Veronese N, Stubbs B, Trevisan C, et al. Poor Physical Performance Predicts Future Onset of Depression in Elderly People: Progetto Veneto Anziani Longitudinal Study. *Phys Ther.* 2017; 96(6):659-668.

Review submitted by Nicolas Hoover

PURPOSE: to examine which objective physical performance measures provide an optimal prediction of incident depression in a representative cohort of older people over 4 years of follow-up.

METHODS: 970 participants were taken from a previous observational cohort study of Italian older adults who were 65 or older with follow up visit 4 years from baseline. Regular physical activity was defined as at least 4h/wk of at least moderate activity (brisk walking, cycling, gardening, dancing, or physical exercising). Demographic data included income, smoking status, education level, body weight, height and BMI, functional status (ADL score), cognitive status (MMSE), and review of systems

Physical Performance Tests: Measures of physical performance (aerobic capacity and strength) were assessed using the following objective tests to investigate the predictive role of these tests in depression onset. Short Physical Performance Battery (SPPB), 4m walking speed, Five-Times Sit-to-Stand Test, Knee extensor strength, hip flexor strength, Handgrip strength, 6-minute walk test.

Depression Screening: Presence of depressive symptoms was assessed at baseline and at 4-year follow-up using the Geriatric Depression Scale (GDS) followed by a completion of a standardized questionnaire by a geriatric psychologist.

Inclusion/Exclusion: 990 were excluded because they had missing information on physical performance tests, 794 were excluded because they already had depression, 153 were excluded because they had missing follow up data regarding depression, 192 were excluded because they died during the follow up period.

RESULTS: 207 participants were diagnosed with depression at 4-year follow-up. This group was significantly older, had a higher percentage of females, and showed significantly worse cognitive status with lower MMSE scores and higher GDS scores. There were no significant differences in current smoking status, education, monthly income, self-reported physical activity level, BMI, comorbidities or ADL score. The participants who were diagnosed with depression scored significantly worse on all physical performance tests.
The association between poor physical performance on baseline testing and having diagnosis of depression at follow-up was significant in women for all tests except 4m gait speed and was significant in men for SPPB and 4m gait speed. Participants with poor physical performance at baseline had significantly higher GDS scores regardless of the physical performance test assessed. All physical performance tests had significant power for predicting depression at follow-up with the highest prediction power on SPPB and the lowest prediction power on handgrip strength.

CONCLUSION: Low physical performance is a positive predictor of depression over 4-year follow-up in older adults independent from comorbidities and other demographic factors.

