Citation: Plaza-Manzano G, Vergara-Vila M, Val-Otero S, et al. Manual therapy in joint and nerve structures combined with exercises in the treatment of recurrent ankle sprains: A randomized, controlled trial. *Manual Therapy*. 2016;26:141-149. doi:10.1016/j.math.2016.08.006.

Review Submitted by: Jon Lester

Objective: To determine the effect of strengthening/proprioceptive exercises vs strengthening/proprioceptive exercises plus manual therapy in the management of chronic ankle instability. Manual therapy could include joint or nerve mobilizations.

Methods: 56 subjects (20-38 yo) with at least 2 plantar flexion/inversion ankle sprains in the past 12 months were separated into either the exercise only group or the exercise + MT group. The exercise group performed proprioceptive and strengthening exercises over 4 weeks (two times per week); The exercise + MT group performed the same exercises and manual therapy over 4 weeks. The manual therapy consisted of TCJ mobilization in distraction, PA/AP talocrural joint mobilization, PA/AP distal tibiofibular joint mobilization, and superficial peroneal nerve neurodynamic mobilization. It appears that every subject received gr III mobs to each joint regardless of limitations. Exercises appeared to target SLS and eversion motor control with appropriate progressions made each week. Outcome measures included: VAS, self-reported functional ankle instability, PPT (ATFL, CFL, fibular malleolus and tibial malleolus), active range of motion in the ankle joint, and strength in ankle flexion and extension.

Results: Both groups reduced VAS score, increased PPT, and increased Cumberland Ankle Instability Toll scores as compared to baseline, however the exercise + MT group improved more so ($P< 0.001$). Ankle DF and PF ROM and strength also responded similarly, whereas both groups improved, but the exercise + MT group improved to a greater extent ($P < 0.001$). All above findings were found at immediately post intervention period and one month after.

Conclusions: In patients with CAI, exercise + MT, as compared to exercise alone, appears to be more successful at improving VAS, PPT, CAIT scores, and DF/PF ROM/strength as a result of this 4 week intervention period/protocol.

Commentary: I find the results of this study very helpful to confirm my care for a couple patient's that I'm working with right now that have CAI. This study suggests that the addition of MT to an exercise protocol improved a multitude of outcome measures as described above. However, I found it interesting that all patients received the same MT regardless of their limitations. I understand that you have to establish a controllable intervention for appropriate internal validity, but it is more applicable for us to "treat the impairments" as opposed to mobilize each joint of the ankle regardless of its ability to move/pain/etc. However, it appears that this form of manual therapy improved outcomes much more than the same exercise protocol without said MT ($P < 0.001$). Therefore, the findings of this study have helped me justify the addition of manual therapy to address joint mobility and neurodynamics via MT in those with a hx of CAI.

Citation: Additive Effect of Therapeutic Ultrasound in the Treatment of Plantar Fasciitis: A Randomized Controlled Trial. J Orthop Sports Phys Ther. 2018; 48(11):847-855. Doi:10.2519/jospt.2018.8110.

Review Submitted By: Casey Moler PT, DPT

Objective: Investigate the additive effect of therapeutic ultrasound on pain, function and quality of life when treating plantar fasciitis.

Methods: A prospective, double blind, placebo controlled clinical trial, was performed on 54 participants with plantar aspect foot pain ("plantar fasciitis") who were randomized by a 10-patient block software program to an active ultrasound or sham ultrasound treatment group. Participants age averaged in the low 50's with 75% of symptoms being greater than 3 months. Both groups received and instructed on the same triceps surae (standing) and plantar fascia (seated) stretching (5 reps 20 seconds). Active ultrasound group received 8 minutes continuous ultrasound at 1MHz at an intensity of 1.8 W/cm2, while the inactive group received negligible intensity at a dosage of 8 visits 2x/week. The outcomes measured in this study consisted of: 2 NPRS pain levels (first few steps in the morning and during the day), pressure pain threshold, perceived functional level.

Results: Both the active and sham ultrasound groups showed significant improvement during the study in outcome measures stated above. However, there was no significant difference in improvements between the active vs. the sham ultrasound group. Both NPRS score (morning

and during the day) as well as the CAT score met the meaningful clinical important difference for both groups.

Conclusion: Active ultrasound compared to sham ultrasound was no superior in addition to a stretching exercise in the treatment of plantar fasciitis. This study suggests that stretching may be an effective treatment for plantar heel pain.

