March Monthly Literature Review

Citation:

Omi Y, Sugimoto D, Kuriyama S, Kurihara T, Miyamoto K, Yun S et al. Effect of hip- focused injury prevention training for anterior cruciate ligament injury reduction in female basketball players. AJSM, 2018;46: 852-861.

Review submitted by:

Jennifer Boyle DPT

Objective:

The purpose of this article was to determine the effectiveness of a hip- focused ACL prevention program in female basketball players.

Methods:

A 12-year prospective study with an interventional design for collegiate basketball team was performed with a total of 775 female players. This study had two phases including phase (1) 4 years of observation where all ACL injuries were recorded (2) 8 years of interventions. These interventions had 2 parts and started with education that occurred 3x per season that explained various ACL mechanisms such as noncontact movements during cutting, deceleration, and landing; addressed ideal trunk position and knee alignment during basketball movements as well as the HIP training program. This program was designed to progressively enhance hip joint function through jump-landing maneuvers, hip strength training, and balance exercises. Each session lasted approximately 20 minutes and was performed 3 times per week throughout the season. Athlete-exposures, ACL numbers and mechanisms of injury, relative risk, absolute risk reduction, numbers needed to treat, and compliance were analyzed.

Results:

There were 16 ACL injuries (13 noncontact MOIs) in the 4-year observation period, whereas 9 ACL injuries (8 noncontact MOIs) were recorded in the 8-year intervention period. The overall ACL injury incidence was 0.25/1000 AEs in the 4-year observation period compared with 0.10/1000 AEs in the 8-year intervention period, respectively. Compared with the 4-year observation period, significant RR reduction in the 8-year intervention period. The noncontact ACL injury incidence was 0.21 per 1000 AEs during the 4-year observation period compared with 0.08/1000 AEs in the 8-year intervention period, which also showed significant RR reduction. The mean compliance rate during the intervention periods (8 years) was 89%.

Conclusions:

This 12 year prospective study suggested strong evidence that hip training significantly reduced the incidence if ACL injury in female basketball players.

Commentary:

This program was based on multiple types of exercises, enhancement of hip joint function emphasis, high levels of compliance and appropriate dose were all stressed is this study. This study stressed the importance of education as well as intervention program. Their needs to be more research for other populations because this study is very geared toward colligate female basketball players. In addition this study was not a randomized control trial it was a cohort observational study that has a level 2 evidence. Regardless, this has great application and room for more research to apply this study to all athletes in order to initiate pre- rehabilitation programs in order to decrease the risk of ACL injuries.

Knee Joint Loading in Healthy Adults During Functional Exercises: Implications for Rehabilitation Guidelines. Rossom SV, et al. JOSPT. Vol. 48, issue 3: pgs 162-173.
Submitted by: Justin Pretlow PT, DPT, OCS

Objective: To quantify knee loading during frequently used activities in physical therapy and grade knee joint loading during those activities. A better understanding of knee contact forces during different exercises may help in designing more staged rehabilitation programs to prevent cartilage and ligament injury while maximizing muscle strengthening.

Methods: The researchers used 3-D motion analysis data of 15 healthy adult subjects(8 male, 7 female, mean age 31, mean BMI 22) during 9 standardized activities to calculate Contact Forces(CF) and Shear Forces(SF) on the tibiofemoral and patellofemoral compartments. CF and SF were compared between compartments and exercises. Participants performed 5 repetitions of the following exercises: gait at self-selected speed, ascending and descending 4 stairs at self-selected speed, standing up from a chair without use of UE, squatting to 90 deg of self-perceived knee flexion with hands at the waist, forward and sideward lunging, and single-leg hop. All exercises performed barefoot.

Results: In the medial tibiofemoral compartment, max and avg CFs were significantly lower during stand-up and sit-down and squats compared to gait. In the lateral compartment, avg CF was higher during the squat, single-leg hop and sideward lunge compared to gait. Patellofemoral forces were greater during all exercises when compared to gait. Force distribution over the medial and lateral compartments varied between exercises.

Conclusions: Forces on an injured zone of the joint can potentially be reduced with careful selection of exercises. Tibiofemoral CFs were higher during all exercises compared to gait, except for the CFs during sit-down, stand-up, stair ascent and descent, and squatting. Even though these exercises required greater knee flexion ROM, the CFs were equal to or lower than CFs during gait, which agrees with previous research using instrumented knee implants. Bilateral nature of the tasks distributing body weight and decreased foot-floor impact likely play a role. These exercises can be used early in rehab without exposing the tibiofemoral joint to excessive CFs.