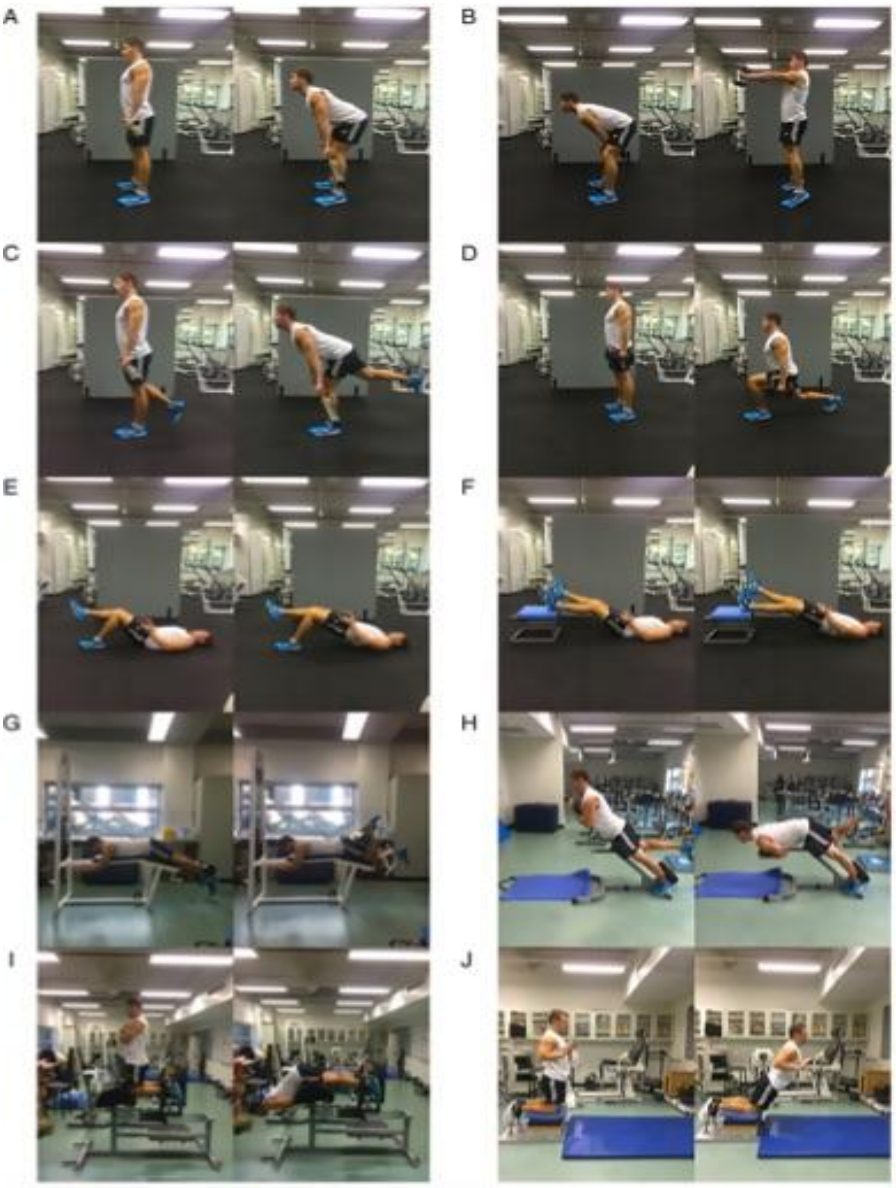
COMMENTS: This article is outside the norm in terms of content for our typical residency discussions largely focused on MT, however, most of us do come across this elderly population in clinic; for me, I have seen a recent growth in my case load of patients with referrals to PT for general strengthening, gait/balance, and falls risk. Although I believe we are all capable of deducing the correlation between lower physical activity level and risk for depression as well as other comorbidities, the physical data in this article may help guide the treatment of these patients more efficiently. One area in particular is patient education. I found it very interesting in this article that every physical performance test had significant power for predicting depression, yet there was no significant difference in self reported physical activity at the 4-year follow up between patients diagnosed with depression and those who were not. This may indicate that this patient population is in need of better education on meaningful and functional physical activity. As movement specialists, it is within our wheelhouse to provide this education, and provide exercise programs that are purposeful in order to help this patient population improve their physical activity level and reduce the risk of depression. In the discussion section, the authors provide evidence of the correlation between depression onset and greater risk of mortality or other confounding medical diagnoses, which bolsters the importance of increasing physical activity. They also provide supporting evidence for the SPPB in its ability to predict cognitive decline and mortality. In this study, the SPPB had the highest predictive power for depression onset as well. These factors combined make the SPPB a potentially useful assessment tool for clinical practice in the older adult population.

Bourse et al. (2017) Impact of exercise selection on hamstring muscle activation. *BJSM*, doi:10.1136/ bjsports-2015-095739

Review submitted by Justin Bittner

Purpose:
To understand which exercises preferentially activate the long head of the biceps femoris muscle.

Methods:
Twenty-four males that were recreationally active were used for this study. The study contained two parts. First surface EMG was used while the participants performed 10 different exercises. The 2 exercises that had the highest and lowest activity at the biceps femoris were used and the exercises were performed again using an fMRI. Scans were performed before and immediately after each exercise.



