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EFFICACY OF KINESIO TAPING COMBINED WITH ECCENTRIC EXERCISE IN
DECREASING PAIN IN MOTION FOR
OVERHEAD ATHLETES WITH ROTATOR CUFF TENDONITIS

A MASTER'S (Capstone) PROJECT
SUBMITTED TO THE GRADUATE FACULTY
OF THE GRADUATE SCHOOL
BETHEL UNIVERSITY

BY
ESTER VANG

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
MASTER OF SCIENCE IN ATHLETIC TRAINING

MAY 2021

BETHEL UNIVERSITY

EFFICACY OF KINESIO TAPING COMBINED WITH ECCENTRIC EXERCISE IN
DECREASING PAIN IN MOTION FOR
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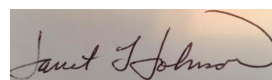
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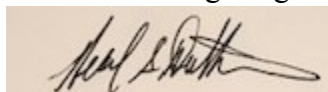
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Abstract

Background: Rotator cuff tendonitis is an injury that can occur in overhead athletes with overuse and eccentric training has shown to help relieve any pain with rotator cuff tendonitis. Kinesio taping (KT) is becoming increasingly popular in the athlete population. KT and eccentric training could be beneficial and effective together, but also remains unsolved as KT has many unanswered questions.

Purpose: The purpose of this critical review is to determine if eccentric exercise combined with KT is superior than with just eccentric exercise in rehabilitation for overhead athletes in order to decrease pain while in motion.

Results: There were 17 articles in total used in this critical review. Twelve of the studies did not have enough evidence or had inconclusive results in supporting KT with an exercise program. Five studies had some support for KT with an exercise program.

Conclusion: The articles provided mixed conclusions of whether or not KT did have its effect with eccentric training or from the studies, an exercise program, in decreasing pain while in motion. On the other hand, three studies showed that short-term use of KT could be beneficial while mid- to long-term effects were not supported.

Implications: Due to a lack of evidence and mixed study results, there is a need for more sufficient evidence or research, specifically in the athlete population, in order to properly support the effectiveness of KT and if it makes a difference being combined with eccentric training or an exercise program.

Keywords: Kinesio taping, eccentric training, rotator cuff tendonitis, pain, overhead athletes

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Chapter 1: Introduction

The shoulder is the one of the most complex joints in the human body. Often called the glenohumeral (GH) joint, the shoulder is a ball and socket joint that makes the shoulder highly mobile, but also very unstable (Maruvada et al, 2020). The shoulder joint is controlled by four primary muscles: the subscapularis, supraspinatus, infraspinatus, and the teres minor. These muscles, collectively known as the rotator cuff, originate from the scapula and insert onto the humerus. The subscapularis is responsible for internal rotation of the shoulder while the supraspinatus moves the shoulder to abduction; the infraspinatus and the teres minor both move the shoulder into external rotation (Maruvada et al, 2020). The rotator cuff muscles are essential in providing a large range of motion in the GH joint. The tendons, located between the bone and muscle, function to transmit the forces that are generated from the muscle to the bone in order to provide movement. There are two tendons in each muscle located at the origin and insertion of the muscle (Physiopedia, 2020). The tendon can be a common location for injury if the shoulder is overused, therefore resulting in tendonitis or tendinopathy of the rotator cuff muscles (Physiopedia, 2020).

Tendonitis is described as an acute inflammation of the tendon that occurs due to small micro tears. It can result quickly from an acute injury or repeated overuse. Tendinopathy is described as any problem that involves the tendon and is considered an umbrella term for all tendon conditions (Ode, 2019). The condition can occur over time in constant overhead motion for athletes for example, participating in baseball, tennis or swimming. Within these sports, rotator cuff tendonitis can be referred to as swimmer's shoulder, pitcher's shoulder, or tennis shoulder (Martel, 2018). The most common cause that could lead to a rotator cuff tendonitis is

shoulder impingement (Factor, 2014). Overuse activity along with changes in the GH joint can cause shoulder impingement and therefore, it can cause rotator cuff tendonitis (Factor, 2014).

Symptoms of rotator cuff tendonitis include pain, swelling, stiffness, pain when waking up, and pain when reaching behind your back (Martel, 2018). Supraspinatus is the most commonly muscle involved in a rotator cuff tendinitis, which abducts the shoulder. It is seen as the greatest stress force during shoulder abduction. In fact, it is “estimated that 95% of rotator cuff tears might find their origin in supraspinatus tendonitis” (Tapscott & Varacallo, 2010). In overhead athletes, overuse of the shoulder joint that involves the rotator cuff muscle can cause irritation or inflammation of the tendons and can lead to tears of the tendon (Abrutyn, n.d.). As mentioned, swimmers, baseball pitchers, or tennis players are typical athletes likely to be affected by this condition with the addition of volleyball and other racket sports that involve overhead motion.

A common exercise treatment for rotator cuff tendonitis is utilizing eccentric exercises. Eccentric exercises are common therapeutic exercises in which one lengthens the muscle while a load is applied (Murtaugh & Ihm, 2013). This type of exercise imposes a greater load on the tendon compared to concentric exercises. Additionally, eccentric exercise muscle conditioning can produce greater measurements in muscle tension than with concentric muscle conditioning. The higher forces can induce a remodeling response chronically and progressively (Murtaugh & Ihm, 2013). There are three basic principles in the eccentric loading regime: the length of the tendon, the load being exerted, and the speed of the movement. The length of the tendon increases as the tendon is pre-stretched, therefore less strain will occur on the tendon while in motion. The load should increase the strength of the tendon by increasing that load exerted on

the tendon. And finally, increasing the speed of the contraction helps with developing a greater force (Camargo et al, 2014).

KT is an elastic adhesive tape that was developed by Dr. Kenzo Kase in 1979 (Ozturk et al, 2016). It is supposedly able to alleviate discomfort and help lymphatic drainage by lifting the skin. Through the lifting, there is an increase in interstitial space which reduces pressure by giving an effective flow of lymphatic fluid in and out of the specific area (Orthopedic & Spine Physical Therapy, n.d.). Additionally, it is stated that KT has the ability to re-educate the neuromuscular system, reduce inflammation, prevent injury, and helps promote circulation and healing (KOH Physical Therapy Lab, n.d.). With all of the popularity and widespread use, there are a few studies that have supported the effectiveness of kinesio taping for neck and upper extremity conditions (Ozturk et al, 2016). KT has been shown to be used for lateral epicondylitis, patellar tendonitis, achilles tendinitis, peroneal tendonitis, and shoulder tendinitis. It can be used for almost any body part, but the question remains as to if KT really works to reduce pain, reduce inflammation, and prevent injury.

Statement of Purpose:

This Critical Review seeks to answer if eccentric exercises with KT is superior than with just eccentric exercises in rehabilitation for overhead athletes in order to decrease pain while in motion. If pain is able to be relieved through KT and eccentric exercises, it could help athletes and health professionals be more aware of kinesio taping and its effects. For example, health professionals are able to take classes in kinesio taping techniques and even be certified as a certified kinesio taping practitioner (CKTP). Health professionals can also be able to use their

financial spendings on the taping if it is proven that kinesio taping with eccentric exercises help overhead athletes.

Need for Critical Review:

There is a need for a critical review of the literature to determine if KT has a significant impact on athletes' pain levels. The articles reviewed for this project explain that KT helps with shoulder impingement rather than rotator cuff tendonitis. Shoulder impingement can cause a rotator cuff tendonitis injury because impingement or narrowing in the subacromial space can lead to pressure on the involved tendon. Therefore, there is much information that needs to be collected in order to answer the many questions.

Significant to athletic training:

Overhead athletes are considered to be tennis players, baseball players, volleyball players, quarterbacks in football, and even swimmers. The GH joint is susceptible to many injuries such as intrinsic and extrinsic mechanisms (Factor, 2014). Intrinsic mechanism is aging, altered biology, microvascular blood supply, degeneration, tendon overload, overuse, or trauma. Extrinsic mechanism is where other anatomical factors come into play such as the acromion and the acromioclavicular joint (Factor, 2014). Eccentric exercises are known to help with tendonitis with the lengthening and the load compared to concentric exercises. If research provides enough factual evidence that KT truly is effective in reducing pain, athletic trainers or health professionals will have a reasonable investment in their time and money in learning and taking advantage of this type of treatment for athletes. To add on, athletes may also be able to return to play quicker and participate more in their respective sports.

