

**Aerobic exercise promotes executive functions and impacts functional neural activity among older adults with vascular cognitive impairment.** Hsu CL, Best JR, Davis JC, et al. Br J Sports Med 2018;**52**:184–191.

Review submitted by: Justin Pretlow, PT, DPT, OCS

**Objective:** To examine the effect of moderate-intensity aerobic training on executive functions and functional neural activity among older adults with mild subcortical ischemic VCI (SIVCI).

**Methods:** 6 month, single-blinded RCT. Older adults with mild SIVCI (mild SIVCI determined by the presence of cognitive syndrome and small vessel ischemic disease) were randomly assigned to: (1) 6-month, 3x/week aerobic training (n=10) or (2) usual care (control; n=11). Both groups received educational materials about VCI and healthy diet. Participants completed functional MRI (fMRI) at baseline and trial completion. During the fMRI sessions, behavioral performance on the Eriksen flanker task and task-evoked neural activity were assessed. (The flanker task is an executive task of selective attention and response inhibition – for example, a series of images with a line of arrows, and the subject has 4 seconds to identify and select the direction of the central arrow in the image.)

**Results:** At trial completion, after adjusting for baseline general cognition, total white matter lesion volume and flanker performance, the aerobic training group significantly improved flanker task reaction time. Compared with the controls, the aerobic training group demonstrated reduced activation in the left lateral occipital cortex and right superior temporal gyrus. Reduced activity in these brain regions was significantly associated with improved (ie, faster) flanker task performance at trial completion. The data suggest that thrice-weekly aerobic training may maintain, or increase, neural efficiency among older adults with mild SIVCI, reducing the need for compensatory neural processes.

**Conclusions:** Aerobic training among older adults with mild SIVCI can improve executive functions and neural efficiency of associated brain areas.

**Commentary:** This article addresses the fact that individuals with SIVCI generally show impaired executive functions and are therefore at risk for dementia and cognitive decline. The results suggest aerobic training has cognitive and neural benefits for older adults with mild SIVCI. One limitation of the study is the very small sample size. Another limitation cited by the authors is the possibility that the inclusion criteria selected healthier than average 71 year olds with SIVCI. Participants had to be healthy enough to participate in the aerobic training and able to undergo the fMRI. I find the results very interesting, if not surprising, that aerobic exercise can potentially improve neural efficiency. The exercise protocol was simple – 3 times a week, 60 mins of walking. If these results can be replicated in larger studies, they could provide a powerful and persuasive argument that exercise can help prevent cognitive decline in aging populations.

**Effect of Hip-Focused Injury Prevention Training for Anterior Cruciate Ligament Injury Reduction in Female Basketball Players: A 12-Year Prospective Intervention Study.** Omi Y, Sugimoto D, Kuriyama S, Kurihara T, Miyamoto K, Yun S, Kawashima T, Hirose N. *Am J Sports Med.* 2018 Jan 1. doi: 10.1177/0363546517749474. [Epub ahead of print]

**Review Submitted by Sarah Bosserman**

**Objective:** The objective of this study was to determine the effectiveness of a hip-focused injury prevention (HIP) training protocol on ACL injury prevention in female collegiate basketball players.

**Methods:** A 12-year prospective interventional design (observation-intervention format) was used for a collegiate basketball team. A total of 757 players were analyzed from 2003-2014. Study consisted of 2 phases: The first, a 4-year observational period where the number of ACL injuries, players, and athlete-exposures (AEs) were recorded. Followed by an 8-year intervention period divided into two, 4-year segments: intervention period I and intervention period 2 (bands were used to increase challenge). Each period included education on common ACL mechanisms of injury and prevention along with a 3-phase progressive strengthening and balance program that was performed for 20 minutes, 3 times per week (i.e. jump-landing, strengthening, and balance on bosu). Each period included basketball-specific exercises and emphasized that players should maintain ideal frontal plane movements. The number of ACL injuries was tracked throughout the intervention period.

