

**Azevedo et al. (2016). Pelvic Rotation in Femoroacetabular Impingement Is Decreased Compared to Other Symptomatic Hip Conditions *J Orthop Sports Phys Ther*, doi:10.2519/jospt.2016.6713**

Review submitted by Justin Bittner

**Purpose:** To compare the sagittal plane pelvic motion during hip flexion and during sitting in people with FAI and people with other symptomatic hip conditions.

**Methods:** Thirty people with FAI (cam deformity), 30 people with other symptomatic hip conditions, and 20 people with healthy hips were included in the study. They were diagnosed by an orthopedic hip surgeon based on clinical examination and MRI findings. Those in the other hip pathology group had negative impingement tests. Exclusion criteria was (1) no neurologic or degenerative diseases, (2) no hip OA, (3) and no previous hip or spine surgery. To measure the sagittal plane pelvic position the examiners placed calipers on the ASIS and PSIS, and the angle was recorded. The same measurement was recorded with the hip flexed to 45 degrees in standing, flexed to 90 degrees in standing, and finally in sitting. All measurements were collected on the participants dominant leg (of the healthy subjects) and the symptomatic leg of those with hip pain. A two-way mixed-model ANOVA was conducted to determine significant differences between pelvic rotation among the 3 groups.

**Results:** There was a significant difference in sagittal pelvic rotation among the 3 groups studies. Standing with hip flexed to 45 and 90 degrees demonstrated a significantly less pelvic rotation than both the healthy hip and non-FAI condition groups. In all three positions the symptomatic FAI group had less pelvic rotation than the other groups

**Conclusion:** People with symptomatic FAI (cam deformity) have decreased posterior pelvic rotation with active hip flexion compared to people with healthy hips and those with other symptomatic hip conditions.

**Comments:** This article shows that patients presenting with symptomatic FAI (cam deformity) have decreased posterior pelvic tilt with active hip flexion. This limitation in pelvic tilt could be an underlying mechanism for an increase in hip pain. If those with FAI have less posterior pelvic tilt during active hip flexion, this could increase the pain felt with high hip flexion positions. It would be like trying to squat while maintaining an anterior pelvic tilt. Squat depth would likely be less and reports of discomfort would likely be reported. Although the rotation differences are very small (2-4 degrees) these same differences are found in those with shoulder pain (3-6 degrees less scapular rotation. These results suggests that we should potentially be addressing pelvic tilt in patients with FAI. By restoring full pelvic rotation with active movements, this could potentially decrease the hip flexion required; reducing the impingement feeling patients get at end ranged hip flexion. These are just some thought, but potentially something we should at least assess and address with FAI patients.

**Ester Cerezo-Téllez, María Torres Lacomba, Isabel FuentesGallardo, Orlando Mayoral del Moral, Beatriz Rodrigo-Medina & Carlos Gutiérrez Ortega (2016) Dry needling of the trapezius muscle in office workers with neck pain: a randomized clinical trial, Journal of Manual & Manipulative Therapy, 24:4, 223-232, DOI: 10.1179/2042618615Y.0000000004**

Review submitted by Nic Hoover

**Purpose:** The purpose of this randomized clinical trial (RCT) was to determine the effectiveness of the DDN of active MTrPs in the trapezius muscle in office workers with neck pain.

**Methods:** A randomized, single blinded clinical trial of Forty-four office workers with neck pain and active MTrPs in the trapezius muscle were randomly allocated to either the DDN or the control group (CG). The participants in the DDN group were treated with DDN of all MTrPs found in the trapezius muscle. They also received passive stretch of the trapezius muscle. The CG received the same passive stretch of the trapezius muscle only. The primary outcome measure was subjective pain intensity, measured using a visual analogue scale (VAS). Secondary outcomes were pressure pain threshold (PPT), cervical range of motion (CROM) and muscle strength. Data were collected at baseline, after interventions and 15days after the last treatment.