Chapter 2: Methods

Search Strategies:

Some of the articles that were used for this Critical Review were searched via the CLICsearch database through the Bethel University online library, Google Scholar and PubMed. If an article was found to be unavailable through Google Scholar, using the CLICsearch with access to Bethel University helped gain access to those important articles. Some of the keywords that were utilized in the article search include “Rotator cuff,” “tendinitis,” “tendinopathy,” “tendinosis,” “subacromial,” “kinesio taping,” “eccentric,” “shoulder,” “impingement,” “overhead,” “pain,” and “athletes.” Through the CLICsearch database, there were 435 articles and then filtering the search by dates from 2010-2020 brought it down to 237 articles. With Google Scholar, there were about 630 articles that were identified with the terms “rotator cuff, tendinopathy, eccentric, and KT”. Making sure to add the necessary keywords such as “overhead” helped narrow the articles found to 235. Adding more keywords such as the specific overhead sports like “baseball players,” “volleyball,” “swimmer,” and “football quarterback,” to PubMed helped narrow the search even further to 50 articles. There were several articles that did not meet the inclusion criteria or included rotator cuff surgery which was not part of the Critical Review. It was more difficult to find articles that included rotator cuff tendonitis as they often presented as subacromial impingement syndrome with kinesio taping and eccentric training.

Inclusion and Exclusion Criteria:

Inclusion Criteria included articles that compared kinesio taping, sham taping, eccentric training ranging from 2008-2020. The articles had to either show randomized control trials (RCT) that compare the kinesio taping with sham taping or kinesio taping with exercises

compared to sham taping with exercises. Systematic reviews or meta-analyses that included KT combined with exercises as well as sham taping also helped in creating this critical review. It was more difficult to find overhead athletes specifically because most rotator cuff injuries occur in the older population. Articles that had English translation were included in the study as it helped with gaining more evidence in the exercise regime combined with kinesio taping critical review. Any articles that had tendonitis were also included in the study.

Exclusion criteria that narrowed the number of articles included surgery for rotator cuff, anything with tears in the rotator cuff, and any articles that did not include exercise or kinesio taping. Additionally, the articles that showed RCT excluded those individuals under 18 years of age which were also excluded from this critical review.

Number and Types of Articles:

The 17 articles selected were mostly RCT studies and systematic reviews. The assessment tools used to evaluate the articles were the PEDro scale, which was used for the RCT articles, and the Critical Appraisal Skills Programme (CASP), which was used for the systematic reviews or meta-analyses. The quality of the articles were determined by the assessment tools with the PEDro scale ranging from 0 to 11 and the CASP scale ranging from 0 to 10. All of the systematic reviews and meta-analyses were considered level I articles while the RCT were considered level II articles. Table 1 portrays the level of evidence, if the article was excellent, good, or low quality, and the total of articles in each category. Table 2 shows a table from “Critical Appraisal of the Evidence: Part 1” article (Fineout-Overholt et al, 2010).

Table 1:

Level of Evidence	Excellent quality	Good quality	Low quality	Total # of Articles each level
I (Systematic Reviews/ Meta-analyses)	2	2	1	5
II (Randomized controlled-trials)	6	5	1	12
III (Controlled-Trial without randomization)	0	0	0	0
IV (Case Control or Cohort Studies)	0	0	0	0
V (Systematic Review of qualitative or descriptive studies)	0	0	0	0

Total # of Articles				17
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Table 2:

Hierarchy of Evidence for Intervention Studies		
Type of evidence	Level of evidence	Description
Systematic review or meta-analysis	I	A synthesis of evidence from all relevant randomized controlled trials.
Randomized controlled trial	II	An experiment in which subjects are randomized to a treatment group or control group.
Controlled trial without randomization	III	An experiment in which subjects are nonrandomly assigned to a treatment group or control group.
Case-control or cohort study	IV	Case-control study: a comparison of subjects with a condition (case) with those who don't have the condition (control) to determine characteristics that might predict the condition. Cohort study: an observation of a group(s) [cohort[s]] to determine the development of an outcome(s) such as a disease.
Systematic review of qualitative or descriptive studies	V	A synthesis of evidence from qualitative or descriptive studies to answer a clinical question.
Qualitative or descriptive study	VI	Qualitative study: gathers data on human behavior to understand <i>why</i> and <i>how</i> decisions are made. Descriptive study: provides background information on the <i>what</i> , <i>where</i> , and <i>when</i> of a topic of interest.
Expert opinion or consensus	VII	Authoritative opinion of expert committee.

Adapted with permission from Melnyk BM, Fineout-Overholt E, editors. Evidence-based practice in nursing and healthcare: a guide to best practice [forthcoming]. 2nd ed. Philadelphia: Wolters Kluwer Health/Lippincott Williams and Wilkins.

(Fineout-Overholt et al, 2010)

Criteria for Evaluating the Studies:

The RCTs were evaluated using the PEDro scale, a tool that includes eleven questions. Some of the questions included “if the eligibility criteria were specified”, “subjects were randomly allocated to groups”, “if allocation was concealed”, “if there were blinding of all subjects”, “blinding of all therapists”, “The study provides both point measures and measures of variability for at least one key outcome” (Verhagen et al, 1998). Although, the PEDro scale should be used to measure a study’s validity of their conclusion. To add on to that, Verhagen

states that the “scale should not be used to compare the “quality” of trials performed in different areas of therapy.” (Verhagen et al, 1998). The PEDro scale assisted with providing importance to each article for their own level and quality. Refer to Appendix B.

The Critical Appraisal Skills Programme (CASP) was used to assess the systematic reviews or meta-analysis. There were ten questions in this assessment tool which asked questions such as, “Did the review address a clearly focused question?”, “Did the authors look for the right type of papers?”, “Do you think all the important, relevant studies were included?”, . “What are the overall results of the review?” (Critical Appraisal Skills Programme, 2018). Refer to Appendix C. The CASP assessment tool, provides guidance and critical thinking to assist in giving the article a certain level and quality. Some of the systematic reviews or meta-analysis also stated the article’s level and quality right in the abstract.

Both of these tools were utilized to assess the article level of evidence and quality. In order to organize the articles, the matrix was a great tool to help arrange the 17 articles. Utilizing the Bethel University Graduate Nursing Program’s matrix with headings that state the design methodology/purpose, sample/setting, design instruments, and results helped determine the most important aspects of the article and identify similarities and differences.

Chapter 3: Literature Review and Synthesis

Synthesis of Matrix

There were 17 articles that were used in this critical review. The matrix that was utilized to organize and help simplify in understanding the articles was the Bethel University Graduate Nursing Evidence Synthesis Matrix. The main headings that this matrix utilizes are design methodology/purpose, sample/setting, design instruments, results, recommendations, and source citation in American Psychological Association (APA) format. Added into the sample/setting column, the assessment tool that was utilized was stated in that column along with the level and quality of the article. As mentioned, the matrix is to help simplify the article and also assist in comparing similar articles. Out of the 17 articles reviewed, there were five systematic reviews/meta-analyses and 12 RCT.

Synthesis of Major Findings

The synthesis of the 17 articles that were used were to determine if KT with eccentric exercises was effective in reducing pain for rotator cuff tendonitis in overhead athletes. The studies were categorized into two groups: Studies that include KT treatment combined with an exercise program and studies that include just KT without an exercise program. The articles will be discussed by order of the quality from excellent to low within each group.

Studies that includes KT taping combined with exercise program

Lucas de Oliveira et al (2020) hypothesized that individuals using KT will have faster improvements in symptoms and functional limitations in comparison to those who do not use KT during a rehabilitation program. This randomized controlled clinical trial included 52 participants who were recruited and had a rotator cuff related shoulder pain (RCRSP). The inclusion criteria for these participants were having a baseline of at least eleven points on the Disabilities of the

Arm, Shoulder, and Hand (DASH) questionnaire, have 1 positive sign of a clinical test such as painful arc of movement, Neer or Hawkins-Kennedy impingement signs, and pain during resisted external rotation, abduction, or empty can test. Two groups were created: one called the KT group and the other called the no-KT group. Outcomes were measured at 5 different times during the study: Baseline, 3 weeks, 6 weeks, 12 weeks, and 6 months. With the KT taping, the two groups attended 10 physical therapy sessions over six 6 weeks. DASH questionnaire, Brief Pain Inventory (BPI), and the Western Ontario Rotator Cuff (WORC) index were the assessments utilized to evaluate the outcomes. Physical therapy was based on patient needs and prescribed home exercises. The study revealed that both groups showed significant improvements for the DASH, BPI and the WORC. They concluded that functional limitations, range of motion, and acromiohumeral distance (AHD) improved in both groups and the KT taping did not have any superior need compared with using physical therapy alone. This article is a level II with excellent quality that had a PEDro score of 11/11.

