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| **Evidence Based Practice II Matthew Medlin**  **PICO Question:** In overhead athlete aged 18-30 years old with subacromial impingement, does scapular taping combined with exercise reduce shoulder pain and improve function as compared to exercise alone? |

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| **Title**  **Author/Journal Year** | **Design/Subjects** | **Purpose** | **Intervention** | **Results** | **Author Conclusions/Relevance** |
| The effects of taping on scapular kinematics and muscle performance in baseball players with shoulder impingement syndrome.  Yin-Hsin Hsu; Wen-Yin Chen; Hsiu-Chen Lin; Wendy T.J. Wang, Yi-Fen Shih.  (Journal Electromyography and Kinesiology) 2009 | Cross-over, pretest/posttest repeated measure design  N= 17 baseball players, age = 23 ± 2.8 years old; BMI = 25.5 ± 2.3 kg/m2; duration of participation in baseball = 14 ± 2.9 years. Duration of shoulder symptoms ranged 0 - 24 months (median = 2 months), maximum pain intensity last 24 hours was between 0-8 (median=3). 9 subjects were pitchers, 8 were fielders. | This study aimed to investigate the effect of elastic taping on kinematics, muscle activity and strength of the scapular region in baseball players with shoulder impingement | Subjects received taping of the lower trapezius with either elastic or a placebo tape. The elastic tape was kinesio tape placed in a Y-shape over the lower trapezius with minimal tension. The placebo tape was Micropore tape cut to same shape and applied to the same position as the elastic.. Following application of one of the tapes the same method was applied for the opposite tape at least three days apart.. Two taping sessions in all per patient were assessed that were "at least" three days apart. The total testing time per session was "about an hour" each. | Significant differences between the two tapings were only found in the scapular posterior tilt at 30 degrees and 60 degrees of arm elevation. Change in scapular displacement was not significant. Taping also tended to increase the muscle activation of the serratus anterior and upper trapezius through the entire range of scaption. The strength changes between the two taping conditions was not statistically significant. Evidence of significance during the study was found between the two taping conditions for posterior tilt during 30-60 degrees elevation with kinesio tape application, upper trapezius %RVC in the 90-120 degree phase with kinesio tape application, lower trapezius %RVC in the 60-30 degree phase with kinesio tape application | The researchers concluded that the applicatin of Kinesio taping over the lower trapezius muscle improved the lower trapezius activity during 60-30 degrees of the lower phase of arm scaption and increased the scapular posterior tilt at 30 and 60 degrees of arm scaption. Thus, the results suggest that Kinesio taping could be a useful therapeutic technique in the rehab clinic.  KT is another tool to be applied in a more comprehensive approach including exercise, etc. for an effective outcome. |
| The Effects of Scapular Taping on the Surface Electromyographic Signal Amplitude of Shoulder Girdle Muscles During Upper Extremity Elevation in Individuals With Suspected Shoulder Impingement Syndrome.  Selkowitz, D; Chaney, C; Stuckey, SJ; Vlad, G.  JOSPT (2007) | Randomized, multi-factorial, repeated-measures, within-subjects design.  N = 21. Patients were described as volunteers from a local university community and affiliated physical therapy clinics that were at least 18 years of age (mean 42.8), with a mean body mass of 72.1 kg and a mean height of 167.9 cm. They reported having shoulder pain for varying duration, ranging from 1 week to several years. | To investigate the immediate effects of scapular taping on surface electromyographic (EMG) signal amplitude of shoulder girdle muscles during upper extremity elevation in individuals with suspected shoulder impingement syndrome | First, the CoverRoll tape was applied to the skin over the upper trapezius on the involved side, starting from the clavicle anteriorly and extending posteriorly, caudally, and medially to the paraspinal area proximal to the lower trapezius electrode, so that the tape was approximately perpendicular to the course of this portion of the upper trapezius. The Leukotape was applied next on top of the CoverRoll tape, with compression over the upper trapezius. | Upper trapezius activity was significantly lower with tape during shelf task elevation (P = .002), especially above 90 degrees (P<.002). Lower trapezius activity was significantly higher with tape (P = .043). No significant differences were found between the tape and no tape for other muscles for the shelf task. During shoulder abduction in the scapular plane, the main effect for upper trapezius showed a significant decrease of EMG signal amplitude (P = .047) for tape versus no tape, but no significant interactions were found among components of this activity, or for other muscles. | Scapular taping decreased upper trapezius and increased lower trapezius activity in people with suspected shoulder impingement during a functional overhead-reaching task, and decreased upper trapezius activity during shoulder abduction in the scapular plane. Taping did not affect the other muscles under the loads tested, but it is possible that the activity of these muscles was not deficient at the time of testing.  Utilization of this taping method alone may not be enough to impact function based on this study and taping should likely be used in conjunction with other methods of physical therapy. |
