose of this systematic review is to evaluate and synthesize the available evidence regarding the reported effects of manual therapy interventions in the treatment of plantar heel pain.

Methods: A comprehensive and systematic literature search of MEDLINE, EMBASE, Cochrane, CINAHL and Rehabilitation & Sports Medicine Source databases was conducted by one author (JJM). Any randomized control trial that involved human participants and was published as a full text in English through July 2014 was included.
SEARCH TERMS: 'heel', 'plantar', 'foot', 'pain', 'manual therapy', 'musculoskeletal manipulations', 'mobilization', 'manipulation', 'myofascial', 'physical therapy', 'conservative treatment' and 'humans'
Inclusion/Exclusion: Articles that did not mention identifiable manual therapy technique were excluded. Only diagnoses specific to heel pain were included. Articles detailing the use of trigger point dry needling as the only form of 'manual therapy' were excluded.

Results: 36 abstracts were chosen to assess for eligibility, 8 were chosen for the final assessment of full texts. The results of the analysis were dichotomized into the short-term effects of manual therapy (less than or equal to four weeks) and the longer term effects of manual therapy (greater than four weeks on plantar heel pain). Only two studies scored ≥7/10 on the PEDro scale and included joint, soft tissue, and neural mobilization techniques. These two studies showed statistically greater symptomatic and functional outcomes in the manual therapy group. The other studies utilized a wide variety of manual therapy techniques and outcomes measures.

Conclusion: Two studies showed statistically significant symptomatic and functional outcomes in the manual therapy group for long-term treatment of plantar heel pain. Results for short-term treatment are difficult to interpret given limitations in several studies' designs. Further research is needed for validation of these results.

Comments: This study demonstrates the need for further research in the area of manual therapy for plantar heel pain. After the initial search, 1745 articles were reduced to 8 full texts that met the criteria for inclusion. Plantar heel pain is a common clinical presentation but can often be a secondary symptom with numerous other impairments making it difficult to treat in isolation. It is interesting to see that, based on this systematic review, the current literature seems to follow the same variability as the clinical presentation itself, especially with regard to the manual therapy interventions that were utilized as treatment.

Melick et al. (2016) Evidence-based clinical practice update: practice guidelines for anterior cruciate ligament rehabilitation based on a systematic review and multidisciplinary consensus. *BJSM*, doi:10.1136/ bjsports-2015-095898

Review submitted by Justin Bittner

Purpose:
To create evidence based practice guidelines for rehabilitation after ACL reconstruction.

Methods:
Two groups if experts in rehabilitation of ACL reconstructions consisting of Physical Therapists, Orthopedic Surgeons, and Sports Physicians were used to steer and choose the systematically reviewed literature. The group searched Medline and Cochran libraries for systematic reviews, RCTs, and meta-analyses. The group of experts selected 9 clinically important topics related to ACL rehab. The articles selected needed to address at least one of the nine topics to be included. The nice topics were: (1) preoperative predictors for postoperative outcome, (2) effectiveness of physical therapy, (3) open and closed kinetic chain quadriceps exercises, (4) strength and neuromuscular training, (5) electrostimulation and electromyographic feedback, (6) cryotherapy, (7) measurements of functional performance, (8) return to play and (9) risk for reinjury. Ninety studies were included in the systematic review and were used to develop the updated evidence statement regarding ACL rehab.

Results and conclusions:
Pre-op rehab is recommended. A deficiency in knee extension prior to surgery increases the risk of having an extension deficit following surgery. Additionally, having greater than 20% strength deficit in the effected LE shows a negative consequence in the self-reported outcome at 2 years post-op.