Commentary: Therapeutic ultrasound is one of the most widely used electrical devices worldwide among practicing physical therapists. Previous studies in the literature looking at the effects of ultrasound for the treatment of plantar fasciitis found insufficient evidence to support its use for this condition. However, those studies fell short to prescribe the appropriate dosage or commonly applied method of therapeutic ultrasound. This study, using ultrasound parameters set to achieve both therapeutic heating and increased metabolic activity effects, found to be no more effective then sham ultrasound treatment in combination with a stretching protocol. The research still implies that a multimodal approach may be most effective however, the use of therapeutic ultrasound has no added benefit in the plan of care to treat patients with plantar fasciitis. Stretching and the progression of time may be adequate to improve pain levels and improve function. This study also brings to light that a total of 8 treatments over a 4 week period is adequate time to see improvements in pain and function with those with plantar fasciitis.

Citation: Rambaud AJM, Ardern CL, Thoreux P, Regnaux JP, Edouard P. Criteria for return to running after anterior cruciate ligament reconstruction: a scoping review. *Br J Sports Med.* 2018;52(22):1437-1444

Review Submitted by: Matt Fung

Objective: To describe the criteria used to guide clinical decision-making regarding when a patient is ready to return to running (RTR) after anterior cruciate ligament (ACL) reconstruction. To report how these criteria have changed over time alongside changes in surgical and rehabilitation approaches. To provide information to help clinicians and patients make quality decisions regarding returning to running after ACL reconstruction.

Methods: A scoping review was performed to synthesize the research available to determine which criteria should be used to determine when the patient can return to running following primary ACL reconstruction. Studies included information as recommended in the manual 'Methodology for JBI Scoping Reviews'. Excluded studies included conference abstracts, opinion pieces, magazine and newspaper articles. Participants included: studies of skeletally mature patients or people performing physically demanding work and primary ACL reconstruction (autograft, with or without meniscus surgery). Excluded participants included studies of patients with knee dislocation, patients undergoing revision ACLR and studies that included only patients who were >40 years-old. Additionally studies were excluded if patients were undergoing ACLR plus major concomitant procedures or receiving allograft ACL.

Data extraction were performed by two reviewers based on the following eight categories.

A. Authors and year of publication
B. Origin
C. Aim(s) of study
D. Study population
E. ACL reconstruction surgical technique
F. Rehabilitation protocol: postoperative immobilization (protective) or no postoperative immobilization (contemporary)
G. Time-based criterion from when patients were permitted to commence running activity
H. Other criteria: questionnaire-based or assessment-based criterion or criteria to allow the patient to commence running or jogging

Results: Among the 201 studies included, 199 reported in the methods or in the rehabilitation program a time from which RTR was permitted. The median RTR was permitted was 12 postoperative weeks. In the subgroup 'open surgery plus protective rehabilitation' the median RTR was 29 weeks. For the 'arthroscopic surgery plus protective rehabilitation' subgroup, the median RTR was 21 weeks. There was no difference between groups for median RTR for open surgery and arthroscopic surgery when a contemporary rehabilitation protocol was employed (10 weeks).

Twenty studies reported using clinical criteria for RTR. Most common criteria were: knee flex ROM (n=14), knee effusion (n=10) and pain (n=10). The most quantifiable and reproducible criteria used were full knee ROM or Rom greater than 95% of the non-injured knee (n=10), and pain M<2 on VAS (n=9).

Thirty studies reported using strength criteria. Eleven used isometric test, eleven used isokinetic test criterion and two used isometric, and isokinetic criteria. The most common objective criteria were isometric quadriceps limb symmetry index (LSI) >80% (n=3) and isokinetic quadriceps and hamstrings limb symmetry index >70% (n=4).

Thirteen studies reported using performance-based criteria: balance criteria (n=6), normal gait pattern during walking or jog-in-place (n=5), or functional tests (n=7). The objective criteria

used were proprioception LSI of 100%, composite score on Y-balance test >90%, functional test LSI >70%, hop test LSI >85%, and two combined tests as 10 consecutive single-leg squats to 40 deg knee flexion without loss of balance, and 30 step-up-and holds without loss or excessive motion outside of the sagittal plane.

Conclusions: Fewer than one in five studies reported clinical, strength or performance-based criteria for RTR even though best evidence recommends performance-based criteria combined with time-based criteria to commence running activities following ACLR. Time was the most frequently reported criterion for RTR with an average of 12 post operative weeks. No universal timeline for RTR exists. The article suggest that these clinical criteria: pain <2 on VAS, 95% knee flex ROM, full knee extension ROM, no effusion/trace effusion should be used as 'non-negotiable' clinical milestones for RTR.

Commentary: My biggest takeaway from this scoping review is that RTR decision making following ACLR should be individualized for each patient. There is no gold standard criteria for determining when a patient is appropriate to begin a running program. There are numerous variables that need to be taken into account following ACLR that need to be addressed prior to beginning a running program; post-operative time ~12 weeks appears to be the most commonly recommended and accepted criteria. I will definitely use the recommendations made by this study in regards to 'non-negotiable' criteria for RTR moving forward in my practice. We need to use our clinical judgement along with surgeon protocol and these recommendations in order for our patients to successfully RTR following ACLR.