Commentary: The authors found that the majority of CFs pass through the medial condyle during gait, stair ascent/descent, forward lunge, and single-leg hop. Lateral condyle CFs were greater during stand-up, sit-down, squat, and sideward lunge. These findings can serve as a helpful reminder/resource when trying to load or unload specific compartments of the knee during rehab for specific patients. Figure 8 of the article is a helpful diagram breaking down zones of the femoral condyles and providing a graded exercise sequence based on the amount of contact forces related to each exercise included in the study. The authors recognize several of the studies limitations. The biggest limitation being the applicability of this data on healthy subjects with no history of lower extremity injury – applying this to injured patients with pain, degenerative changes in the knee joint, and compensatory movement strategies may prove very challenging. The participants were all relatively young as well(mean age of 31) so these stats may only apply to healthy, younger knees. On a related note, the authors cite the assumption of

neutral joint alignment as a possible limitation to their findings. Cartilage thickness was assumed to be uniform as well for their knee model calculations, which could further skew the data. The authors state their findings are consistent with previously reported Contact Forces. Despite the limitations, I think this article provides helpful information for planning rehabilitation with consideration of injury location, surgical intervention, and controlling for loading and shear forces.

Wannaprom, Nipaporn et al. "Neck muscle vibration produces diverse responses in balance and gait speed between individuals with and without neck pain ." . *Musculoskelet Sci Pract 35* (2018): 25-29. Web.

Review Submitted by: Katie Long, PT, DPT

Objective: To examine the effects of vibration-induced muscle responses on static standing balance and gait speed in individuals with and without neck pain.

Methods: 30 members in each the neck pain and control groups. Inclusion for the neck pain group included neck pain for greater than 3 months, no radicular pain, and a score of 10/100 on the Neck Disability Index-Thai version. Inclusion for the control group included no neck pain, no frequent intermittent headaches or dizziness in the past 6 months. Postural sway was assessed using the sway meter developed by Lord et al. (2003) in which participants stood with shoes off in static stance for 30s and the device recorded anterior-posterior and medial-lateral sway. Gait speed was assessed using the timed 10m walk test. Neck muscle vibration was provided to the C2 spinous process using a vibration device. The vibration had a 5 cm round head and was set at a frequency of 100 Hz and an amplitude of 1.0 mm for 30s. Patients performed two sessions consecutively with 30 minute breaks in between sessions. Each session was performed in the same order with each group. Session one consisted of postural sway assessment, 30s neck vibration, postural re-assessment. Session two consisted of two trials of the 10m walk test, 30s neck vibration, and 10m walk test reassessments.

Results: Prior to intervention, patients in the neck pain group had significantly larger sway area than those in the control group. Following intervention, those in the neck pain group demonstrated significantly decreased area of postural sway. However, those in the control group had significantly increased area of postural sway resulting in no between group difference following intervention due to the net changes. These results were also true of sway displacement in both anterior-posterior and medial-lateral directions. Prior to intervention, patients in the neck pain group had significantly slower gait speed than control group. Following intervention, those in the neck pain group demonstrated significantly increased gait speed, while those in the control group demonstrated significantly decreased gait speed resulting in no between group difference.

Conclusions: The results of this study demonstrate that neck muscle vibration improved static balance and gait speed in those with neck pain. It also shows that neck muscle vibration affects those with and without neck pain differently. It highlights the importance of the relationship between the cervical spine musculature and postural control. The authors postulate that in the presence of neck pain, vibration may address the impairments in gait and balance that are due to decreased proprioceptive input. Similarly, the reason for the decline in function of those without neck pain may be explained by the vibration altering the cervical proprioceptive and/or vestibular integration in this group.

Commentary: This study serves to emphasize the importance of proprioceptive training in those with neck pain. The use of neck muscle vibration was quickly implemented in this study with no

adverse effects and significantly improved outcomes in balance and gait in those with neck pain. Utilizing neck muscle vibration in conjunction with additional proprioceptive training may be a feasible and effective supplement to current treatment of those with neck pain. All patients included in this study had a history of neck pain of >3 months, therefore some caution could be taken in application of these results to those with acute neck pain. The mean age of those with neck pain in this study was 31.5 +/- 10.5 years, therefore caution when interpreting these results for an older population might also be advised.

Lam O, Strenger D, Chan-Fee M, et al. Effectiveness of the McKenzie Method (Mechanical Diagnosis and Therapy) for Treating low Back Pain: Literature Review With Meta-analysis. JOSPT. Epub ahead of print: [30 March 2018]. doi: 10.2519/jospt.2018.7562.

Review Submitted by: Sarah Bosserman, PT, DPT, CSCS

Objective: To determine the effectiveness of Mechanical Diagnosis and Therapy (MDT), also known as the McKenzie method, provided by trained therapists, compared to different types of interventions for improving pain and disability in patients with acute and chronic low back pain separately.

Methods: Six electronic databases were searched, up until September 2017. RCTs that examined the effectiveness of MDT on pain and disability in patient with LBP were included (therapists must be MDT trained and MDT classification given prior to treatment). Comparator interventions had to be a typical rehab intervention, including manual therapy, exercise, or education. The cutoff to differentiate between acute and chronic LBP was 12 weeks. The SMD with 95% CIs were calculated to compare effects of MDT to other interventions in patients with acute or chronic LBP.