Post-op rehab should consist of 3 phases: (1) impairment based, (2) sport-specific training, (3) return to play. Post-op rehab should continue to 9-12 months, depending on patient goals and return to sport/work goals. Weight bearing immediately after surgery does not increase knee laxity and shows decreased incidence of anterior knee pain. Cryotherapy should be used during the first week post-op to reduce pain. After one week, no additional decrease in pain is noted; and cryotherapy demonstrates no effect drainage and ROM. Isometric quadriceps exercises are safe and effective to perform in first week post-op. The effect of E-stim for quad activation is shown to improve muscle strength within first 2 months post-op, but after that its use is inconclusive. Open chain quad strengthening can be initiated at 4 weeks post op in a limited range (90-45). OKC strengthening ROM can be increased to 90-30 at week 5, 90-20 at week 6, 90-10 at week 7, and full ROM by week 8. Neuromuscular training shoulder be used in addition to strength training to reduce risk of a second ACL injury.

A battery of strength and hop tests should be used to assist in determining return to play. For pivoting and contact sports, a limb symmetry index 100% is recommended before returning to sport.

Comments:
I liked how this systematic review broke ACLR rehab into 3 phases. It was nice to see an article report the importance of "prehab" which I feel our profession has been trying to bring the light the importance of recently. Most patient's view interventions as either surgical or rehabilitated and is nice to see some literature from a powerful journal showing the importance of this phase of rehab. I found it interesting that the recommendation for cryotherapy was only found to be effective within the first week post op, and otherwise did not help with ROM or swelling. Overall, I think it is great that this comprehensive protocol tries to fill the gap between evidence and clinical practice. Additionally, that the evidence statements were developed with a multidisciplinary approach to emphasize the necessity of collaboration among professions.

Neto T, Freitas SR, Marques M, Gomes L, Andrade R, Oliveira R. Effects of lower body quadrant neural mobilization in healthy and low back pain populations: A systematic review and meta-analysis. *Musculoskeletal Science and Practice*. 2017; 27:14-22. doi: 10.2016/j.msksp.2016.11.14

Review submitted by: Katie Stokely, PT, DPT

Objective: Neural mobilizations, including neural tensioning and neural sliding, have been widely utilized to assess and improve the neurophysiological and mechanical properties of the nervous system. The aim of this systematic review was to analyze randomized controlled trials whose primary purpose was to investigate the effectiveness of NM techniques when utilized for lower quadrant dysfunction. Their goal was two-fold; to determine the effect of NM on lower quadrant flexibility in healthy adults and the use of NM to reduce pain and disability in adults who exhibited non-acute low back pain.
Methods: Randomized controlled trials were extracted from PubMed, PEDro, Web of Science, Scielo, and Cochrane Central Register of Controlled Trials, and were assessed for quality utilizing the PEDro scale. Inclusionary criteria included studies that utilized NM techniques for adults over 18 years of age who were healthy or low back pain participants, with or without leg pain. Exclusionary factors included systemic neuromuscular or rheumatic disorders, post-surgical participants, and pregnancy. Interventions included any lower quadrant NM when utilized in a controlled condition or compared with other forms of intervention. No specific alternative intervention was chosen as the goal of the study was to determine the effects of NM, not necessarily to determine if it was superior to another intervention. Studies had to have one of the following outcome measures: pain intensity, disability, or lower limb flexibility. Data collection was performed by three reviewers and data extraction was completed by one reviewer. Data was pooled for meta-analysis due to the similarity in methodology and participant demographics.

Results: A total of ten articles were analyzed for this systematic review. Five articles reviewed involved healthy participants and five articles analyzed subjects with low back pain. Seven studies were of good quality; three studies were of fair quality. A total of 502 participants were pooled for meta-analysis. The technique, duration, and frequency of NM between studies varied; NMs, sliding or tensioning techniques, in the slump test position were most common. Five studies demonstrated a medium effect size in support of utilizing NMs to improve lower quadrant flexibility when compared to a control group or intervention of static stretching. Five studies showed large effect sizes for utilizing NM to reduce pain and disability scores. Studies with the largest effect size found including NMs with spinal mobilizations and exercise was more effective in reducing pain and disability that spinal mobilization and exercise alone.

Conclusion: The results of this systematic review and meta-analysis suggest NMs have positive effects on lower quadrant flexibility in healthy adults and decrease pain and disability in adults with non-acute low back pain.