Citation: Hudson R, Richmond A, Sanchez B et al. Innovative treatment of clinically diagnosed meniscal tears: a randomized sham-controlled trial of the Mulligan concept "squeeze" technique. *Journal of Manual & Manip Therapy*. 2018; 26(5): 254 – 263.

Review Submitted by: Erik Kreil

Objective: Assess the effect of Mulligan Concept "squeeze" technique compared to sham techniques in treatment of clinically diagnosed meniscal tears.

Methods: This was a sham-controlled trial using randomized treatment across four clinics with four athletic trainers providing treatment. Twenty-eight participants (males = 14, females = 14) met the inclusion criteria of at least 3/5 physical exam findings following recruitment using a convenience sample of both physically active and sedentary participants who ranged from 14 to 62 years old. These participants also presented either a positive Apley's or Thessaly's test and did not present with a concurrent injury or illness. A priori randomization equally distributed participants among either the "squeeze" technique or sham groups. The "squeeze" technique was administered, shown below, by applying increased pressure to the painful area through knee flexion followed by lessening pressure through knee extension. Knee flexion overpressure was provided by the patient at end range knee flexion. The patient position would progress to full weight bearing as tolerated.

(A) (B) (C)

Sham intervention included the same "squeeze" treatment protocol, except the clinician placed the grip force a ½ inch below the point of maximal joint line tenderness. A maximum of six treatments were provided within a two-week period, with NRS, PSFS, and a DPA Scale used as discharge criteria measures. Participants who did not reach the discharge criteria within the allotted time period were recommended to seek alternate treatment, if in the "squeeze" treatment group, or placed in the "squeeze" treatment group, if in the sham group.

Results: Twenty-three participants completed the study ("squeeze" = 12, sham = 11), who were generally healthy and from both athletic and general populations. "Squeeze" group members represented six acute and six chronic injuries, whereas sham group members represented three acute and eight chronic injuries. A univariate ANOVA did not demonstrate significant difference in cumulative pain scores between groups after the final treatment, however 100% of "squeeze" group members met the discharge NRS criteria while only four of the sham group members met this criteria. A univariate ANOVA revealed a significant difference in mean PSFS improvement favoring "squeeze" group members compared to sham group members immediately after the first treatment. The same is true after the final treatment, with "squeeze" group members reporting a mean PSFS change of 5.83 +/- 1.85 compared to sham group members reporting just .55 +/- 2.07. Mean change in DPA scores from the "squeeze" group members more than doubled that of sham group members after the final treatment, though neither met the criteria for return to play.

Conclusion: This was a small-scale study that found Mulligan Concept "squeeze" technique can be an effective treatment as an initial approach to rehabilitate clinically classified meniscal tears.

Commentary: Preservation of the meniscus in any scenario is universally understood as the ideal option following injury. Arthroscopic management is currently the proposed gold standard for treatment of meniscal tears, however this involves a high rate of surgical failure, increased medical spending, and is intrusive compared to conservative management. The Mulligan Concept "squeeze" technique is a non-intrusive conservative approach that has been shown to be clinically effective in improving pain and function among patients within a relatively short duration of treatment. This study adds to the growing support in its utilization as an initial approach in patients with clinically classified meniscal tears. This method's rapid results have the potential to bring an athlete closer to return-to-sport sooner and reduce general population medical spending by reducing treatment timeline. More research is required to continue this discussion.

Citation: Hop Distance Symmetry Does Not Indicate Normal Landing Biomechanics in Adolescents Athletes with Recent Anterior Cruciate Ligament Reconstruction. Wren T, Zaslow T. *Journal of Orthopaedic & Sports Physical Therapy.* 2018 Aug; 48(8): 622-629

Review Submitted by: Jeff Peckins

Objective: To compare biomechanics of single-leg hop in adolescents with a recent ACL reconstruction in operative lower extremity (LE) and nonoperative LE, as well as in uninjured controls, to determine if 90% hop distance symmetry between LEs suggests proper biomechanics and therefore readiness to return to sport.

Methods: The study is retrospective and looked at biomechanics and single-leg hop in adolescent patients who underwent unilateral ACL reconstruction surgery, and also controls with no history of lower extremity (LE) injury. Patients were divided into those with a limb symmetry index (LSI) of 90% or greater (symmetric, n=29), and those with anLSI less than 90% (asymmetric, n=17). Only controls that demonstrated symmetric single-leg hop distance were included in the study (n=24).