**Results:**

**PAIN:** Regarding subjective pain (Fig. 2), the DDN group VAS median decreased from 5.8 to 0 after treatment ( $P<0.001$ ) and follow-up ( $P<0.001$ ). In the CG, VAS changed from 5 to 3 after treatment ( $P<0.001$ ). This value was maintained throughout the follow-up assessments (A0 vs A1/ A0 vs A2;  $P<0.001$ ). DDN was significantly superior to passive stretch ( $P<0.001$ ) in decreasing pain.

**PPT:** In the PPT comparison, both groups presented statistically significant differences after the interventions (A1 vs A1;  $P<.001$ ): a PPT increase of 2.5kg/cm<sup>2</sup> in the DDN group (A0 vs A1;  $P<.001$ ) and 1kg/cm<sup>2</sup> in the CG (A0vs A1;  $P=.069$ ). In follow-up assessment (A2 vs A2;  $P<.001$ ), the DDN group was superior to the CG regarding the increase in PPT, with statistically significant differences ( $P<.001$ ).

**CROM:** A statistically significant improvement in AROM in rotation, inclination and flexoextension flexion/extension was found in the DDN group ( $P<0.001$ ;  $P<0.05$ ;  $P<0.05$ , respectively) in the A1 and A2 assessments and in rotation in CG ( $P<0.05$  in A1). No statistically significant differences were found either in flexion/extension or in side bending in the CG. The DDN group showed a higher improvement than the CG in AROM after interventions (A1 vs A1;  $P<0.05$ ) and at follow-up (A2 vs A2;  $P<0.05$ ).

**STRENGTH:** Muscle strength in flexion, extension, right and left rotations increased significantly in the DDN group ( $P<.001$ ) and in side bending ( $P<.05$ ) but not in the CG ( $P>.05$ ). No statistically significant differences were found in the comparisons A0 vs A1 or A0 vs A2 as paired databases in the CG, except flexion and left rotation ( $P<.05$ ) in A1. The results showed statistically significant differences between both groups in post-intervention (A1) and follow-up (A2) assessments in all the values of muscle strength ( $P<.05$ ) in favor to DDN group.

**Conclusion:**

Deep dry needling plus passive stretch seems to be more effective in decreasing pain than passive stretch alone, increasing the PPT and cervical AROM and muscle strength in the trapezius muscle in office workers with neck pain. This would support the use of DDN in the management of MPS of the trapezius muscle. Further clinical trials with larger sample sizes, including other cervical muscles and a longer follow-up, are needed to uphold the results obtained in this clinical trial.

**Comments:**

The strength of this study is the clinical applicability based on pt demographics and simplicity of inclusion criteria. Clinically, female office workers w/ neck/UT pain and decreased ROM are a common presentation. The assessment of cervical strength is a unique characteristic that is often not seen in studies but makes sense anatomically based on the mechanism of TDN improving motor end plate activity in the muscle fibers. Although the sample size is small and this particular article is only applicable to female office workers, overall, this study provides good evidence for the use of TDN in neck pathology w/ soft tissue components.

**Koppenhaver S, Embry R, Ciccarello J, et al. Effects of dry needling to the symptomatic versus control shoulder in patients with unilateral subacromial pain syndrome. *Man Ther.* 2016;26:62-69.**

**Pubmed link:** <https://www.ncbi.nlm.nih.gov/pubmed/27497188>

**Review Submitted by: Scott Resetar, PT, DPT**

**Objective:** To examine the effect of dry needling to the infraspinatus muscle on muscle function, nociceptive sensitivity, and shoulder range of motion (ROM) in the symptomatic and asymptomatic shoulders of individuals with unilateral subacromial pain syndrome.