Commentary: The discussion portion of this review examines a key point which is the variability in frequency, intensity, duration, and technique utilized for NMs and that the underlying physiological mechanisms of NMs is still not well understood. There was a high variability in the NM parameters used by each study which makes it difficult to determine an appropriate NM protocol. Determining a protocol for NMs may continue to be challenging until more is understood regarding how these techniques affect neural tissue. In addition, dosage may be dependent on the intended use of the NM techniques and should be kept specific to each individual as the sensitivity of neural structures may differ based on individual physiology and pathology.

Danielsson L, Kihlbom B, Rosberg S. "Crawling Out of the Cocoon": Patients' Experiences of a Physical Therapy Exercise Intervention in the Treatment of Major Depression. Phys Ther. 2016;96(8):1241-50.

Review submitted by: August Winter, PT, DPT

Objective: The purpose of this study was to better understand the perception of individuals with major depressive disorder on an exercise intervention administered by physical therapists. Specifically the aim of this study was to better understand how the participants perceived the exercise and their thoughts on what it meant to be exercise participants.

Methods: Participants were drawn from a larger scale study investigating exercise in individuals with depression. Inclusion criteria included DSM-IV diagnosis of major depression and lack of suicidal tendencies. Iterative sampling procedures assured that both positive and negative outcomes were included in the qualitative analysis. The physical therapy intervention itself involved two one-one-one sessions with a physical therapist which involved initial exercise program planning. These sessions were followed by 10 weeks of twice weekly group based aerobic exercise utilizing Rate of Perceived Exertion scales to monitor effort. During the initial program prescription and throughout the study an emphasis was placed on a person-centered approach, involving the following: using the patient's narrative as a starting point, building a therapeutic relationship, and joint agreement and documentation of the program. Semi-structured interviews and qualitative content analysis were utilized to create common categories from the data gathered. The topic areas in the interview included: direct and indirect changes following the intervention, previous experience of exercise, views on exercise during depression, and facilitators.

Results: 13 semi-structured interviews were conducted. Four major categories were identified during the process 1. Struggling toward your healthy self: participants saw exercise as a means to reintegrate into participating in other aspects of life, or as a means to "reapproach oneself as the person you want to be…" 2. Challenging the resistance: participants appreciated the concreteness of a challenging exercise in contrast to the vague and overwhelming resistance to all activities that depression can produce 3. Feeling more alive but not euphoric: participants described an increased alertness and energy, although some were disappointed that they did not experience a greater sense of euphoria 4. Needing someone to be there for you: many participants expressed enjoying working with a physical therapist as a supportive partner in exercise, with some participants enjoying the group setting and others voicing displeasure over it.

Conclusions: Physical therapists may have a role in the mental health arena when prescribing and guiding patients with major depressive disorder through exercise interventions. Patient response to exercise interventions can be complex and requires providers to exemplify a therapeutic approach that is person-centered.

Commentary: This is an interesting article for several reasons, the first of which is the novel population in which it was conducted. This study was performed in Sweden, where physical therapists have a more involved role in the mental healthcare world. As the authors note, plenty of research exists to suggest that exercise has been found to have beneficial effects in those suffering from depression, but there is a lack of literature on physical therapist involvement in that process. A large number of our patients, particularly those with chronic conditions such as non-specific low back or neck pain, have had major depressive episodes in the past or are currently being treated for depression. We spend

considerable amount of time and effort discussing a biopsychosocial approach to patient care, but the topic of specifically treat a patient who is depressed and may not have a musculoskeletal impairment is a unique one here. As our profession grows and continues to find its place within healthcare, this avenue might be one that would be beneficial for patients and for our field of physical therapy. This article does an excellent job discussing the important factors associated with treating these patients effectively, namely by building a therapeutic alliance that focuses on empathetic language and continued support. By identifying the salient features of exercise from the participants themselves, this article gives us as therapists a view into what we should focus on during our treatments of any patient with depression. The largest limitations of this study involve the homogenous population in a culture different from our own (both in physical therapy and nationally) and collective experience of the primary therapists (each 15+ years of treating this population).