Letafatkar et al (2020) investigated if the addition of KT to therapeutic exercises is efficient and effective compared to therapeutic alone and also no intervention. This intervention was conducted on patients that have shoulder impingement syndrome. There were 120 patients with inclusion criteria with pain lasting more than six weeks, painful arc during exertion of flexion and abduction, positive Neer or Hawkins-Kennedy tests, and painful resisted external rotation, abduction, or painful Jobe's test. There were baseline assessment and post-intervention assessment during the eight week timeline. The exercises involved, such as three stretching and three strengthening, occurred over the eight weeks for three days a week for one hour. The KT was removed before therapeutic exercise and then reapplied after the exercise. The control group did not have an intervention, but were given a brochure to prevent overuse or injury. The

outcome measurements were the numeric rating scale and disability and scapular kinematics measured by 3-dimension software. The Iranian version of the disabilities of the Arm, Shoulder, and Hand questionnaire were used for disability. The results showed that therapeutic exercise with KT was far superior to the control group and the therapeutic exercise alone. They determined that adding KT taping with exercise may be of some assistance to improve clinical outcomes with patients that have shoulder impingement syndrome. The article is level II, excellent quality with a 10/11 score on the PEDro scale.

Martins Da Silva et al (2020) conducted a randomized, blind clinical trial that tested KT in shoulder rotator cuff tendinopathy. There were 60 participants that had an inclusion criteria of sub acromial pain for at least three months and two of three positive impingement tests such as Jobe test, Hawkins-Kennedy test, or Neer's test. There were three groups that the 60 participants were randomly assigned to which were named the exercise group (EG), kinesio tape group (KTG), and the exercise plus kinesio tape group (EKTG). The outcome measurements that were being assessed are pain level, active and passive mobility, muscle strength, and function. Pain intensity was assessed using the VAS, muscle strength was evaluated by a manual dynamometry, ROM using a goniometer, and function assessment by the Shoulder Pain and Disability Index (SPADI). The exercise protocol included seven eccentric exercises which lasted four weeks. The sessions were held three times a week to which load was increasing by patient agreement of 0.5 kilogram per week unless pain was present. KT was applied twice a week for four weeks and the KT was replaced every three days. All outcome measurements that were assessed showed improvement in all the groups. Comparing between the groups, the EKTG had a significantly higher improvement than the EG and KTG groups ($p < 0.05$). In conclusion, all groups have improved on all the outcome measurements and based on the evidence, when KT taping is

combined with an exercise protocol, it is effective for lowering pain levels and increasing ROM. This article is 9/11 of the PEDro scale and with level II, excellent quality study.

Simsek et al (2013) study was a randomized, double-blind, controlled clinical trial that utilized KT with an addition of exercise therapy in order to improve the pain in subacromial impingement syndrome. There were 38 patients that were randomly divided into a therapeutic kinesio taping group and a sham kinesio taping group. These patients were determined by a diagnosis of subacromial impingement syndrome and had a positive Neer and Hawkins impingement test. In addition to the taping, the exercises that were performed were Hughston's six exercises that emphasized strengthening the rotator cuff muscles with the patient in prone position and a thera-band that was used to help scapular stabilization. All the exercises were performed once a day, for five days a week that lasted for two weeks. The taping occurred in a three-day interval for 12 days and the design instruments for assessment used in this study was severity of pain at rest, sleep, and during activity on a 10-cm visual analog scale (VAS), range of motion (ROM), muscle strength, and Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire, and the constant score. In conclusion, the results showed improvement in both groups on the fifth and twelfth day. Comparing the two groups, pain with movement and the DASH questionnaire in the therapeutic KT group were lower at the fifth day ($p>0.01$). Additionally, night pain, pain with movement, DASH score, shoulder external rotation, muscle strength, and pain free shoulder abduction ROM were all improvements on the twelfth day for the therapeutic KT group. It was determined that KT application combined with an exercise program can be more effective than an exercise program alone in order to help with subacromial impingement syndrome. The PEDro score was a 9/11 with excellent quality and a level II article.

Miccinilli et al (2018) conducted a RCT that had two groups, a real group (RG) and a sham group (SG) to receive taping application with an addition of a rehabilitation protocol to determine if kinesio taping supports a rehabilitation program for rotator cuff tendinopathy (RoCT). 21 patients were enrolled in the RG and 19 were in the SG. Patients were selected based on radiologic diagnosis of RoCT and had at least one positive shoulder test. The design instruments utilized in this study were the Numeric Rating Scale (NRS) for shoulder pain, Medical Research Council (MRC) Scales for shoulder strength assessment, and Constant Murley Score (CMS). These instruments were administered before and at the end of treatment. With the taping, there was a rehabilitative protocol that included ten sessions of rehabilitative treatment from Monday to Friday over a span of two weeks. The exercises included passive shoulder mobilization, postural exercises, active assisted mobilization, and active shoulder mobilization. The patients also utilized shoulder exercises and also strengthening of shoulder muscles with scaption, chair press, push up plus, and external and internal rotation with rubber bands and weight lifting. The RG after treatment showed improvements in NRS with pain at rest, pain during movement, improvement in CMS, MRC scale in shoulder flexion, extension, abduction, and extension. In conclusion, it was determined that KT application combined with a rehabilitation program can reduce pain during rehabilitation therapy; however the results showed that the study is not significant enough to recommend KT during rehabilitative programs for RoCT. The article is considered a level II study with good quality evidence. It had a 8/11 score on a PEDro scale.

Kaya et al (2010) completed a RCT to compare the effectiveness of KT with an home exercise program and physical therapy modalities in patients that were diagnosed with shoulder impingement syndrome. This study was included in this critical review to specifically focus on

the outcome measurements of the group that used KT with an home exercise program instead of both the groups. There were a total of 55 patients with an inclusion criteria of pain before 150 degrees of active shoulder elevation in any plane, positive empty can test, and positive Hawkins-Kennedy test. The subjects were randomly placed into groups. Group 1 received a standard intervention of therapeutic KT taping with the addition of a home exercise program (HEP) which consisted of isometric exercises, range of motion, strengthening, and stretching with relaxation. Group 2 utilized a daily program of physical therapy modalities that includes ultrasound, transcutaneous electrical nerve stimulation (TENS), exercise, and a hot pack for two 2 weeks. The responses to treatment were evaluated by the Disability of Arm, Shoulder, and Hand (DASH) scale, night pain, daily pain, and pain with motion. The outcome measurements were assessed at baseline (T1), first (T2), and second weeks (T3) of the treatments. Focusing on outcome measurements of the group 1, there was significant improvement between T1 to T2 in all the outcome measurements ($p < 0.001$). From T1 to T3, there were improvements in rest pain ($p < 0.01$), activity pain ($p < 0.05$), nocturnal pain ($p < 0.01$), ASESS-100 ($p < 0.01$), Constant Murley scale ($p < 0.05$), Western Ontario Rotator Cuff ($p < 0.05$). Overall, this study showed that KT did show significant improvements in outcome measurements, but were inconclusive to offer it as another treatment. With a PEDro scale of 8/11, the article was determined to be a level II with good quality.

Wrobel et al (2020) conducted a study that assessed the influence of KT on pain, range of motion, and muscle strength in patients with rotator cuff lesions during long-term rehabilitation programs. There were 60 patients total that had a rotator cuff injury in which 30 were placed in the research group and the other 30 was assigned to a control group. The research group utilized KT combined with a six week rehabilitation program while the control group only underwent a

rehabilitation program. The outcome measures that were included were Biodex System 4 dynamometer examination measurements, Peak Torque (PT), and ROM. Pain was determined by visual analog scale (VAS). The results showed positive results in both groups, showing increase in muscle strength and improvement in functional movement. Although, there were better effects when KT was added, the differences were not statistically significant. Overall, Wrobel et al (2020) felt that both groups show the same results and that a rehabilitation program alone could help improve pain, ROM, and muscle strength. The article is considered to be a level II with good quality, scoring a 8/11 on the PEDro scale.

Kul and Ugur (2019) presented a study that compared the effectiveness of KT treatments to conventional physical therapy modalities. This critical review was included to assess pain with the kinesio trapping group (KTG) and to focus on the outcome measurements of just the KTG. There were a total of 40 patients that were diagnosed with subacromial impingement syndrome (SIS) in which they were included in this study as SIS relates to rotator cuff tendonitis. The KTG followed a home exercise program (HEP) with KT and the second group (PTG) followed physical therapy (PT) modalities together with an HEP program both for 15 days. The patients were assessed by range of motion (ROM), Visual analogue scale (VAS; rest, movement, and night pain), the society of the American Shoulder and Elbow Surgeons Evaluation (ASESS-100), Constant-Murley (C-M) scale, and Western Ontario Rotator Cuff (WORC) index before and after treatment. HEP consisted of ROM, Codman, stretching the posterior capsule, and strengthening. The PTG patients were to apply a hot pack for 20 minutes, a TENS for 30 minutes, and ultrasound (US) for 10 minutes in addition to the HEP. The results showed that the DASH in the KTG before treatment (BT) and after treatment (AT) were a decrease in interquartile range (IQR) from 50.3-70.3 to 17.8-32. Pain scores (VAS) by movement was a decrease in BT, one week

after treatment (1WAT), and two 2 weeks after treatment (2WAT) with an IQR from 70-100 BT to 27.50-60 1WAT to 20-50 2WAT. The article had a 7/11 score on the PEDro scale and is considered a good, level II article.