**Methods:** N=57. Within subject design, each person's asymptomatic shoulder served as their own control. Outcome measures were: infrapinatus muscle thickness, both contracted and at rest, shoulder IR and horizontal adduction ROM, pain pressure threshold at the same 3 sites that were dry needled, Penn Shoulder Score, GROC, numeric pain rating scale (NPRS) during comparable sign. Physical exam outcome measures and NPRS were taken immediately before and after needling, and then 3-4 days post. Penn Shoulder scale taken before needling and 3-4 days post. All participants were needled by the same clinician, who was blinded to the prior objective and subjective exam. The needling clinician needled 3 general areas of the infraspinatus (superior, middle, inferior) with a sparrow pecking motion, with each needle staying inserted for a total of 5-10 seconds.

**Results:** 60% of the patients improved greater than the MCID on the Penn Shoulder Scale at 3-4 days post. 1 patient decreased in score by more than the MCID. PPT, IR ROM, and horizontal adduction ROM significantly increased at 3-4 days post. IR ROM also increased in the asymptomatic, non-needled shoulder, but to a lesser degree.

**Conclusions:** Contrary to the author's hypothesis, there were no significant changes in muscle thickness with contraction or at rest at any time point. The authors note that the only previous study of dry needling on infrapinatus muscle function showed an alteration of the timing of firing of scapular muscles that was "normalized" after dry needling. The authors note that if thickness was not changed, it is possible that the timing of infraspinatus was altered and this was not measured in the study. Immediate changes in PPT and shoulder ROM were small and insignificant, however at 3-4 days post, all ROM changes and PPT were statistically significantly improved. **Limitations:** ultrasound measurement of muscle size is difficult, needling clinician was blinded to objective exam which lead to a general needling strategy rather than a clinically targeted needling strategy, and there was no comparison on people whose shoulders weren't needled, or people who only had one shoulder needled.

**Commentary:** This is the first known study of dry needling on symptomatic shoulders and adds to the growing body of evidence for the use of dry needling

**Kyritsis P, Bahr R, Landreau P, Miladi R, Witvrouw E. Likelihood of ACL graft rupture: not meeting six clinical discharge criteria before return to sport is associated with a four times greater risk of rupture. Br J Sports Med. 2016;50(15):946-51.**

Review submitted by: August Winter, PT, DPT

**Objective:** Investigate whether strength and functional testing as part of a return to sport (RTS) criteria are risk factors for ACL graft rupture.

**Methods:** Five surgeons performed different surgical approaches depending on the patients' presentation, with patellar and hamstring grafts occurring and meniscal repairs performed if necessary. Subjects completed a physical therapy program ran by PTs who treat only ACL-injured patients. Criteria to RTS included the following tests and parameters: isokinetic testing at 60, 180, and 300 deg/s (quadriceps deficit < 10% at 60 deg/s), single hop (limb symmetry index > 90%), triple hop (limb symmetry index > 90%), cross over hop (limb symmetry index > 90%), running T test (< 11 s), and full completion of on field sports specific rehab. The running T test involves forward, sideways, and backward running for time in a "T" pattern. Subjects were discharged from PT when they met the above six criteria, and were considered 'not fully discharged' if they chose to RTS before that.

**Results:** 158 male professional sports athletes in Qatar sustained initial ACL injuries and met the inclusion criteria of the study. The mean time for RTS was 229 days after surgery. 26 individuals (16.5%) sustained an ACL graft rupture following RTS, with the median time from RTS till rupture being 105 days. Of the 116 out of 158 athletes who were considered fully discharged, 10.3% sustained an ACL graft rupture compared to 33.3% of the 42 individuals who were considered not fully discharged. In the statistical analysis, the Cox regression model revealed that those who were not fully discharged (did not meet all 6 criteria) had a four times greater risk of sustaining a graft rupture. Lower hamstring to quadriceps ratio at 60 deg/s via isokinetic testing was also found to be a risk factor for graft rupture

**Conclusions:** Utilizing and meeting more extensive discharge criteria for RTS following ACLR can reduce the risk of ACL graft rupture. Lower hamstring strength relative to quadriceps strength may also be an important risk factor for graft rupture. The overall risk of graft rupture following RTS remains high.