| Effect of taping as a component of conservative treatment for subacromial impingement syndrome  Kumar, NSS; Nehru, A; Rajalakshmi, D.  Health: Scientific Research (2012) | Double blinded randomised controlled clinical trial  N = 52. 36 male and 16 female patients (mean age 36.2 years) diagnosed by their referring physicians with SIS were enrolled. | This study focuses on the effect of scapular taping and conventional physical therapy in increasing isometric muscle strength, decreasing pain, improving function in patients with subacromial impingement syndrome | Patients in the experimental group received scapular taping along with conventional therapy. All the patients received treatment for three days a week for six weeks. the Tape was applied from the center of the spine of the scapula to the T12 spinous process in a diagonal fashion.. Patients had to return to the outpatient clinic three times a week to be re-taped. On the first day of treatment the patients were taught conventional exercises and each of which was reviewed during following sessions. The patients in the control group were treated with conventional exercises consisting of icing, joint mobilization, stretching and strengthening. Patients were seen for 6 weeks for a total of 18 visits. | At baseline, there were no differences between groups on variables of SPADI pain and disability or isometric strength. Following treatment, the taping group demonstrated improved score in SPADI demonstrating a decrease in pain and disability and improvement in isometric muscle strength compared with the control group. Comparing with unpaired t-test, the scapular taping group improved by 6.30 units in the SPADI. Isometric muscle strength in the taping group increased more than the control group. SPADI scores following treatment were statistically significant (Taping = 52.32, control 45.92, p=0.024). Highly significant differences were noted in the flexors (t=5.32), abductors (t=4.30), and external rotators (t=5.93) of the shoulder and significant difference was noted in the extensors (t=2.97) and internal rotators (t=2.98). | Scapular taping may be a useful adjunct for promoting proper scapular position and can be used in conjunction with other interventions, like specifically selected exercises, patient education and about modification of performing overhead activities. A thorough examination of the scapula's position at rest and during movements is most important before using taping as a treatment technique. |
| Kinesio Taping in Treatment and Prevention of Sports Injuries  Williams S, Whatman C, Hume P, Sheerin K  Sports Medicine (2012) | Meta Analysis Cochrane Review  N = 10 studies, described in detail fit inclusion criteria | The aim of this review was to evaluate, using meta-analysis, the effectiveness of Kinesio tape in the treatment and prevention of sports injuries | No intervention provided. Cochrane review methodology was utilized (literature search, assessment of study quality, data collection of study characteristics, analysis and interpretation of results, recommendations for clinical practice and further research) | Ten articles met criteria for the meta-analysis. Eight studies reported statistically significant outcome for at least one outcome measure. One study indicated statistical significance for management of pain, but these were likely clinically unimportant. Four studies indicated significant changes in ROM, two of these were of high quality (level 4). Four studies showed positive outcomes for strength, although most results were inferred. For proprioception, one study reported two positive outcomes, but was more related to sense error. Two studies reported significant effects of KT on muscle activity using EMG, one of which was of very high methodological quality. | KT may have a small beneficial effect on strength, force sense error and active range of motion of an injured area, but further clarification is needed. There was no substantial evidence to support the use of KT for improvements in other musculoskeletal outcomes (pain, ankle proprioception or muscle activity). Future research should focus on the efficacy of KT in the treatment of injuries in sporting cohorts. Appropriate blinding of subjects and asses- sors, as well as the presence of a placebo taping group, is required to ensure methodological quality.  At this time, anecdotal evidence outmatches the evidence. Future studies should seek to close this gap with excellent methodological studies. |