Results: 17 studies were selected after review, with 12 considered valid for analysis. 1) Acute LBP: MDT vs Other Interventions – 4 studies analyzed: moderate quality evidence of no significant difference in pain after intervention between groups. High quality evidence of no significant difference in disability after intervention between MDT and MT plus exercise interventions, however, sub-group analysis found a significant difference in pain, favoring MDT ($P<.04$). 2) Chronic LBP: 7 studies included: moderate evidence of a significant ($P=.03$) difference in pain after intervention, favoring MDT. There was also high quality evidence of a significant ($P<.01$) difference in disability favoring MDT vs other interventions. In subgroup analysis, when MDT compared to MT plus exercise, there was moderate to high evidence of no significant differences in pain ($P=.03$) or disability ($P=.23$) between interventions. When compared to exercise alone, there were no significant differences in pain post interventions, however, there was a significant difference ($P<.01$) in disability, favoring the MDT approach.

Conclusions: For acute LBP, the authors concluded that MDT is not superior to other rehab interventions for the primary measures of reducing pain and disability. For chronic LBP, MDT was found to be more effective for reducing pain and disability, however, this finding depends on the intervention being compared to MDT. Treatment effect was small to moderate for MDT, meaning clinical significance may be less significant.

Commentary: This review reported that that the mean PEDro score for all of the studies was 6/10, with scores mainly down-graded due to the nature of the studies, as blinding of providers was not achieved by any of the studies. A large positive aspect of the study, however, was that it differentiated between acute and chronic LBP, as we know that these types of pain behave and present differently. It was found that there was no significant difference for acute LBP on disability between interventions, but they did find results favoring MDT over MT + exercise

for pain relief. The authors discussed that this may be explained by differences in using a symptom-based approach vs a non-specific exercise regimen (that may result in a less immediate reduction in pain). The lack of differences in disability may be accounted for by the fact that results were positive for all groups and that most patients with acute LBP have a favorable prognosis. The findings for chronic LBP favor the MDT approach against certain interventions (exercise alone and placebo) but found that MDT "might not be any better than combined manual therapy plus exercise", as both were effective. There is evidence that MDT is effective in the treatment of LBP, but this review points out that there are other interventions that may be just as effective. Using continued clinical reasoning and patient values/preferences will likely result in improved outcomes versus exclusively relying on a single treatment approach.

Whittaker GA, Munteanu SE, Menz HB, *et al*. Foot orthoses for plantar heel pain: a systematic review and meta-analysis. Br J Sports Med 2018;52:322-328.

Review Submitted By: Tyler France, PT, DPT, CSCS

Objective: The objective of this study is to investigate the effectiveness of foot orthoses for pain and function in adults with plantar heel pain.

Methods: This systematic review was conducted in a manner that conforms to PRISMA guidelines. Randomized controlled trials were included if they compared foot orthoses with any comparator (eg, foot orthoses vs night splints). For the intervention to be regarded as a foot orthosis, it had to be an in shoe device that aimed to contour to the plantar arch and it had to extend further distally than the anterior margin of the heel. Studies had to have investigate the effect of foot orthoses on plantar heel pain and included at least one outcome measure of pain or function. The Cochrane Collaboration tool was used to assess the risk for bias in the original article.

Results: The initial search identified 900 articles, and after screening, 19 articles were included in the final review. The combined sample size of the trials was 1660. Of those, 67% were women, the mean age was 47 years and the mean body mass index was 30. Risk of bias assessment concluded that 89% of the included trials were at a high risk for bias, primarily due to a lack of blinding. Ratings were made at short, medium, and long term time points with real foot orthoses being compared to sham orthoses and customized orthoses being compared to prefabricated foot orthoses.

Conclusions: SHORT TERM: There was no statistically significant difference between customized foot orthoses vs. sham foot orthoses, firm prefabricated orthoses vs sham orthoses, and firm prefabricated foot orthoses vs soft prefabricated orthoses on pain. There was insufficient data to conduct a meta-analysis on short term function in this study. MEDIUM TERM: Customized foot orthoses appeared to be more effective at reducing pain than sham orthoses, but the change in pain did not meet the MCID for the Foot Health Status Questionnaire. No other comparisons showed any effect on pain. No effect was found on function between any comparison groups. LONGER TERM: The meta-analysis found no effect on pain or function in the long term between comparison groups.

Commentary: This systematic review and meta-analysis found moderate quality evidence that foot orthoses are effective at reducing pain in the medium term (7-12 weeks) when compared with sham orthoses. The effect size was small, so it is unsure whether this finding is clinically meaningful for patients. The quality of evidence for all other findings was low or very-low, indicating that the true effect is likely to be substantially different than the estimated effect. There was found to be no difference in the type of material used in the fabrication of the orthosis. There have been two other systematic reviews conducted on this topic in the past and the results of the three separate reviews are inconsistent. Clinically, these findings help highlight the need for a multimodal approach at managing these patients in the short and long term. More studies are needed in this area to bolster the strength of these recommendations.