**Commentary:** This study provides evidence for the importance of RTS criteria involving strength and functional tests following ACLR. The rupture rate for athletes who met all of the criteria and were fully discharged (10.3%) is lower than that previously reported in the literature by Bourke et al (18%) and Kamien et al (25%). Despite the high rate of reinjury and previous early data suggesting the importance of using functional testing as part of RTS criteria, only 41% of surgeons in another study reported using such tests to help inform RTS decisions. Clearly this is a process that PTs can be providing input into by performing these tests within the clinic. The limitations of this study involve its applicability to clinical practice. The population studied consisted of all professional athletes, who may be more likely to be compliant with home exercises and session attendance than typical patients. The PTs also were part of a group that only treated ACL injuries and had access to an isokinetic dynamometer, a piece of equipment not typically found in clinical practice. Unfortunately this study did not provide any analysis of the athletes who did not meet all 6 criteria to distinguish how only meeting some of the test benchmarks would affect the risk of rupture. Additionally, the number of total ACL ruptures was relatively small (n=26). While taking away one test will likely change the predictive value demonstrated in this study, the criteria provided here do outline a good set of RTS tests which should be performed with all ACLR patients.

**Lluch Girbes E, Duenas L, Barbero M, et al. Expanded Distribution of Pain as a Sign of Central Sensitization in Individuals With Symptomatic Knee Osteoarthritis. *Physical Therapy*. 2016;96(8):1196-1207. doi:10.2522/ptj.20150492.**

Review submitted by: Katie Stokely, PT, DPT

**Objective:** The purpose of this cross-sectional design study was to determine whether areas of knee pain represented by pain drawings related to central sensitization (CS) measures in individuals with varying degrees of knee osteoarthritis. Secondly, the study analyzed the relationship between the areas of described pain and clinical symptoms reported.

**Methods:** The study included 53 participants who were scheduled to undergo a total knee arthroplasty and fit the inclusionary criteria of having diagnosed chronic knee osteoarthritis of the tibiofemoral or patellofemoral joints, via radiographic imaging and clinical diagnosis. Exclusionary criteria included previous knee replacement surgery or orthopedic surgery to the affected lower extremity or co-existing neurological, metabolic or neurologic conditions that could disrupt data collection. Participants were asked to evaluate their knee pain utilizing an 11-point numeric pain scale and then complete a pain drawing as well as several self-reported outcome measures for pain, functional limitations, and central sensitization. Pain drawings were recorded via digital tablet in which patients were instructed to illustrate the location of their pain during the previous week. Objectively, pain pressure threshold and conditioned pain modulation were utilized as direct measures of CS. Range of motion and the Time Up and Go (TUG) test were performed to determine physical ability. Pain drawing data was superimposed separately for males and females to determine the location of highest reported symptoms. Spearman correlation coefficients were calculated to investigate possible correlations between reported area of pain and direct and indirect measures of CS as well as clinical symptoms.

**Results:** Overall, women demonstrated increased area of pain mapping as compared to men. In terms of area of pain and direct and indirect measures of CS, there was a significant correlation between pain pressure threshold at the knee ( $r_s = -.306$ ,  $P < 0.05$ ) and ipsilateral extensor carpi radialis longus muscle ( $r_s = -.308$ ,  $P < 0.05$ ) and area of pain. Those with reported increased areas of pain demonstrated lower pain pressure thresholds. The presence of decreased pain threshold distant to the location of osteoarthritis may indicate more widespread hyperalgesia characteristic of central sensitization. Additionally, those with larger areas of pain recorded higher Central Sensitization Inventory scores. With regards to clinical symptoms, those with enlarged areas of pain reported high pain ( $r_s = .325$ ,  $P < 0.05$ ) and stiffness ( $r_s = .341$ ,  $P < 0.05$ ) subset scores on the Western Ontario and McMaster Universities Arthritis Index (WOMAC).

**Conclusion:** In patients with knee osteoarthritis, enlarged pain distribution recorded via self-reported pain diagram may correlate with some direct and indirect measures of CS.