Results and conclusions:

Biceps femoris had the highest level of activation (99.3% MVIC) with the concentric phase of the unilateral straight knee bridge. Biceps femoris had an activation of 71.9% during the eccentric phase of the Nordic HS curl. The medial HS had an activation of 120.7% MVIC with the concentric phase of the HS curl. The medial HS had an activation of 101.8% during the eccentric phase of the Nordic HS curl. The highest ratio of biceps femoirs to medial HS was during the lunge. Lowest ratio was with the bent knee bridge. Overall, hip extension exercises seem to preferentially activate the biceps femoris while the Nordic exercise preferentially activates the medial HS muscles.

Comments:
This study illustrates exercises that could be used in the clinic to assist in selection and progression of loading strategies for patients with proximal HS injuries. These exercises can easily be given to a patient as a home exercise program with education on set and reps. A potential progression based on the activation patterns provided in this study could be: isometrics, lunge, hip hinge, hip extension, straight knee bridge, and Nordic HS curl. This progression would gradually load and biceps femoris, which is the most commonly injured HS tendon in runners. In addition to treating a HS tendinopathy, this progression could be used in injury prevention training in runners; understanding that exercises incorporating hip extension will preferentially increase the tensile load on the biceps femoris.

Bączkowicz, D., Falkowski, K., & Majorczyk, E. (2016). Assessment of relationships between joint motion quality and postural control in patients with chronic ankle joint instability. *JOSPT*, (0), 1-26.

Reviewed by: Erik Lineberry

Background: Lateral ankle sprains are among the most common injuries encountered during athletic participation. Following the initial injury there is an alarmingly high risk of re-injury and development of chronic ankle instability (CAI), which is dependent on a combination of factors, including sensorimotor deficits and changes in the biomechanical environment of the ankle joint.

Objective: To evaluate CAI-related disturbances in arthrokinematic motion quality and postural control and the relationships between them.

Methods: Sixty-three male subjects (31 with CAI and 32 healthy controls) were enrolled in the study. For arthrokinematic motion quality analysis, the vibroarthrographic signals were collected during ankle flexion/extension motion using an acceleration sensor and described by variability (VMS), amplitude (R4) and frequency (P1 and P2) parameters. Using the Biodex Balance System, single leg dynamic balance was measured by overall (OSI), anteroposterior (APSI), and mediolateral (MLSI) stability indices.

Results: In the CAI group values of vibroarthrographic parameters (VMS, R4, P1 and P2) were significantly higher than in the controls ($p<0.01$). Similar results were obtained for all postural control parameters (OSI, APSI, MLSI; $p<0.05$). Moreover, correlations between OSI and VMS, P1 and P2, as well as APSI and P1 and P2 were observed in the CAI patient group but not in controls.

Conclusions: In patients with CAI, deficits in both quality of ankle arthrokinematic motion and postural control was present. Therefore, physical therapy interventions focused on improving ankle neuromuscular control and arthrokinematic function are necessary in CAI patient care.

Commentary: The inclusion criteria of history of 2 or more grade 2 or higher lateral sprains with at least 2 weeks of rehab including pain reduction, ROM intervention, and continuation of HEP to reduce reinjury risk. The exclusion criteria excluded patients with pain or limited ROM in the affected ankle. This was an interesting look at this patient population. The study was designed to assess lingering impairments in patients with asymptomatic CAI and how to prevent

future ankle sprains/injury. This study showed increased variability and amplitude of both AP and ML ankle motion on the tilt plate in patients with CAI. These results were correlated with reduced arthrokinematic motion quality. This study shows a mechanism for why added manual therapy can help improve outcomes in patients with ankle sprains and CAI. Most studies focus on the arthrokinematic motion and osteokinematic motion available following ankle sprains and the benefit that manual therapy can have for these impairments. An overlooked benefit to manual therapy is our ability to show patient their end ranges and allow them to feel motion at a specific joint to help them translate this to closed chain and functional activity. Other mechanisms of dysfunction the study discusses are decreased endurance of proximal and local muscles and reduced hyaline cartilage from prolonged inflammation and immobilization causing some of the prolonged symptoms associated with CAI. The study suggests a follow-up on chondral status and its affects on outcomes of CAI and possible modifications to interventions. This shows the multifactorial approach needed to treat these patients and the importance of a biomechanical assessment to reduce excessive or improper loading of the ankle and other kinetic chain structures. Using data from biomechanical screen we can provide an intervention that can improve mechanics throughout lower quarter and halt further degeneration of ankle structures.