**Results:** A total of 16 ACL injuries (8 non-contact) were recorded during the observation phase and 9 were recorded during the intervention phase, with 6 ACL injuries (5 non-contact) during period I and 3 (all non-contact) during period II. The ACL injury incidence rates were reduced in both intervention period I (0.11/1000 AEs) and period II (0.08/1000 AEs) compared to observation period (0.25/1000 AEs). There was a 62% rate of ACL injury relative risk (RR) reduction during the 8-year intervention period relative to the observation period. Furthermore, the mean compliance rate for the HIP training protocol during the combination of phase I and II was 89%.

**Conclusions:** This study concluded that the HIP training protocol significantly reduced ACL injury incidence in collegiate female basketball players.

**Commentary:** According to this report, female athletes have 2-8 times greater risk of ACL injury compared with their male counterparts with about 70% of the ACL injuries being non-contact in nature. Furthermore, female basketball players have one of the highest rates of ACL injuries, though studies focused solely on this population have been limited. Although this study was not a RCT and took place over a long time-frame, they did analyze the data for differences between observation and intervention periods and these differences were considered minimal (i.e. practice sessions/time and games played in same league). Clinically, this study demonstrated the importance of hip strength, education, and neuromuscular re-education for prevention of ACL tears. The study emphasized that the success was directly related to the sport-specific training and high compliance rate, reinforcing the importance of making strengthening exercises relevant to the task for optimal results and patient buy-in. Furthermore, this study only included collegiate females, indicating a need for future studies including younger patients.

**Citation:**

Nascimento L, Salmela L, Souza R and Resende R. Hip and knee strengthening is more effective than knee strengthening alone for reducing pain and improving activity in individuals with patellofemoral pain: a systematic review with meta- analysis. J Orthop Sports Phys Ther. 2018;48 : 19-31.

**Review submitted by:**

Jennifer Boyle, DPT

**Objective:**

The objective of this systematic review was to examine the efficacy of knee strengthening, associated or not with hip strengthening (from now on referred as to hip and knee strengthening), to increase strength, reduce pain, and improve activity in individuals with patellofemoral pain.

**Methods:**

A systematic review was performed including randomized trials and/ or controlled trials. These studies included participants with patellofemoral pain and the experimental intervention was hip and knee strengthening.

**Results:**

14 papers were included in this systematic review that included 673 participants. Mean PEDro score was 5.8. Hip and knee strengthening resulted in a significant improvement in activity with an effect size of 1.2, compared with knee strengthening alone.

**Conclusions:**

It was found that hip and knee strengthening is more effective than knee strengthening alone for decreasing pain and improving activity in persons with patellofemoral pain.

**Commentary:**

This study is a great gathering of studies providing evidence that strengthening the hip and knee is the most appropriate to help individuals with patellofemoral pain. Being that this is one of the most common knee pathologies having a great toolbox of interventions is very important. As well, focusing on the entire LE chain rather than part of it will ensure a more successful recovery rather than only focusing on the knee.

**Lopezosa-Reca, Eva et al. "Is There Any Association Between Foot Posture And Lower Limb-Related Injuries In Professional Male Basketball Players? A Cross-Sectional Study." *Clinical Journal of Sport Medicine* (2017): 1. Web.**

Review Submitted by: Katie Long, PT, DPT

**Objective:** To evaluate the relationship between foot posture and lower limb injuries in elite basketball players.

**Methods:** 220 participants from two professional basketball associations were recruited. Participants were required to be >18 years of age and have at least 10 years of experience in basketball. They were excluded if they had a presence of serious foot injury in the past 6 months, poor balance, edema in the ankle preventing completion of the Foot Posture Index (FPI). Outcome measures used were the FPI, and type of sports injury (lateral ankle sprain, lateral knee sprain, medial knee sprain, patellar subluxation, patellar chondromalacia, patellar tendinopathy, meniscus injury and 5<sup>th</sup> metatarsal fracture).