**Commentary:** The limitations of this study make it difficult to determine the use of reported pain location via pain diagram and the presence of CS. A significant limitation of this study is the lack of concurrent injury screening, as it could potentially increase central sensitization to pain, particularly if it were a chronic condition. The lack of reporting regarding reliability and stability of participant reported symptoms over time might impact the results of this study as well, as expanding pain in non-organic musculoskeletal patterns is common for patients with sensitized pain. This study brings to light the need as clinicians to be aware CS may be present in patients with knee osteoarthritis who come in with large pain diagrams; however, more research needs to be performed before a significant correlation can be made.

**De Mey, K., Danneels, L., Cagnie, B., & Cools, A. M. (2012). Scapular muscle rehabilitation exercises in overhead athletes with impingement symptoms effect of a 6-week training program on muscle recruitment and functional outcome. *The American journal of sports medicine*, 40(8), 1906-1915.**

Reviewed by: Erik Lineberry, DPT

**Objective:** This study's goal was to develop a 6 week program that includes exercises designed to improve scapular muscle activation and timing during shoulder elevation. The program may also change pain and functional level of overhead throwing athletes with mild impingement.

**Methods:** 47 subjects with mild shoulder impingement were included in this study. SPADI scores and maximal voluntary isometric contraction via EMG were taken before and after treatment. Mean muscle activation levels, muscle ratio data, and muscle onset timing were assessed for the upper, middle, and lower trapezius and serratus anterior muscle during scaption. The authors chose 4 exercises from a 2007 Cools article that were shown to decrease UT/MT and UT/LT ratios. These exercises were sidelying external rotation, side lying flexion, prone horizontal abduction, and prone extension. Data was collected at pretest and 6 weeks posttest, with pain scores and exercise progressions occurring at 2 and 4 weeks post initial session.

**Results:** 40 participants completed the study. SPADI scores significantly decreased from 29.866-17.03 to 11.76 - 13.78 during ( $P < .001$ ). The trapezius muscle groups showed increased MVIC values and decreased activation during arm elevation. The SA muscle did not show increased MVIC activation. Post-intervention the UT to SA ratio significantly decreased, whereas UT to MT and UT to LT did not change ( $P < .05$ ). No differences were found in muscle timing. The LT showed significant earlier activation compared with UT ( $P < .001$ ) and MT ( $P < .001$ ). The serratus anterior showed significant earlier activation compared with the UT ( $P < .001$ ), MT ( $P < .001$ ), and LT muscles.

**Conclusion:** Selected exercises improved pain and function based on SPADI scores, reduced relative trapezius muscle activation, and altered UT/SA ratios. They were unable to change the timing of the scapular muscles during arm elevation with a 6-week training program in overhead athletes with mild impingement symptoms.

**Commentary:** This article was interesting due to the rarity for a study to purely study a specific exercise program for a specific condition. With that being said I think that it unfortunately has several shortcomings. I believe its strengths lie in the possibly of creating a future study around, rather than its current findings.

Firstly, it is hard to believe they did not include a control group in this study and that is certainly my biggest disappointment in it. There is no way to determine how much of the results would have occurred anyway, especially in a population like this one with mild symptoms and high activity levels. Another thing that I would have liked to have seen was a supervised group vs HEP group. This study decided to only look into HEP performance for 6 weeks and I think it would be hard to monitor adherence and proper performance of the exercises to allow for the most change. They referenced 2 studies that indicated HEP performance and supervised exercise have similar results and decided to only look at home exercises due to this. I think this is where study design

can fall short of clinical applicability. In a clinic setting most PTs would not perform the same four exercises with a patient over the course of 6 weeks. I think what this study showed well was that these may be some good exercises to start with in patients with shoulder impingement, but I really wished they would have compared to control so that this could be concluded with more confidence. I think a study like this with better design can serve as a great idea for jumping off points for specific patient populations, but this specific study fell short and became an example of research that has limited clinical significance.