Hill RJ, Mckernan LC, Wang L, Coronado RA. Changes in psychosocial well-being after mindfulness-based stress reduction: a prospective cohort study. J Man Manip Ther. 2017;25(3):128-136.

Review submitted by: August Winter

Objective: Chronic pain is a prevalent and costly issue that is associated with increased life stress, poor stress management skills, and other psychosocial factors such as depression and anxiety. For several reasons, patients are not always able to access dedicated psychotherapy interventions to deal with chronic pain. The purpose of this study was to describe a program of mindfulness-based stress reduction (MBSR) provided by non-psychological clinicians with the aim of improving psychological well-being.

Methods: Outcomes were assessed before and after the 8 week intervention. Participants were included from the Integrative Medicine Center, which treats chronic pain, depression, anxiety, and other conditions. Participants completed the Brief Symptom Inventory (BSI), Perceived Stress Scale (PSS-10), Mindfulness Attention Awareness Scale (MAAS), and the Self-Compassion Scale (SCS). The program itself was an 8 week program that involved weekly 2.5 hour group sessions and a mindfulness workbook. The goal of the program was "cultivating a flexible attentional capacity to enhance coping and reduce distress." The group sessions were led by 3 non-psychologist clinicians (an RN, a social worker, and a yoga instructor) who previously had underwent an 8-week training course and each had more than 5 years of mindfulness training.

Results: Of the 196 participants who agreed to participate, 130 completed all the sessions. Scores on the BSI, MAAS, SCS, and PSS-10 were all significantly improved post-intervention, with overall small to moderate effect sizes.

Conclusions: A mindfulness program can be instituted by non-psychological clinicians and lead to improvements in several aspects of psychological well-being that are commonly affected in chronic pain patients.

Commentary: Overall this study has several limitations in terms of its practicality in the physical therapy setting: the amount of time spent on each intervention, the previous experience with mindfulness training of the treating clinicians, the lack of pain severity or physical therapy related questionnaires, and the heterogeneous nature of the sample. With those limitations in mind, I like this study for two reasons. One is the inclusion of the PSS-10, which per the study is, "used for evaluating the perception of life's evens as uncontrollable, unpredictable, and overloading." In treating patients with chronic pain I have found one of the most frustrating setbacks to be one a patient has a new life event which seemingly derails their previous progress. This outcome measure might be a good tool to track a patient's progress with their coping ability, and potentially use as a way to further a conversation about dealing with setbacks as they come up. I also think this article provides some more examples of wording that we can cherry-pick to include in our pain education. Obviously there is a lot more to be competent in teaching mindfulness than reading an article, but the figure below provides some ideas on how to address these concepts with our patients.

Table 4. Mindfulness strategies for the physical therapist.