Kocyigit et al (2016) determined if KT in individuals that have subacromial impingement syndrome (SIS) would be comparable to a controlled variable such as sham taping. There were a total of 41 patients that were randomized into two groups and completed the treatments. Group 1 was the KT group using a Y-strip design while group 2 was the sham group that used a beta fix surgical hypoallergenic flexible tape that is identical to the KT tape. Taping was repeated every four days, three times during study period with the patient having tape applied for 12 consecutive days. An exercise program was to be adhered to by the patients with the Codman pendulum exercises that were to be done once a day. Outcome measurements were assessed through pain on the 100 mm visual analog scale (VAS), range of motion, Constant scores, and Nottingham Health Profile (NHP). The results showed that there was a significant decrease in VAS for nocturnal pain and Constant Score in both groups but the KT group showed notable change in NHP pain and physical activity scores. Overall, it was determined that KT and the sham group revealed similar results in reducing pain and Constant scores. The study was a level II with good quality. It had a score of 7/11 on the PEDro scale.

Ghozy et al (2020) did a systematic review and meta-analysis in the efficacy of KT in treatment of shoulder pain and disability in RCTs. This systematic review and meta-analysis reviewed 12 studies with 555 patients. The ten major databases of the electronic search were the PubMed, Scopus, ISI web of Science, POPLINE, Virtual Health Library, System for Information on Grey Literature in Europe, Global Health Library, The New York Academy of Medicine, ClinicalTrials.com and Google Scholar. The inclusion criteria were randomized control trials that

investigated KT in treatment of shoulder pain with an intervention or with none. Outcome measurements of the randomized controlled trials included pain and disability for this systematic review and meta-analysis. Meta-analysis was conducted to calculate the standardized mean differences. It was determined that KT only showed significant improvement in shoulder pain when it was combined with an exercise program, otherwise, KT did not produce superior results than a placebo or treatment with steroids. This article is good quality, level I study. The CASP score is 7/10.

Studies that include KT taping without exercise program

Thelen et al (2008) objective for this study was to determine if short-term KT would help in decreasing pain during active range of motion as compared to sham taping. There were 42 patients that were included if they had pain onset prior to 150 degrees of active shoulder elevation in any plane, positive empty can test, positive Hawkins-Kennedy test, and difficulty performing activities of daily living. These patients were also diagnosed with rotator cuff tendonitis or impingement which they were then randomly assigned to either a therapeutic KT group or a sham KT group. The patients were to wear the tape for two consecutive three day intervals. The outcome measurements were self-reported pain and disability and also pain-free active range of motion. It was determined that the therapeutic KT group resulted in immediate improvement in pain free shoulder abduction right after the tape application. On the other hand, between the two groups, there were no differences in range of motion, pain, or disability scores during the specific time intervals. The conclusion of this study was that KT may help immediately after taping, but there are no long-term effects of KT taping when decreasing pain intensity or disability. This study was a level II, excellent quality. It had a 9/11 score on the PEDro scale.

Shakeri et al (2013) objectives of this RCT were to determine if the effects of KT would help in decreasing pain intensity during movement, during the night, and during range of motion. The timeline of this study was to assess the kinesio taping immediately after application, after three days, and after one week. Inclusion criteria of this study was if patients had two positive shoulder impingement screening items and at least one positive test on a specific subacromial impingement test. The patients were randomly assigned into a control group and an experimental group. The experimental group received a therapeutic KT with specific Y-strips and I-strips while the control group only had three sets of KT with no pulling. Analysis of variance (ANOVA) was measured to determine if there was a significant change in the experimental group as well as analysis of covariance (ANCOVA). The ANCOVA showed pain levels during movement and during night were greater in the experimental group than the control group right after KT was applied. In contrast, there were no significant differences in range of motion between the control and experimental groups after utilizing KT and there were no differences after one week of measurements of pain intensity and shoulder range of motion. This study showed that KT may produce an immediate improvement during range of motion pain intensity and pain during. This study was a level II article with excellent quality. It had a 9/11 score on the PEDro scale.

Celik et al (2020) conducted a systematic review and meta-analysis to evaluate the effects of KT on the many shoulder disorders. The studies were included if they were full text articles of RCTs and one group was treated by KT. The study was conducted with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis guidelines (PRISMA). The data sources that were used for this study were MEDLINE, PEDro, The Cochrane Library, Web of Science, and Embase and OpenGrey databases. There were 14 total studies that were included with a total of

680 participants. RCTs in English or Turkish were included as well as all orthopedic shoulder disorders. The study excluded subjects with neurological disorders as well as those below 18 years of age for this systematic review. The systematic review showed that KT did not help with decreasing pain when comparing it to a sham taping. KT is not superior to a sham taping and in conclusion, there is no evidence that KT is beneficial for shoulder disorders. This review was excellent quality with a level I. The CASP score on this review was a 9/10.

Desjardins-Charbonneau et al (2014) examined current evidence of the efficacy of taping in rotator cuff. The systematic review and meta-analysis used four bibliographical databases in order to find RCTs that had nonelastic taping or kinesio taping in comparison with other intervention or placebo for treatment for individuals with rotator cuff tendinopathy. The inclusion criteria were participants that were 18 years of age and older, had a diagnosis of rotator cuff tendinopathy, impingement, or subacromial bursitis. The sample of finding the related articles were also taping intervention such as a placebo versus KT. The literature search and study identification were used through electronic bibliographical search such as MEDLINE, EMBASE, the Physiotherapy Evidence Database (PEDro), and the Cumulative Index to Nursing & Allied Health Literature (CINAHL). There were two evaluators who independently reviewed the titles and a third reviewer was utilized if there were disagreements. There were ten trials that were included with pain reduction or improvement of function. Kinesio tape alone resulted in pain free flexion and in pain free abduction. The qualitative analysis showed that the evidence was inconclusive on the efficacy of kinesio taping when it was used without exercise or rehabilitation. The systematic review received a 8/10 on the CASP assessment tool with excellent quality as well as being level I.

Ortega-Castillo et al (2020) performed a systematic review to analyze if the effects of KT is beneficial for tendinopathies. This study was included to show if different types of studies on different types of tendinopathies were comparable in rotator cuff tendonitis. The study used five databases such as PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Cochrane Library, SportDiscus, and Physiotherapy Evidence Database (PEDro) to search for the articles. The inclusion criteria included patients that had had tendinopathy, an isolated KT was applied to at least one of the groups, there were comparisons in other techniques, and outcome measurements were based on pain, function, disability, and quality of life. There were a total of 13 articles that included 454 patients. The PEDro scale was used as an assessment tool which the mean score of the articles was a five score out of ten. Ortega-Castillo et al (2020) determined that their findings were limited in supporting KT treatment for tendinopathy as the quality of the articles were low as well as insufficient number of clinical trials. This study received a 7/10 on the CASP assessment tool. It had a level I with good quality.

Artoli and Bertolini (2014) reviewed KT application and how the application resulted in pain. The main point of this systematic review was to describe the principles of KT methodology and analyze results of clinical trials that included control groups that were measuring pain with KT. The databases that were included in this study were PudMed, SciELO, Lilacs, Scirus, and Academic Google. There were ten clinical trials that were selected and those articles were scored based on the PEDro scale. The article revealed that KT either produced a higher, similar, or lower pain reduction than in the other groups being compared to. It was inconclusive with the results and determined that KT taping could help in short-term pain relief. In the end, it was suggested that it could be a complementary technique with another main treatment, but there is

no real evidence that it could be a main treatment for pain reduction. This article scored 6/10 of the CASP assessment tool and is considered a level 1, low quality article.

Alam et al (2015) study was a RCTI that investigated the effect of KT on shoulder external rotators muscle and shoulder external and internal ROM. The participants were healthy individuals with inclusion criteria including males from 21-29 years of age, body mass is normal value, and normal active ROM of the shoulder in functional testing. There were three groups that had no taping (NT), KT taping, and placebo taping (PT) with a three 3-day interval. Mean peak torque showed no significant difference among the three taping conditions and there were no differences in external rotation ROM. It was concluded that KT did not have a big difference in shoulder external rotation peak torque and also in ROM from the internal and external aspects. This is a 6/11 PEDro scale and a low quality with a level II.

Strength and Weaknesses

Articles that spoke about KT with an exercise regime were considered strong when compared to articles that spoke only about KT versus a sham taping group. There were mostly RCTs that helped in showing the strength of how KT is or is not effective with an exercise program when a patient has rotator cuff tendonitis. Focusing on the RCTs in this critical review, only some of the RCTs showed support of KT, but also concluded with needing more evidence and information to recommend KT for treatment benefits. Other RCTs showed that there were no differences between the two groups and that an exercise program alone showed similar results when KT was involved. On the other hand, RCT articles that showed studies that were conducted to compare KT with a sham taping with no exercise program had a significant difference between the group being compared to but did not necessarily advise clinician to choose KT as an

alternative treatment option. The systematic reviews in this critical review strongly advised more evidence and information on KT and how beneficial it can be.