**Results:** Mean age of study participants was 22.51 +/- 3.88 years. Point guards were categorized by the FPI to have normal to supinated foot position. Centers were categorized by the FPI to have normal to pronated foot position. Shooting guards and forwards were categorized by the FPI to have normal foot position. Forward-centers were categorized by the FPI to have pronated foot positions. Those with supinated foot posture presented with the highest prevalence of injuries (3 injuries per foot), followed by pronated foot posture (2.7 injuries per foot), and lastly those with neutral foot posture (1.68 per foot). Patellar tendinopathy was more common in those with supinated feet. Regardless of playing position, lateral ankle sprain and patellar tendinopathy were the most common injuries experienced.

**Conclusions:** The results of this study state that lateral ankle sprains were the most common injury experienced by basketball players followed by patellar tendinopathy. Centers were the most affected by lower limb injuries. Due to the high percentage of those experiencing lateral ankle sprains in this study (97.3%), the authors noted inability to correlate foot posture as a causational factor to injury. Patellar tendinopathy was more prevalent in those with supinated feet. This study did not explore cause-effect relationships, so their results should be considered with caution as the factors were investigated in correlation to one another.

**Commentary:** The results of this study may be utilized in both rehabilitation and prevention context. It highlights the importance of assessing the entire lower kinetic chain in young athletes during return to sport training and could be used to support the potential use of orthotic intervention if appropriate. Treatment and prevention of lateral ankle sprains and patellar tendinopathy in this patient population may require a thorough evaluation of their foot posture and how it relates to their athletic demands. It is also valuable to consider patient playing position, as those who play center seem to experience higher incidence of injury. The authors attribute this to possible increased height, BMI and nature of positional demands under the basket during games.

**Wright AA, Donaldson M, Wassinger CA, Emerson-kavchak AJ. Subacute effects of cervicothoracic spinal thrust/non-thrust in addition to shoulder manual therapy plus exercise intervention in individuals with subacromial impingement syndrome: a prospective, randomized controlled clinical trial pilot study. J Man Manip Ther. 2017;25(4):190-200.**

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

**Objective:** To determine the subacute effects of cervicothoracic thrust/non-thrust manipulation in addition to shoulder manual therapy plus exercise in patients with subacromial pathology.

**Methods:** Patients were randomly assigned to either shoulder treatment plus CTJ mobilization/manipulation or shoulder treatment-only group. Primary outcomes were average pain intensity (Numeric Pain Rating Scale) and physical function (Shoulder Pain and Disability Index) at 2 weeks, 4 weeks, and patient discharge. **INCLUSION CRITERIA:** Must have at least two positive tests for the diagnosis of SIS which included (1) Hawkins-Kennedy Impingement sign; (2) painful arc sign; and (3) weakness in external rotation with the arm at the side. **EXCLUSION CRITERIA:** presence of any red flags, previous shoulder surgery; fracture; current oral steroid use; steroid or analgesic injection in past 3 months; cervicothoracic joint referral; neurological symptoms and/or sinister pathology; and misdiagnosed shoulder pathology.

**Results:** 18 patients (mean age=43.1 (15.8) years) met the inclusion criteria and were included in the study. Both groups experienced statistically significant improvements in pain and function at 2 weeks, 4 weeks, and discharge. The between-group differences for changes in pain or physical function were not significant at any time point.

**Conclusions:** The addition of cervicothoracic spinal manipulation/mobilization to the shoulder treatment-only group did not significantly alter improvement in pain or function in patients with subacromial pathology. Both approaches appeared to provide equal benefit. Both groups improved on all outcomes and met the criteria for clinical relevance for both pain and function.

**Commentary:** The findings of this article are consistent with those of Cook et al, which also demonstrated no between-group differences when comparing cervical manual therapy plus shoulder manual therapy to shoulder manual therapy alone. One-third of patients in this study reported symptom duration greater than one year. Interestingly, the total number of visits were similar between the studies even though Cook's study reported >40% of patients experiencing an acute episode. This trial excluded individuals who experienced shoulder symptoms with neck motions, which could exclude a large group of patients with shoulder pain who may have seen an additional benefit to cervicothoracic manual therapy. Lack of significant between-group differences may also be attributed to the small sample size used in this study. The results of this study should be taken with a grain of salt due to the underpowered sample size.