Strategy	Goal(s) of strategy	Physical therapy examples
Present Moment Awareness	Encourage participants to be aware of their sensory experiences with curiosity and non-judgment *What do you see?* *What do you hear?* *What do you feel?* *What do you taste?* *What do you smell?*	Encourage patients to be fully present for interventions such as manual therapy and other pain-relieving modalities by encouraging patients to either focus on their breath or the sensory experiences during the intervention (e.g. pressure, temperature)
	Discourage avoidance (e.g. painful part of body or negative emotional state) and/or amplification of experiences (e.g. magnifying negative thoughts)	Normalize the human tendency to worry about the future and/or ruminate about the past, while encouraging participants to redirect their attention on the present moment as often as needed. Teach the importance of having a mindful mindset in regard to healing, nervous system stabilization, and pain control
Attention Restricting Practices	Encourage participants to restrict their attention to a present moment experience such as the pattern of breath, how their feet feel as they hit the ground, and physical or emotional experiences	Encourage patients to focus on sensations of their body moving through a movement rather than pain and/or other unpleasant sensations and encourage attention switching as tolerated between unpleasant sensations (e.g. pain) and non-painful parts of the body, with the goal of enhancing patient's ability to be present with their pain without minimizing and/or amplifying it
Observation of Sensory, Affective, Environmental, and Cognitive Experiences	Encourage participants to engage in formal, informal, and movement practices with curiosity and without criticism or expectation	Inquire about patient's ability to engage in a moving activity mindfully (i.e. walking on treadmill, resistance exercise) by asking the following questions: *What thoughts were you having?* *How frequently were you lost in thought* versus *connected to your breath or movement?* *Did you believe your thoughts or feel the need to change and chase them?* *Did you have pleasant and/or unpleasant emotional experiences?* *Did you feel the need to move away from your emotions?* *Did you feel like your emotions amplified when you attended to them?* *Did you experience unpleasant physical sensations?* *Did you feel the need to ignore the physical sensations?* *Did you feel your physical sensations were dangerous or intolerable?* *Were you able to listen to the wisdom of your body?*
	Encourage intention setting at the beginning of practice to include observation of sensory, affective, environmental, and cognitive experiences without criticism	
	Normalize the brain's tendency to get distracted by thoughts and other sensations and highlight the importance of awareness of these tendencies so patients can come back to practice (e.g. breathing, connection with movement) as soon and as often as possible. Discourage emphasis of 'being free from thought or negative emotions' as goals	

Li H, Moreland JJ, Peek-asa C, Yang J. Preseason Anxiety and Depressive Symptoms and Prospective Injury Risk in Collegiate Athletes. Am J Sports Med. 2017;45(9):2148-2155.

Pubmed Link: https://www.ncbi.nlm.nih.gov/pubmed/28441037

Review Submitted by: Scott Resetar, PT, DPT

Objective: To determine the effect of reported preseason anxiety and depressive symptoms on the risk of injuries during a prospective season in a cohort of collegiate athletes.

Methods: Two D-I sports programs participated. 958 athletes filled out baseline demographics including age, height, weight, school year, history of injury in the last 12 months. Athletes filled out a 20 item Center for Epidemiological Studies Depression Scale, a 0-4 likert scale. If an athlete was >15 on that scale they classified as having depression, as this is above the median for all college students. Similarly for anxiety, a 20 item State Anxiety Inventory, and a 20 item Trait Anxiety Inventory were completed (are you anxious right now vs are you typically an anxious person). If you were over ~36 on these scales you were above the median for college students and classified as having anxiety. All injuries were classified in a Sports Injury Monitoring System (SIMS) used by certified athletic trainers. Injuries were classified by type, body part, mechanism, severity, return to play date, and type of exposure (game vs practice). They calculated injuries per athlete exposure (AE) (1 game or practice).

Results: 958 athletes participated. There were 597 total injuries occurring in 389 athletes. Those with a history of injury in the last year were significantly more likely to have an injury during the study period. 276 athletes (28.8%) reported preseason anxiety, 208 athletes (21.7%) reported preseason depression, and 158 athletes (16.5%) reported both anxiety and depression. Injury rate of those with anxiety was 38.9 injuries 10,000 AE's, vs 16.3 per 10,000 AE's for those without anxiety. Total of 2.3x rate of injury. Athletes with and without depression had injury rates of 25.2 and 23.1 injuries per 10,000 AE's, respectively, which was not significantly different.

Conclusions: The authors here add to the growing body of literature showing psychological symptoms increasing likelihood of injury. It appears that Anxiety, more so than depression, has an effect on increasing injury risk. It is posited by the authors that a possible narrowed concentration and attention, a well research consequence of anxiety, may contribute to the injury risk. It is possible that the attention disturbance could result in too little or too much arousal and/or bad muscle tension or coordination. It is also possible that a failure in decision making during an AE, caused by insufficient apprehension of potential risk, could increase the injury risk.