| Scapular Muscle Activity in Overhead Athletes With Symptoms of Secondary Shoulder Impingement During Closed Chain Exercises.  Tucker W.S., Armstrong C.W., Gribble P.A., Timmons M.K., Yeasting R.A.  Archives of Physical Medicine and Rehabilitation (2010) | Match control group design  N = 30 volunteers, ages 18-35, all on active roster and currently participating for elite athletic team in baseball (4), softball (4), volleyball (10), tennis (4), or swimming (8). Subjects were placed in nonpathology vs. shoulder impingement group and matched. | The purpose of this study was to quantify the activation of the upper trapezius, middle trapezius, lower trapezius, and serratus anterior in overhead athletes who have a history of secondary shoulder impingement, as well as in those who lack this history, during 3 upper extremity closed chain exercises: a standard push-up, a push-up on an unstable surface, and an upper extremity closed chain rehabilitation device | Subjects were measured for EMG data for four main muscle groups during closed chain exercises with standardization of exercises with data normalized for arm length/subject height. EMG data for exercises was compared between groups to identify differences between nonpathology vs. shoulder impingement groups. | There was an exercise main effect for the middle trapezius, serratus anterior, upper trapezius, and lower trapezius. The standard push up was found to elicit greater middle trapezius compared to Cuff Link. There was also a group x exercise interaction for the middle trapezius. The cuff link exercise elicited significantly greater serratus activation compared to standard push up and BOSU. No group main effect or group x exercise interaction was found for the serratus anterior. The Bosu elicited a significantly greater upper trapezius activation level compared to standard push up and Cuff Link. There was no group main effect and no exercise x group interaction for the upper trapezius. The standard push up was fond to elicit significantly greater lower trapezius activation compared to the Cuff Link. There was no group main effect and no group x exercise interaction. | The findings suggest that overhead activities with and without secondary shoulder impingement demosntrated differences in middle trapezius activation between the groups and within the 3 closed chain exercises, possiblly due to increased scapular stabilization resulting from increased upward rotation. However, the SIS group displayed similar serratus anterior, upper trapezius, and lower trapezius activation levels compared with healthy overhead athletes. Since there was greater SA activation and considerably lower UT activation, which is different from previous open chain studies, this study supports the use of closed chain exercises in the clinical treatment and rehabilitation of overhead athletes.Additionally, the Bosu trainer may not be advantageous for increasing activation of the SA or for rehabilitating patients with impingement.  Muscle imbalances found in open chain impingement syndrome exercises may respond differently in closed chain exercises as a result of increased dynamic stabilization. Thus, closed chain exercises may play a role in rehabilitaiton of overhead athletes but they must be gradually returned to more functional athletic tasks. |
| The clinical efficacy of kinesio tape for shoulder pain: a randomized, double-blinded,clinical trial.  Thelen, MD; Dauber, JA; Stoneman, PD.  The Journal of Orthopaedic and Sports Physical Therapy (2008) | Prospective, randomized, double-blinded clinical trial with repeated measures.  N = 21; 17 males, 4 females, all college students enrolled in US Military Academy, age 18-24 with diagnosed rotator cuff tendonitis or impingement. | The purpose of this study was to compare the short-term effect of a therapeutic KT application on reducing pain and disability in subjects with shoulder pain (clinically diagnosed as rotator cuff tendonitis/impingement) as compared to sham KT application. | Treatment KT tape or sham KT was applied to subjects. Subjects activity level was semi-controlled by giving limited-duty performing physical profiles. Subjects were taped and instructed to wear tape for 48-72 hours and to return to the clinic for re-evaluation 12-24 hours after removing the tape. Subjects were assessed and re-taped at re-evaluation time periods with similar instructions for wear and return. | The only difference found at day 1 was that the change score for pain-free ROM shoulder abduction ROM in the treatment group greatly improved compared to the sham group. No main effect for group or group-by-time interaction was observed. No patients removed tape early. The immediate difference between groups no longer existed by day three. Pain free ROM for abduction immediately improved in the treatment group without a concurrent improvement in pain intensity at the end point AROM. Pain and disability measures (SPADI and VAS) were not significantly different between groups. A majority of subjects improved and no longer required care within 4 weeks after completion. 