Results: Asymmetric patients hopped a significantly shorter distance on the operated LE compared to controls, however hopped a similar distance on their unoperated LE. In contrast, symmetric patients hopped an intermediate distance on both LEs. Asymmetric patients had lower knee flexion moments, lower peak hip and knee flexion angles, and energy absorption on their operated knee during landing compared to their unoperated side during landing. Asymmetric patients showed decreased hip and knee flexion on their operated LE. Symmetric patients had lower knee flexion moments and energy absorption at the knee on their operated LE vs their unoperated LE. Symmetric patients also demonstrated larger hip flexion angles and moments on both sides compared to controls, and larger energy absorption at the hip on their operative LE. Asymmetric patients had decreased knee adduction moments on their operative LE compared to controls, and symmetric patients had similar findings bilaterally.

Conclusion: Symmetry of single-leg hop tests alone is not adequate enough to determine readiness to return to sport; it is necessary to also assess biomechanics of the single-leg hop test.

Commentary: This study highlights the importance of closely monitoring ACL reconstruction patients' biomechanics when completing single LE dynamic movements. The article discusses a variety of sagittal and frontal plane biomechanics at the hip, knee, and ankle joint that were different between the symmetric, asymmetric, and control groups. Overall, both the symmetric and asymmetric decreased loading of the knee on their operated LEs, and instead had increased loading at their hip or ankle. Biomechanics in the frontal plane only showed minor differences between groups. ACL reconstruction patients who demonstrated symmetry did so by jumping a smaller distance with their uninjured LE, compared to controls and asymmetric patients. Therefore, the single-leg hop test symmetry in itself is not adequate enough to determine if a patient is ready to return to sport.

Citation: Pennock et al. (2018) Nonoperative Management of Femoroacetabular Impingement: A Prospective Study. *The American Journal of Sports Medicine*, https://doi.org/10.1177/0363546518804805.

Review Submitted by: Cameron Holshouser, PT, DPT

Objective: The purpose of this study was to perform a prospective study utilizing a nonoperative protocol with patients presenting to a physical therapy clinic with FAI syndrome.

Methods: Patients were asked to be in this study if they presented to the PT clinic for evaluation of groin-based hip pain, radiographic evidence of FAI, and a positive anterior impingement test. Patients were excluded if they had a history of hip surgery or radiographic abnormalities consistent with non-FAI conditions, such as femoral neck stress fractures, slipped capital femoral epiphysis, tumor or rheumatologic conditions. If meeting the inclusion and exclusion criteria, the patient was asked to participate in non-operative management of FAI syndrome. The protocol consisted of an initial trial of rest, physical therapy, and activity modification. Patients who remained symptomatic after the initial trial were offered an image-guided intra-articular steroid injection. Patients with recurrent symptoms after the injection were then offered arthroscopic treatment. Outcome scores were collected at 12 and 24 months.

Results: 93 hips (73 patients, average age 15.3, range 10-21 years) were used in this study. 65 (70%) hips were managed with physical therapy, rest and activity modification alone. 11 hips (12%) required steroid injection but did not progress to surgery. 17 hips (18%) required arthroscopic surgical management. All three groups had similar improvements in the modified Harris Hip Score ($p = .961$) and nonarthritic hip score ($p.975$) with average improvements of 20. 3 ± 16.8 and 13.2 ± 15.5, respectively. Hips with cam impingement and combined cam-pincer impingement were 4.0 times more likely to meet the MCID in Salter Harris score ($p = .004$) and 4.4 times more likely to receive surgical interventions ($p= .05$) than patients with pincer deformities alone. Participants in team sports were 3.0 times more likely than individual sport athletes to return to competitive activities ($p= .045$).

Conclusions: The majority of patients in this study (82%) of adolescent patients presenting with FAI could be managed nonoperatively with significant improvement in outcome scores at 2 years.

Commentary: This is a great article that is clinically relevant in physical therapy for FAI management for adolescent patients. First off, this article demonstrated that the majority of these patients (82%) could be treated non-operatively. The majority of patients got better just with rest, physical therapy and activity modification (70%). While this study found that patients with larger cam deformities were more likely to be treated operatively, the majority (76%) did not progress to surgery. This study also suggests that nonoperative management may produce similar self-reported outcomes compared to surgical intervention. One big downfall with management of FAI for patients in this study was that most of the patients did not return to sport especially if the sport demanded frequent forceful and/or repetitive impingement

positions. This article only looked at subjective outcomes, but objective outcomes would have also been clinically useful. The article gives a nice description of what exactly was performed for the non-operative management. The first line of management started with all sporting events were discontinued for 6 weeks. Once admitted to PT, the primary focus for PT was core stability and education to avoid deep hip flexion and internal rotation. Patients were slowly reintroduced to sporting activity See link for standardized protocol (https://journals.sagepub.com/doi/suppl/10.1177/0363546518804805). Overall this study is something that we as PT's can use when talking with the patient, family, and referring providers about the management of adolescent FAI syndrome. Limitations in this study include long term results of nonoperative management as deformities may lead to early degenerative joint changes, this study was under the power analysis, young population, and lastly 25% of the cohort did not complete the study.