Some weaknesses that the articles had was not having enough information on the specifics of the eccentric training program when combining KT taping with an exercise regime. Another limitation was finding articles that had overhead athletes with rotator cuff tendonitis as most of the articles dealt with an older population rather than an athlete population. It was harder to find articles that specifically spoke about rotator cuff tendonitis or tendinopathy as subacromial impingement syndrome was a popular keyword when finding articles that dealt with rotator cuff injuries.

Overall, the strength and weaknesses shows how imperative it is for this critical review and also with gaining more evidence about whether or not KT is beneficial with eccentric training in overhead athletes with rotator cuff tendonitis.

Summary

There were 17 articles that were reviewed in this critical review. 12 were RCTs and five were systematic or meta-analysis reviews. Outcome measurements of most of the articles in the RCT studies did not show any significant differences between the groups as KT had the same effectiveness in pain and ROM as an exercise program alone or compared with a sham taping. The systematic reviews needed more evidence to recommend KT for athletes and healthcare professionals to be used for treatment. There was not enough evidence to prove that KT is effective and beneficial by itself for individuals for rotator cuff tendonitis.

The next chapter will be discussing if KT kinesio taping is overall beneficial for athletes and athletic trainers. Currently, the trend of KT is getting more popular in use but in the next section of this critical review, there are implications and discussion to distinguish if KT combined with eccentric training in overhead athletes with rotator cuff tendonitis are truly helpful or it shows that there are gaps in literature that should be reviewed.

Chapter 4: Discussion, Implications, and Conclusions

This critical review is to determine the effectiveness of KT in decreasing pain in overhead athletes. Specifically, KT combined with eccentric exercises is more beneficial than just doing eccentric exercises alone in overhead athletes that have rotator cuff tendinitis with an aim to decrease pain while in motion. Synthesizing the 17 articles in the previous chapter has helped categorize the findings and show which studies do or do not support KT with eccentric training in rotator cuff tendonitis. This chapter will address the critical review question and will also include the trends or gaps that can be found in these studies as well as implications to the athletic training practice. This chapter then will recommend future research if needed or answer the clinical question.

Literature Synthesis

The 17 articles were divided into three categories, the first group of studies included KT with an exercise program that had inconclusive results to support KT for treatment of pain and decreased ROM. The second group of studies included KT with exercise and showed some evidence that KT taping decreased pain and improved ROM. The last group contains studies with KT without exercise and concluded that they needed more information on supporting its efficacy. Dividing the articles into categories allows for easy analysis of the conclusion of these studies.

There were five studies that included kinesio taping with an exercise program that had inconclusive evidence in supporting KT with an exercise program. One “excellent” quality article was a RCT, which showed different results when applying kinesio taping and using an exercise regime during the study. Lucas de Oliveira et al (2020) concluded that although both the kinesio taping and the no kinesio taping group did the same exact physical therapy sessions,

there were no significant outcome measurements between the group to show that kinesio taping was superior to physical therapy alone. Additionally, KT taping did not show improvement for mid- to long-term care for individuals that have rotator cuff related shoulder pain. The remaining four studies were considered “good” quality articles. Wrobel et al (2020) had positive results for both groups, one with KT and rehabilitation program and the other with rehabilitation program only, but concluded that KT taping method combined with a rehabilitation program gave the same results as a rehabilitation program alone, specifically when referring to pain, ROM, and muscle strength of rotator cuff. Similar results were seen by Kocyigit et al (2016). The KT taping group versus a sham taping group both had decreased outcome measurements and generated similar results when it came to pain and Constant score measurements, showing the KT taping was no better than a sham taping.

Continuing in this category were two articles that compared KT with modalities. This portion of the study was to only show if there were any significant differences in particular outcome measures such as pain in movement with VAS and DASH with the KT group. Kaya et al (2010) showed that rest, night, and movement median pain scores of the KT group decreased from baseline to the first week when only comparing the KT group with itself through treatment times. In conclusion, KT may have been an option for treatment, but only if it was used immediately and not for long term. This was inconclusive as a result. Kul et al (2019) did a similar study in comparing physical therapy modalities such as ultrasound and a hot pack versus KT with a HEP. The KT HEP group showed improvements with ROM and VAS with rest pain, activity pain, and nocturnal pain. They concluded that KT could be a potential supportive care instead of an alternative treatment method.

There were five articles with KT combined with an exercise program that supported or showed some improvement over the comparison group. Three “excellent” quality studies showed some support in utilizing KT with an exercise program. Letafatkar et al (2020) investigated three different groups, one group that had KT group with therapeutic exercises, another group that had just therapeutic exercise, and a control group with no intervention. There were positive effects in the groups that had therapeutic exercise, but in conclusion, adding KT to therapeutic exercises had more significant effects. Martins da Silva et al (2020) also completed a study with three different groups: the exercise group, a KT only group, and a KT with exercise group. They concluded that the exercise group with KT showed greater improvements than the other two groups. Overall, KT enhanced the effects of exercise in patients that have rotator cuff tendinopathy. Additionally, KT was beneficial in reducing pain. Simsek et al (2013) had two groups that were either a KT group or a sham taping group with addition of exercise therapy. Improvements in pain and ROM were seen in both groups but was concluded that KT application with the exercise program was more effective than the exercise program alone.

The last two articles were “good” quality articles. Miccinilli et al (2018) compared a real KT group and a sham group. The KT group with rehabilitative exercise showed an increase in functional recovery and strength. This article shows support but determined that there needs to be more research. Ghozy et al’s (2020) systematic review concluded that KT showed significant improvement of shoulder pain when it was combined with exercise. They reviewed 12 studies with a total of 555 participants to get to their conclusion.

There were seven articles that compared KT with a sham group. The studies concluded with statements of needing more evidence or information in order to conclude that KT taping is superior to a sham taping. Two randomized controlled trials were included in this category.

Thelen et al (2008) concluded that KT taping for decreasing pain intensity is not supported while Shakeri et al (2013) showed that KT taping had an immediate effect when improving pain intensity with movement and with night pain but no differences after one week of measurements. Celik et al's (2020) systematic review did report positive effects and there was no significant evidence of any benefits of KT taping on shoulder disorders. Another systematic review by Desjardins-Charbonneau et al (2015) did have improvements in pain free range of motion but there was not enough evidence to conclude that KT is beneficial in conjunction with an exercise intervention. Ortega-Castillo et al (2020) provided a systematic review of KT and whether it is beneficial for tendinopathies. This is important to include due to the fact that this critical review looks closely at rotator cuff tendonitis and whether the different types of tendon respond differently to being treated with KT. The findings showed that there was limited evidence to support KT alone for treatment of tendinopathies when evaluated at mid- or long-term treatment. Artioli and Bertolini (2014) did a systematic review with KT and pain. The overall results showed that the immediate effect of KT could help with pain but the evidence was inconclusive. Alam et al (2015) conducted a RCT to investigate the immediate effect of KT on muscle strength and ROM. The conclusions revealed that there were no significant differences in ROM or peak torque.

Current Trends and Gaps in Literature

There are many gaps in literature when asking if KT has an effect on pain when in motion. Even with the five studies that showed some support, there was still no significant confirmation that KT taping should be used as a treatment plan with eccentric exercises in overhead athletes with rotator cuff tendinitis. Also, when combining keywords such as "KT taping," "eccentric," "overhead," "rotator cuff," "tendonitis," some articles would include

subacromial impingement syndrome rather than rotator cuff tendonitis as the injury. Articles that included subacromial impingement were included nonetheless as the condition can be a contributing factor to the development of rotator cuff tendonitis. More gaps in literature such as the age range and population were an issue in answering the critical review questions. The age range of most of the participants was 30-60 years old and only one article (Thelen et al, 2008) addressed athletes or college students. Current research seems to focus on the age and population of older individuals because they are most likely to have a rotator cuff injury. This population could be more fully investigated in future research as it would then focus on overhead athletes.

Implications for Athletic Training

Major findings from the studies included in this critical review seem to not have sufficient evidence to prove that KT with eccentric training would be a main treatment for overhead athletes that have rotator cuff tendonitis in order to decrease pain while in motion. KT showed significant decrease in outcome measurements such as pain, ROM, and functional assessment in short-term rather than mid- or long- term recovery. Letafatkar et al (2020), Martins da Silva et al (2020), Simsek et al (2013), Miccinilli et al (2018), and Ghozy et al (2020) showed supportive evidence that KT taping does help in certain outcome measurements such as pain, ROM, and functional movement while Lucas de Oliveira et al (2020), Wrobel et al (2020), Kocyigit et al (2016), Kaya et al (2010), Kul et al (2019) also showed decrease in outcome measurements but when comparing it to the other group in their study; the other group as well had improved outcome measurements.