7 subjects did not respond to taping technique (3 KT, 4 sham) and continued with treatment following the study. | When applied to a young, active patient population with a clinical diagnosis of rotator cuff tendinitis/impingement, KT may assist clinicians to obtain immediate improvement in pain-fre shoulder abduction ROM. However, over time KT appears to be no more efficacious than sham taping at decreasing shoulder pain intensity or disability.  KT may be beneficial but is unlikely to provide optimal results with only taping alone and should be used in conjunction with exercise and therapy. |
| Does taping influence electromyographic muscle activity in healthy shoulders?  Cools, AM; Witvrouw, EE; Danneels, LA; Cambier, DC  Manual Therapy (2002) | Ramdomized control with one time measure.  N = 20; all males, volunteers, mean age 22.15 years (20-25), body weight 71.35 kg (61-90) and mean height 180.74 cm (169-188). 15 subjects right handed, 5 left handed. All healthy subjects. | The purpose of this study was to examine the influence of tape application on muscular activity in scapular muscles (three trapezius parts and serratus anterior) during a dynamic abduction and forward flexion movement | Two conditions of taping were applied (Fixomull stretch vs. Leukotape). Groups were compared for muscle activtion two movements: abduction in the frontal plane and forward flexion in the sagittal plane. | There was a significant muscle x movement direction interaction effect and no significant interaction for muscle x period and muscle x resistance. There was no significant interaction between the tape factor and any other factor. The application of tape had no impact on EMG activity in any of the conditions, and differences in EMG activity based on all other factors are independent of tape application ( no tape x other factor interaction). | No significant differences were found in muscle activity in the trapezius and serratus anterior muscles based on the application of tape. The scapular technique apparently does not affect muscle function in normal pain-free shoulders.  Thus, healthy shoulders are unlikely to benefit from taping and inferences can be made as to use being more efficacious in unhealthy shoulders that demonstrate muscle imbalances. Studies must confirm this however. |
| Scapular taping in the treatment of anterior shoulder impingement.  Helen H. Host  Physical Therapy (1995) | Case Study  N=1; right handed, 40 year old, dx right shoulder pain. Very active recreationally (i.e. weight training, racquetball, tennis). Duration 8 months. Imaging negative for fx or moderate/severe ligamentous disruption. 0 out of 10 pain for both shoulders at rest, 5/10 pain R shoulder flex/abd. Bilat forward shoulders. Tenderness to palpation R bicipital tendon and rotator cuff tendons, none on left. Weakness with pain R shoulder flex/abd/supraspinatus. Shortness lat dorsi on R and pec minor B. | The purpose of this case report is to describe how taping designed to promote proximal scapular stability was used in conjunction with other physical therapy interventions to manage a patient with anterior shoulder impingement | Scapular taping was applied and re-taped subsequently with no more than 4 days between visits. Taping was combined with scapular retraining and postural exercises to promote appropriate scapulohumeral rhythm. Stretching was utilized to lengthen shortened muscles. The patient was advised to avoid any activities that give him pain. | In visits 5-8, the patient continued to have pain around 3-5 without the tape during right flexion/abduction but reported that his pain was progressively decreasing. On the 9th visit he was able to abduct and flex through a complete 180 degree range and perform his HEP without pain and without the tape, so taping was discontinued. On the 10th and final visit the patient reported no pain with any of his work or recreational activities, and the occasional "twinge" of pain (1 or 2) in the anterior right shoulder the day after weight lifting. The right scapula's medial border was now 5 cm from the spinous process of T-4. A slight winging was still evident but was not as great. The MMT for supraspinatus was now 4+/5 and all other muscles were 5/5 with no pain. The patient's muscle shortness had improved both in lats and pec minors bilaterally. At one month follow up he reported he had not had right shoulder pain for the past 3 weeks and was playing racquetball, and practicing tennis serves. At a second follow up made 3 months later the patient reported still having no pain and had resumed playing tennis. | Scapular taping may be a useful adjunctive technique for promoting proper scapular position and should be used in conjunction with other conservative methods of treating patients with impingement syndromes of the shoulder. |