Commentary: Strengths: Prospective study, large N, diverse sample, accurate injury rate calculations since they did it per AE. Weaknesses: 90% of potential athletes voluntarily participated, but it is possible that non-participation in the study is associated with anxiety or depression or injury risk. Athletes anxiety/depression symptoms were recorded at pre-season, but these may have changed over the season and in the offseason or off-semester.

haibi A, Benth J, Tuchin P, Russell M. Adverse events in a chiropractic spinal manipulation therapy single-blinded, placebo, randomized controlled trial for migraineurs. Musculoskelet Sci Pract. 2017; 29:66-71.

Review submitted by: Katie Stokely, PT, DPT

Objective: Previous research has shown manual therapy interventions have demonstrated similar effects as pharmacological treatment on migraine headaches and may be a beneficial treatment option for those who have adverse effects to or want to avoid medication. While the frequency of reported adverse events (AEs) has increased, manual therapy randomized controlled studies do not always report AEs, which is a requirement of pharmacological randomized controlled trials (RCTs), and often lack information regarding the type and severity of, as well as withdrawal rate due to AEs, which decreases the overall quality of these studies. Therefore, the goal of this study was to report all AEs in a prospective chiropractic spinal manipulation therapy (CSMT) RCT for participants with migraines.

Study Design: Prospective 3-armed, single-blinded, placebo, RCT.

Methods: A total of 70 participants, six men and 29 women, were included in each of the CSMT and placebo groups. In total, there were three parallel groups for comparison: (1) active group who received chiropractic manipulation, (2) placebo group who received sham manipulation, (3) control group who continued their normal pharmacological management. Inclusionary criteria for the active and placebo groups comprised of participants between the ages of 18-70 years old, diagnosed with migraines according to ICHD-II, and reporting at least one migraine attack per month. Participants were excluded if they had contraindications to spinal manipulation, spinal radiculopathy, pregnancy, depression, or CSMT in the previous 12 months. Participants could not receive manual therapy by another health professional throughout the 12-week duration. Participants underwent 12 interventions over a 12-week period with a three, six, and 12-month follow-up. AEs were recorded following the CONSORT and HIS Task Force recommendations prior to each intervention session. AEs from the 12th treatment were not recorded. Participants recorded whether they experienced an AE, and this was followed up with questions from the clinical investigator as to what type and duration of the AEs. AE data was collected for only the active and placebo groups.

Results: A total of 557 spinal manipulations in the active CSMT group were performed; 60% cervical, 29% thoracic, 9% lumbar and 2% pelvic spinal region. Migraine frequency was decreased in all groups from baseline to post-intervention. There was no significant difference in the migraine days between the CSMT and placebo group. There was a significant difference between the CSMT and control group at all post-intervention times. There was a significantly higher number of AEs in the CSMT group versus the placebo group; 73/355 versus 29/348, respectively. A majority of the time, one AE was reported. Localized tenderness, tiredness, and neck pain were the most commonly reported AEs which were considered mild. One moderate AE, a migraine attack, was reported. No severe or serious AE was reported throughout the study.

Conclusion: Overall, AEs were found to be mostly mild and transient. One moderate AE was reported and no severe or serious AEs were reported in 557 manipulations. While there was an

increase in AEs following CSMT as compared to placebo manipulation, the number of AEs reported was less than that reported with use of prophylactic migraine medication.

Commentary: This articles and previous research show that AEs after spinal manipulation are typically mild and transient. Future RCTs should utilize a systematic and accepted method to track AEs so greater analysis can be performed to determine the occurrence of serious or severe AEs with this type of manual therapy as the sample size of this study was too small to determine the prevalence of uncommon AEs. Articles like this may be utilized to create more acceptance and patient comfort with spinal manipulation as a manual therapy treatment method.