Recommendation for Future Research

Future research could be addressed by expanding the population. Most research is currently focused on older adults instead of overhead athletes. It is rarely seen that the

participants of a study are athletes when searching for rotator cuff injury studies. A larger sample size could help in determining if there is truly a difference between KT combined with eccentric exercises versus just eccentric exercises alone. The 17 articles were vague in stating if KT can help with decreasing pain while in motion. Some of the articles show that KT does help but some show that exercise alone could also help.

Conclusion

A total of 12 RCTs and five systematic reviews were utilized to answer the question of “Does eccentric exercises with kinesio taping a more superior treatment than a treatment with just eccentric exercises in rehabilitation for overhead athletes with rotator cuff tendonitis in order to decrease pain while in motion?” The 17 articles reviewed has helped in understanding KT more, but there was a mix in results when answering the question in this critical review. Outcome measurements seem to improve with KT taping combined with exercises, but several studies have shown that exercise alone can help in the outcome measurements, specifically looking at pain and ROM. On the other hand, KT has shown to assist in short-term treatment and is an option that can be helpful for acute rotator cuff tendonitis in overhead athletes. From the evidence and the studies collected, there needs to be more information on KT and future research that can better answer this clinical question. For example, population, sample size, and injury would need to be narrowed down to overhead athletes, larger sample size, and rotator cuff tendonitis. Overall, additional research is needed to determine if KT is a good treatment option with eccentric exercises in overhead athletes with rotator cuff tendonitis.

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Appendix A: Matrix

Source: Shakeri, H., Keshavarz, R., Arab, A. M., & Ebrahimi, I. (2013). Clinical effectiveness of kinesiological taping on pain and pain-free shoulder range of motion in patients with shoulder impingement syndrome: a randomized, double blinded, placebo-controlled trial. *International journal of sports physical therapy*, 8(6), 800–810.

Design Methodology/Purpose	Sample/Setting	Design Instruments	Results
<p>Purpose: Investigating the effects of kinesio taping on pain intensity while in movement, nocturnal pain, and pain-free shoulder range of motion.</p> <p>Methods: Randomized, Double-Blinded, Placebo-controlled design</p>	<p>There were 30 patients that had been referred by a physician in this study. Patients were included if they were positive on two or more shoulder impingement screening items. There were 15 in the experimental group and the other 15 subjects in the control group.</p> <p>PEDro Scale: 9/11</p> <p>Level: II</p> <p>Quality: Excellent</p>	<p>The design instruments that were used in this study were the visual analogue scale for pain intensity during movement or nocturnal pain. It was assessed at baseline, immediately after kinesio taping, after three days, and one week after kinesio taping.</p>	<p>Kinesio taping was significantly greater than the experimental group than the control group in terms of pain level and nocturnal pain. There were also no significant differences between two groups in the one week measurements of intensity of pain and shoulder range of motion.</p>
<p>Recommendations: Further studies were needed to investigate the effect of kinesio taping especially since scapula was not assessed. They found another area of concern such as assessing pain intensity and shoulder range of motion before and after treatment as outcome measures.</p>			

Source: Miccinilli, S., Bravi, M., Morrone, M., Santacaterina, F., Stellato, L., Bressi, F., & Sterzi, S. (2018). A Triple Application of Kinesio Taping Supports Rehabilitation Program for Rotator Cuff Tendinopathy: a Randomized Controlled Trial. *Ortopedia Traumatologia Rehabilitacja*, 6 (20), 499-505. DOI: 10.5604/01.3001.0012.9707.

Design Methodology/Purpose	Sample/Setting	Design Instruments	Results
<p>Purpose: The purpose of this study is to investigate the efficacy of a combination of three different applications of kinesio tape with the combination of rehabilitative exercise in the reduction of pain and functional recovery for those subjects that have rotator cuff tendinopathy.</p> <p>Method: Randomized Control Trial</p>	<p>The setting was based in Rome through the Physical and Rehabilitation Medicine of Campus Bio-Medico University. The subjects were diagnosed through a physical and rehabilitation medicine specialist and diagnosed with rotator cuff tendinopathy.</p> <p>PEDro Scale: 8/11</p> <p>Level: II</p> <p>Quality: Good.</p>	<p>The design instruments were the Numeric Rating Scale for shoulder pain, Medical Research Council scales for shoulder strength assessment, and the Constant Murley Score.</p>	<p>The results showed that the real group during treatment 1 showed improvement at rest and during movement with shoulder flexion, extension, abduction, adduction, ER, IR, and elbow flexion. They concluded that conventional rehabilitative treatment with KT taping can be used for reduced pain.</p>
<p>Recommendations: Explaining more about how pain is reduced and how it can help those return to function easier than before.</p>			

Source: Celik, D., Argut S. K., Coban, O., & Eren, I. (2020). The clinical efficacy of kinesio taping in shoulder disorders: a systematic review and meta analysis. *Sage Journals*, 34 (6), 723-740.
<https://doiorg.ezproxy.bethel.edu/10.1177/0269215520917747>

Design Methodology/Purpose	Sample/Setting	Design Instruments	Results
<p>Purpose: This study was to evaluate the effects of KT taping on the many shoulder disorders. The studies were included if they were full text articles of randomized controlled trials and one group was treated by kinesio taping.</p> <p>Method: Systematic Review and Meta-analysis</p>	<p>The sample for this study included healthy participants and those subjects with neurological disorders were excluded from this systematic review. All orthopedic shoulder disorders were included. Those below 18 years of age were excluded.</p> <p>CASP: 9/10</p> <p>Level: I</p> <p>Quality: Excellent</p>	<p>The quality of the designs was assessed through the Physiotherapy Evidence Database scale which is a critical appraisal instrument for physiotherapy studies. 11 items were based on the Delphi list and a score of 9 or 10 were to be excellent quality. Meta-analyses were performed using the RevMan 5.3. Random-effects model was used to account for variability between studies and its effect on the intervention.</p>	<p>There were 14 total studies that were included with a total of 680 participants. It showed the kinesio taping did not have a better production on pain compared to the sham.</p>
<p>Recommendations: Very broad shoulder disorders. Having some eliminated to focus on a specific injury.</p>			

Ortega-Castillo, M., Martin-Soto, L., & Medina-Porqueres, I. (2020). Benefits of Kinesiology Tape on Tendinopathies: A Systematic Review. *Montenegrin Journal of Sports Science and Medicine*, 9(2), 73-86. doi:10.26773/mjssm.200910.

Design Methodology/Purpose	Sample/Setting	Design Instruments	Results
<p>Purpose: The effects of kinesio taping (KT) is beneficial for tendinopathies.</p> <p>Method: Systematic Review. The PEDro scale was used as an assessment tool.</p>	<p>The inclusion criteria included patients that had had tendinopathy, an isolated KT taping was applied to at least one of the groups, there were comparisons in other techniques, and outcome measurements were based on pain, function, disability, and quality of life.</p> <p>CASP: 7/10</p> <p>Level: I</p> <p>Quality: Good</p>	<p>PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Cochrane Library, SportDiscus, and Physiotherapy Evidence Database (PEDro) to search for the articles.</p>	<p>KT taping treatment for tendinopathy as the quality of the articles were low as well as insufficient number of clinical trials.</p>
<p>Recommendations: Limited evidence and insufficient number of clinical trials, larger, long-term, and high quality studies are in need to support this theory of KT taping helping tendinopathies.</p>			

Alam, S., Malhotra, D., Munjal, J., and Chachra, A. (2015). Immediate effect of kinesio taping on shoulder muscle strength and range of motion in healthy individuals: a randomized trial. *Hong Kong Physiotherapy Journal*, 33(2), 80-88.
<https://doi.org/10.1016/j.hkpi.2014.10.004>.

Design Methodology/Purpose	Sample/Setting	Design Instruments	Results
<p>Purpose: The effect of KT taping on shoulder external rotators muscle and shoulder external and internal ROM</p> <p>Method: Single-blinded, placebo controlled, randomized trial.</p>	<p>The participants were healthy individuals with inclusion criteria including males from 21-29 years of age, body mass is normal value, and normal active ROM of the shoulder in functional testing.</p> <p>PEDro: 6/11</p> <p>Level: II</p> <p>Quality: Low</p>	<p>Torque and range of motion measured with biodex isokinetic dynamometer and a goniometer.</p>	<p>KT did not have a big difference in shoulder external rotation peak torque and also in ROM from the internal and external aspects</p>
<p>Recommendations: Limited in population and sample size. Future research for long-term use of KT instead of short-term.</p>			

Desjardins-Charbonneau, A., Roy, J. S., Dionne, C. E., & Desmeules, F. (2014). The efficacy for taping for rotator cuff tendinopathy: A systematic review and meta-analysis. *International Journal of Sports Physical Therapy*, 10(4), 420-433.