| Effect of shoulder taping on maximum shoulder external and internal rotation range in uninjured and previously injured overhead athletes during a seated throw.  McConnell, J; Donnelly, C; Hamner, S; Dunne, J; Besler, T.  Journal of Orthopaedic Research (2011). | Randomized repeated measure cross-over control trial  N = 26 elite college overhead athletes; mean age 20 years (18-28); sports include volleyball (7 total: 6 uninjured, 1 injured), baseball (6 total: 5 uninjured, 1 injured), tennis (13 total: 6 uninjured, 7 injured); 11 female, 15 males. | The purpose of our study was to investigate whether shoulder taping affects shoulder kinematics in injured and previously injured overhead athletes during a seated throw. | Subjects performed throwing trials of a handball into a net from seated position with and without shoulder taping using the protocol defined by McConnell and McIntosh. | No main effect group of shoulder taping was found on maximum ER and IR, shoulder abduction ROM, or ball velocity. Max ER increased with tape from 131-135 degrees in the uninjured group and decreased with tape from 143 to 138 degrees in the previously injured group. IR with tape increased the range from 42-44 degrees in the uninjured group and decreased the range from 54-51 in the previously injured group. There was a significant interaction effect of shoulder taping found depending on previous injury status on max ER, which increased with tape. There was a significant interaction effect of IR with previous injury status. Total rotation ROM in the previously injured was decreased by tape from 197 to 188, whereas for the uninjured group, it increased with taep from 174-178 degrees. There was a significant interaction effect of total rotation ROM and taping with previous injury status. No interaction effect was found with shouldering taping and previous injury status with shoulder abduction or ball velocity. | Shoulder taping had a differential effect on shoulder ER rotation range, whereby uninjured overhead athletes increased their ROM, but previously injured athletes decreased their ROM. The fine control of humeral translation may be improved by the specific application of tape, minimizing strain on the anterior structures and improving the stability of the shoulder. These findings have implications for rehabilitating shoulder injuries, returning athletes to sport after injury, and for screening athletes at risk of injury.  Scapular taping can provide effect to enact changes in scapulohumeral rhythm and mechanics. This could also play a future role in use during activity and screening in injury prevention. |
| Kinesio taping compared to physical therapy modalities for the treatment of shoulder impingement  Kaya, E; Zinnuroglu, M; Tugcu, I.  Clinical Rheumatology (2010) | Pretest/posttest repeated measure design  N=55 total, n=30 KT, n=25 PT. Inclusion criteria pain before 150 degrees active shoulder elevation, +empty can, +Hawkins-Kennedy, difficulty performing ADLs, age 18-70. Exclusion criteria steroid injection, shoulder girdle fx, GH dislocation/sublux, AC sprain, cervical sxs, shoulder surgery previous 12 weeks, shoulder pain > 6 months. | The purpose of this study was to determine and compare the efficacy of kinesio tape and physical therapy modalities in patients with shoulder impingement syndrome. | Patients were treated with kinesio tape (n = 30) three times by intervals of 3 days or a daily program of local modalities (n = 25) for 2 weeks. | The rest, night, and movement median pain scores of the kinesio taping (20, 40, and 50) group were statistically significantly lower (p values were 0.001, 0.01, and 0.001, respectively) at the first week examination as compared with the physical therapy group (50, 70, and 70). However, there was no significant difference in the same parameters between two groups at the second week (0.109, 0.07, and 0.218). Kinesio tape has been found to be more effective than the local modalities at the first week and was similarly effective at the second week of the treatment. Kinesio taping may be an alternative treatment option in the treatment of shoulder impingement syndrome especially when an immediate effect is needed. | Kinesio tape has been found to be more effective than the local modalities at the first week and was similarly effective at the second week of the treatment.  KT may be a viable tool in a comprehensive program especially for immediate effects regarding pain. Long-term efficacy remains inconclusive. |
| Upper and lower trapezius muscle activity in subjects with subacromial impingement symptoms: Is there imbalance and can taping change it?  Smith, M; Sparkes, V; Busse, M; Enright, S.  PT in Sport (2009) | Cross-sectional study with nested within-subject intervention  N=48; Subjects with SIS (n=16) matched age/gender group of asymptomatic subjects (n=32). Inclusion criteria full AROM and unilateral shoulder pain > 1 month, + history, + Neer/Walsh test, + Hawkins-Kennedy, +Active shoulder ext, + palpation supraspinatus, pain with resisted isometric abduction, + empty can. Exclusion criteria sxs neural tension ULTT 1, cervical thoracic spine involvement, GHJ instability via +Load/shift test, RC weakness, + sulcus sign | To investigate whether subacromial impingement symptoms (SIS) were associated with upper and lower trapezius muscle imbalance and the effect of a scapula taping technique on upper and lower trapezius muscle activity. | Taping applied per guidelines defined by McConnell to inhibit the upper trapezius fibers and facilitate the lower trapezius fibers. Tape was applied over the middle third of the trapezius and directed posteriorly towards T12 and belly of LFT. | Symptomatic subjects demonstrated a significantly higher ratio of upper trapezius fiber:lower trapezius fiber activity than the asymptomatic subjects. With taping the symptomatic subjects demonstrated a significant reduction in UFT activity but no significant change in activity of LFT. No relationship was found between the degree of underlying muscle imbalance and the reduction in UFT under the taped condition for the symptomatic group. | Subacromial impingement symptoms are associated with altered upper and lower trapezius muscle activity which can be partially addressed by the application of tape. |
| Subacromial Impingement Syndrome: The Effect of Changing Posture on Shoulder Range of Movement  Lewis, JS; Wright, C; Green, A.  JOSPT (2005) | Random allocation of subjects into a placebo-controlled, crossover study  N=120, 60 SIS and 60 asymptomatic. Inclusion criteria: +Neer, unilateral shoulder pain > 1 week, pain during flex/abd, + Hawkins, +empty can, +painful arc, +palpation GT; Exclusion criteria: Health professionals, systemic illness, pregnancy, cervical pain, hx of spine pathology, instability sxs, AC sxs, elite level athletes\* | To investigate the effect of changing thoracic and scapular posture on shoulder flexion and scapular plane abduction range of motion in asymptomatic subjects, and in subjects with subacromial impingement syndrome. | Changing posture was accomplished through request to bring shoulders down and back followed by Luekotape application that was pretensioned from T1-T12 and was compared to placebo taping of the same placement. | Changing posture had an effect on all components of posture measured and these changes were associated with a significant increase in the range of motion in shoulder flexion and abduction in the plane of the scapula. Changing posture was not found to have a significant effect on the intensity of pain experienced by the symptomatic subjects, although the point in the range of shoulder elevation at which they experienced their pain was significantly higher. | The application of taping has been recommended for many therapeutic rea- sons and it was necessary to demonstrate that one of the effects of taping, as used in this investigation, was to elicit a change in the static posture of the subjects. There may be a place for the techniques described in this study in the assessment of patients to determine the possible benefit of postural changes and taping on SIS.  Elite level athletes and ages not matching proposed population. Results can only be inferred for target subjects. |
| Scapular Muscle Rehabilitation Exercises in Overhead Athletes With Impingement Symptoms: Effect of a 6-Week Training Program on Muscle Recruitment and Functional Outcome.  De Mey, K; Danneels, L; Cagnie, B; Cools, AM.  Am J Sports Med (2012) | Case series  N=47 (25 men, 22 women); age 24.6; avg 6 hours a week competitive overhead sports including volleyball (17), tennis (10), canoe polo (2), baseball (2), swimming (11), and badminton (5). 43 were right handed, only in 2 were nondominant UE affected. Shoulder impingement determined by +Neer, Hawkins, Jobe, apprehension, and relocation testing; subjects included with at least 2 of 5 and with altered scapular resting positions (yes); excluded with dislocation, shoulder sx, or sxs cervical, Nsaid ingestion, steroid injection last 12 months | The aim of this study was to evaluate the effect (pain, function, activation levels) of the 4 exercises (side-lying flexion, side-lying ER, prone hor abd + ER, prone extension) in a clearly defined population of overhead athletes with mild impingement symptoms. | The subjects were tested before and after a 6-week daily home exercise program consisting of the exercises previously described in purpose. All