Design Methodology/Purpose	Sample/Setting	Design Instruments	Results
<p>Purpose: Examined current evidence of the efficacy of taping in rotator cuff.</p> <p>Method: Systematic review and meta-analysis. Literature search used four bibliographical databases in order to find randomized controlled trials</p>	<p>The inclusion criteria were participants that were 18 years of age and older, had a diagnosis of rotator cuff tendinopathy, impingement, or subacromial bursitis.</p> <p>CASP: 8/10</p> <p>Level: I</p> <p>Quality: Excellent</p>	<p>The literature search and study identification were used through electronic bibliographical search such as MEDLINE, EMBASE, the Physiotherapy Evidence Database (PEDro), and the Cumulative Index to Nursing & Allied Health Literature (CINAHL).</p>	<p>The qualitative analysis showed that the evidence was inconclusive on the efficacy of kinesio taping when it was used without exercise or rehabilitation.</p>
<p>Recommendations: More evidence of efficacy of KT taping.</p>			

Thelen, M. D., Dauber, J. A., & Stoneman, P. D. (2008). The clinical efficacy of kinesio tape for shoulder pain: a randomized, double-blinded, clinical trial. *The Journal of orthopaedic and sports physical therapy*, 38(7), 389–395. <https://doi.org/10.2519/jospt.2008.2791>.

Design Methodology/Purpose	Sample/Setting	Design Instruments	Results
<p>Purpose: If short-term KT taping would help in decreasing pain during active range of motion as compared to sham taping.</p> <p>Method: A randomized, Double-Blinded, Clinical Trial. Patients diagnosed with rotator cuff tendonitis or impingement were randomly assigned to either a therapeutic KT group or a sham KT group.</p>	<p>42 patients that were included if they had pain onset prior to 150 degrees of active shoulder elevation in any plane, positive empty can test, positive Hawkins-Kennedy test, and difficulty performing activities of daily living.</p> <p>PE德罗: 9/11</p> <p>Level: II</p> <p>Quality: Excellent</p>	<p>The outcome measurements were self-reported pain and disability and also pain-free active range of motion.</p>	<p>This study was that KT may help immediately after taping but there are no long-term effects of KT taping when decreasing pain intensity or disability</p>
<p>Recommendations: KT for decreasing pain intensity for young patients is not supported. Needs more evidence.</p>			

Letafatkar, A., Rabieli, P., Kazempour, S., and Alaei-Parapari, S. (2020). Comparing the effects of no intervention with therapeutic exercise, and exercise with additional Kinesio tape in patients with shoulder impingement syndrome. A three-arm randomized controlled trial. *Clinical Rehabilitation: SAGE journals*, 1-10. <https://doi.org/10.1177/0269215520971764>.

Design Methodology/Purpose	Sample/Setting	Design Instruments	Results
<p>Purpose: KT taping to therapeutic exercises is efficient and effective compared to therapeutic alone and also no intervention</p> <p>Method: Three-arm randomized controlled trial.</p>	<p>There were 120 patients with inclusion criteria with pain lasting more than six weeks, painful arc during exertion of flexion and abduction, positive Neer or Hawkins-Kennedy tests, and painful resisted external rotation, abduction, or painful Jobe's test.</p> <p>PE德罗: 10/11</p> <p>Level: II</p> <p>Quality: Excellent</p>	<p>Measurements were the numeric rating scale and disability and scapular kinematics measured by 3-dimension software. The Iranian version of the disabilities of the Arm, Shoulder, and Hand questionnaire were used for disability.</p>	<p>Therapeutic exercise with KT taping was far superior to the control group and the therapeutic exercise alone</p>
<p>Recommendations: Clinicians could be of assistance with adding KT taping in improving clinical outcomes.</p>			

Martins Da Silva, L., Bello, G. M., Flores, B. C., Dias, L. S., Camargo, P., Mengue, L. F., ...Daitx, R. B. (2020). Kinesio tape in shoulder rotator cuff tendinopathy: A randomized, blind clinical trial. <i>Muscle, Ligaments, and Tendons Journal</i> , 10(3), 364-375. DOI: 10.32098/mltj.03.2020.03			
Design Methodology/Purpose	Sample/Setting	Design Instruments	Results
<p>Purpose: Analyze efficacy of KT in isolation and association with exercise on pain and function of patients.</p> <p>Method: Randomized, blind clinical trial.</p>	<p>60 participants that had an inclusion criteria of sub acromial pain for at least three months and two of three positive impingement tests such as Jobe test, Hawkins-Kennedy test, or Neer's test.</p> <p>PEDro: 9/11</p> <p>Level: II</p> <p>Quality: Excellent</p>	<p>Measurements that were being assessed are pain level, active and passive mobility, muscle strength, and function. Pain intensity was assessed using the VAS, muscle strength was evaluated by a manual dynamometry, ROM using a goniometer, and function assessment by the Shoulder Pain and Disability Index (SPADI).</p>	<p>KT taping is combined with an exercise protocol, it is effective for lowering pain levels and increasing ROM.</p>
Recommendations: Exercise helps with lowering pain level and increase ROM.			

Şimşek, H. H., Balki, S., Keklik, S. S., Öztürk, H., & Elden, H. (2013). Does Kinesio taping in addition to exercise therapy improve the outcomes in subacromial impingement syndrome? A randomized, double-blind, controlled clinical trial. <i>Acta orthopaedica et traumatologica turcica</i> , 47(2), 104–110. https://doi.org/10.3944/aott.2013.2782			
Design Methodology/Purpose	Sample/Setting	Design Instruments	Results
<p>Purpose: Kinesio taping with an addition of exercise therapy in order to improve the pain in subacromial impingement syndrome</p> <p>Method: Randomized, double-blind, controlled clinical.</p>	<p>There were 38 patients that were randomly divided into a therapeutic kinesio taping group and a sham kinesio taping group. These patients were determined by a diagnosis of subacromial impingement syndrome and had a positive Neer and Hawkins impingement test.</p> <p>PEDro: 9/11</p> <p>Level: II</p> <p>Quality: Excellent</p>	<p>Pain at rest, sleep, and during activity on a 10-cm visual analog scale (VAS), range of motion (ROM), muscle strength, and Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire, and the constant score.</p>	<p>KT application combined with an exercise program can be more effective than an exercise program alone in order to help with subacromial impingement syndrome.</p>
Recommendations: Determined that KT with exercise can be more effective than exercise alone in shoulder impingement.			

Ghozy, S. Dung, N. M., Morra, M. E., Morsy, S., Elsayed, G. G., Tran, L., ... Huy, N. T. (2020) Efficacy of kinesio taping in treatment of shoulder pain and disability: a systematic review and meta-analysis of randomized controlled trials. *Physiotherapy*, 107, 176-188 <https://doi.org/10.1016/j.physio.2019.12.001>.

Design Methodology/Purpose	Sample/Setting	Design Instruments	Results
<p>Purpose: Efficacy of kinesio taping in treatment of shoulder pain and disability.</p> <p>Method: Systematic and meta-analysis</p>	<p>This systematic review and meta-analysis reviewed 12 studies with 555 patients. The inclusion criteria were randomized control trials that investigated KT taping in treatment of shoulder pain with an intervention or with none.</p> <p>CASP: 7/10</p> <p>Level: I</p> <p>Quality: Good</p>	<p>Ten major databases of the electronic search were the PubMed, Scopus, ISI web of Science, POPLINE, Virtual Health Library, System for Information on Grey Literature in Europe, Global Health Library, The New York Academy of Medicine, ClinicalTrials.com and Google Scholar</p>	<p>It was determined that KT taping only showed significant improvement in shoulder pain when it was combined with an exercise program.</p>
<p>Recommendations: Determined that the duration of treatment plus the injury did not influence KT taping.</p>			

Lucas de Oliveira, F. C. L., Pairot de Fontenay, B., Bouyer, L. J., Desmeules, F., & Roy, J.-S. (2020). Kinesiotaping for the Rehabilitation of Rotator Cuff-Related Shoulder Pain: A Randomized Clinical Trial. *Sports Health*. <https://doi.org/10.1177/1941738120944254>

Design Methodology/Purpose	Sample/Setting	Design Instruments	Results
<p>Purpose: Individuals using kinesio taping (KT) will have faster improvements in symptoms and functional limitations in comparison to those who do not use KT taping during a rehabilitation program</p> <p>Method: Randomized Control trial.</p>	<p>52 participants that were recruited who had rotator cuff related shoulder pain (RCRSP). The inclusion criteria: Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire, have 1 positive sign of a clinical test such as painful arc of movement, Neer or Hawkins-Kennedy impingement signs, and pain during resisted external rotation, abduction, or empty can test.</p> <p>PE德罗: 11/11</p> <p>Level: II</p> <p>Quality: Excellent</p>	<p>DASH questionnaire, Brief Pain Inventory (BPI), and the Western Ontario Rotator Cuff (WORC) index were the assessments utilized to evaluate the outcomes.</p>	<p>KT taping did not have any superior need compared with using physical therapy alone.</p>
<p>Recommendations: There are no mid or long term gains with KT taping to reduce pain, shoulder function, and range of motion.</p>			

Wrobel, M., Bac, A., Ogrodzka-Clechanowicz, K., Zalewski, M., Michalik, E., & Ścisłowska-Czarnecka, A. (2020). The evaluation of the long-term influence of the Kinesio Taping method on the selected parameters in patients with rotator cuff lesions: a randomized controlled trial. PREPRINT (Version 1) available at Research Square [<https://doi.org/10.21203/rs.3.rs-97544/v1>].