subjects performed the exercises with the affected side 3x10 per exercise daily. | Forty participants completed the exercise program. The SPADI scores significantly decreased from 29.86 6 17.03 during initial assessment to 11.7 6 13.78 during post measurements. The 3 trapezius muscle parts showed increased MVIC values and decreased activation levels during arm elevation, whereas this was not the case for the SA muscle. After the training program, UT/SA significantly decreased, whereas UT/MT and UT/LT did not change. No differences in muscle timing between pre- and post measurements could be identified. The LT showed significant earlier activation compared with UT (20.47) and MT (20.49). The serratus anterior showed significant earlier activation compared with the UT (20.74) MT (20.76) and LT muscles (F = 0.27). | Selected exercises (1) improve pain and function based on SPADI scores, (2) reduce relative trapezius muscle activation, and (3) alter UT/SA ratios. **However, they were unable to change the timing** of the scapular muscles during arm elevation when compared before and after a 6-week training program in overhead athletes with mild impingement symptoms.  This demonstrates the potential need for taping as an adjunct therapy in modifying activation patterns. |
| Effectiveness of Rehabilitation for Patients with Subacromial Impingement Syndrome: A Systematic Review  Michener, LA; Walsworth, MK; Burnet, EN.  J Hand Therapy (2004) | Systematic Review  N= 12 trial studies | The purpose of this systematic review was to examine the evidence for rehabilitation strategies for patients with SAIS—specifically, the efficacy of non-surgical nonpharmacologic treatment procedures | No intervention provided. Cochrane review methodology was utilized (literature search, assessment of study quality, data collection of study characteristics, analysis and interpretation of results, recommendations for clinical practice and further research) | 12 studies were included as a result of methodological appraisal. Limited evidence currently suggests that exercise, joint mobilization, and laser therapy are effective in decreasing pain and improving function in patients with SAIS. Ultrasound does not appear to be of benefit, and acupuncture yielded equivocal findings from two trials. Therapeutic exercise was the most well investigated form of rehabilitation. It mostly consisted of stretching the anterior and posterior shoulder girdle, muscle relaxation techniques, motor learning to normalize dysfunctional patterns of motion, and strengthening of rotator cuff and scapular muscles. Improvements in pain, patient satisfaction, levels of disability and functional loss, strength, shoulder ROM, pain with subacromial compression, and overall shoulder use have been demonstrated with therapeutic exercise programs. | Given the current evidence, therapeutic exercise is indicated as an effective intervention for patients with SAIS as opposed to no treatment or placebo treatment. Exercise is effective for patients with SAIS; how- ever, we do not know which patients specifically respond to exercise(s). Not all patients within these trials responded to exercise.  This systematic review demonstrates that exercise, while effective, often requires additional adjunct therapies to help ensure optimal outcome. |
| A systematic reivew and a synthesized evidence-based rehabilitation protocol.  Kuhn, JE.  J Shoulder Elbow Surg (2009) | Systematic Review  N=11 studies included | The purpose of this systematic review is evaluate the role of exercise in treating rotator cuff impingement and to develop an evidence-based gold standard, physical therapy, exercise program for the treatment of rotator cuff impingement syndrome by synthesizing the features of exercise protocols from clinical studies with the highest levels of evidence. | No intervention provided. Cochrane review methodology was utilized (literature search, assessment of study quality, data collection of study characteristics, analysis and interpretation of results, recommendations for clinical practice and further research). | General principles for exercise program included frequency, ROM, stretching/flexibility, strengthening, manual therapy, and modalities. The data from this systematic review strongly suggests that exercise improves symptoms in patients with impingement syndrome. Supervised exercise, home exercise programs, exercise associated with manual therapy and exercise after subacromial decompressions demonstrate improvement in pain in all but 1 study.Strength was not shown to improve significantly for exercise alone, but did improve when exercise was combined with manual therapy. Function improved with exercise in most studies. | These results suggest that exercise therapy is highly effective at reducing pain and likely effective at improving function. These effects may be augmented with manual therapy or acromioplasty. |