Design Methodology/Purpose	Sample/Setting	Design Instruments	Results
<p>Purpose: Assess the influence of KT taping on pain, range of motion, and muscle strength in patients with rotator cuff lesions during long-term rehabilitation programs.</p> <p>Method: Randomized controlled trial.</p>	<p>There were 60 patients that had a rotator cuff injury which 30 were placed in the research group and the other 30 was assigned to a control group.</p> <p>PE德罗: 8/11</p> <p>Level: II</p> <p>Quality: Good</p>	<p>Biodex System 4 dynamometer examination measurements, Peak Torque (PT), and ROM. Pain was determined by visual analog scale (VAS).</p>	<p>Both groups show the same results and that a rehabilitation program alone could help improve pain, ROM, and muscle strength.</p>
<p>Recommendations: No recommendations, both groups showed similar results.</p>			

Source: Kul, A., & Ugur, M. (2019). Comparison of the Efficacy of Conventional Physical Therapy Modalities and Kinesio Taping Treatments in Shoulder Impingement Syndrome. *The Eurasian journal of medicine*, 51(2), 139–144. <https://doi.org/10.5152/eurasianjmed.2018.17421>

Design Methodology/Purpose	Sample/Setting	Design Instruments	Results
<p>Purpose: A study that compared the effectiveness of kinesio taping treatments to conventional physical therapy modalities</p> <p>Method: Randomized control trial</p>	<p>There were a total of 40 patients that were diagnosed with subacromial impingement syndrome (SIS) in which they were included in this study.</p> <p>PE德罗: 7/11</p> <p>Level: II</p> <p>Quality: Good</p>	<p>The patients were assessed by range of motion (ROM), Visual analogue scale (VAS; rest, movement, and night pain), the society of the American Shoulder and Elbow Surgeons Evaluation (ASESS-100), Constant-Murley (C-M) scale, and Western Ontario Rotator Cuff (WORC) index before and after treatment.</p>	<p>Physical therapy was more effective after treatment but that KT can provide support care for SIS</p>
<p>Recommendations: KT is supportive potential care but is not an alternative treatment. More evidence to prove that it can be an alternative treatment.</p>			

Kocyigit, F., Acar, M., Turkmen, M. B., Kose, T., Guldane, N., & Kuyucu, E. (2016). Kinesio taping or just taping in shoulder subacromial impingement syndrome? A randomized, double-blind, placebo-controlled trial. *Physiotherapy Theory and Practice*, 32(7), 501-508. <http://dx.doi.org/10.1080/09593985.2016.1219434>

Design Methodology/Purpose	Sample/Setting	Design Instruments	Results
<p>Purpose: To determine if kinesio taping (KT) in individuals that have subacromial impingement syndrome (SIS) would be comparable to a controlled variable such as sham taping.</p> <p>Method: Randomized, double-blind, placebo controlled trial.</p>	<p>There were a total of 41 patients that were randomized into two groups and completed the treatments. Group 1 was the KT group using a Y-strip design while group 2 was the sham group that used a beta fix surgical hypoallergenic flexible tape that is identical to the KT tape.</p> <p>PEDro: 7/11</p> <p>Level: II</p> <p>Quality: Good</p>	<p>Outcome measurements were assessed through pain on the 100 mm visual analog scale (VAS), range of motion, Constant scores, and Nottingham Health Profile (NHP). The results showed that there was a significant decrease in VAS for nocturnal pain and Constant Score in both groups but the KT group showed notable change in NHP pain and physical activity scores</p>	<p>KT and the sham group revealed similar results in reducing pain and Constant scores.</p>
<p>Recommendation: There were similar results in both groups.</p>			

Kaya E., Zinnuroglu M., & Tugcu, I. (2011). Kinesio taping compared to physical therapy modalities for the treatment of shoulder impingement syndrome. *Clin Rheumatol*, 30(2).201-7. doi: 10.1007/s10067-010-1475-6. Epub 2010 Apr 30. PMID: 20443039.

Design Methodology/Purpose	Sample/Setting	Design Instruments	Results
<p>Purpose: To compare the effectiveness of kinesio taping with an home exercise program and physical therapy modalities in patients that were diagnosed with shoulder impingement syndrome.</p> <p>Method: Randomized controlled trial</p>	<p>There were a total of 55 patients with inclusion criteria of pain before 150 degrees of active shoulder elevation in any plane, positive empty can test, and positive Hawkins-Kennedy test.</p> <p>PEDro: 8/11</p> <p>Level: II</p> <p>Quality: Good</p>	<p>The responses to treatment were evaluated by the Disability of Arm, Shoulder, and Hand (DASH) scale, night pain, daily pain, and pain with motion.</p>	<p>They concluded that kinesio tape was more effective than local modalities during the first week and had a very similar effect to local modalities in the second week.</p>
<p>Recommendations: KT taping can help in immediate effect but more evidence is needed for long-term effects.</p>			

Artioli, D�errick Patrick, & Bertolini, Gladson Ricardo Flor. (2014). Kinesio taping: application and results on pain: systematic review. <i>Fisioterapia e Pesquisa</i> , 21(1), 94-99. https://doi.org/10.1590/1809-2950/553210114			
Design Methodology/Purpose	Sample/Setting	Design Instruments	Results
<p>Purpose: The main aim of this systematic review was to describe the principles of KT taping methodology and analyzing results of clinical trials that included control groups that were measuring pain with KT taping.</p> <p>Method: Systematic Review</p>	<p>There were a total of 40 patients that were diagnosed with subacromial impingement syndrome (SIS) in which they were included in this study.</p> <p>CASP: 6/10</p> <p>Level: I</p> <p>Quality: Low</p>	<p>The databases that were included in this study were PudMed, SciELO, Lilacs, Scirus, and Academic Google. There were ten clinical trials that were selected and those articles were scored based on the PEDro scale</p>	<p>It was suggested that it could be a complementary technique with another main treatment but there is no real evidence that it could be a main treatment for pain reduction</p>
Recommendations: Inconclusive results. KT can help with short-term. Needs more evidence.			

Appendix B: PEDro Scale

1. eligibility criteria were specified no yes where:
2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received) no yes where:
3. allocation was concealed no yes where:
4. the groups were similar at baseline regarding the most important prognostic indicators no yes where:
5. there was blinding of all subjects no yes where:
6. there was blinding of all therapists who administered the therapy no yes where:
7. there was blinding of all assessors who measured at least one key outcome no yes where:
8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups no yes where:
9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analysed by “intention to treat” no yes where:
10. the results of between-group statistical comparisons are reported for at least one key outcome no yes where:
11. the study provides both point measures and measures of variability for at least one key outcome no yes where:

The PEDro scale is based on the Delphi list developed by Verhagen and colleagues at the Department of Epidemiology, University of Maastricht (*Verhagen AP et al (1998). The Delphi list: a criteria list for quality assessment of randomised clinical trials for conducting systematic reviews developed by Delphi consensus. Journal of Clinical Epidemiology, 51(12):1235-41*). The list is based on "expert consensus" not, for the most part, on empirical data. Two additional items not on the Delphi list (PEDro scale items 8 and 10) have been included in the PEDro scale. As more empirical data comes to hand it may become possible to "weight" scale items so that the PEDro score reflects the importance of individual scale items.

The purpose of the PEDro scale is to help the users of the PEDro database rapidly identify which of the known or suspected randomised clinical trials (ie RCTs or CCTs) archived on the PEDro database are likely to be internally valid (criteria 2-9), and could have sufficient statistical information to make their results interpretable (criteria 10-11). An additional criterion (criterion 1) that relates to the external validity (or “generalisability” or “applicability” of the trial) has been retained so that the Delphi list is complete, but this criterion will not be used to calculate the PEDro score reported on the PEDro web site.

The PEDro scale should not be used as a measure of the “validity” of a study’s conclusions. In particular, we caution users of the PEDro scale that studies which show significant treatment effects and which score highly on the PEDro scale do not necessarily provide evidence that the treatment is clinically useful. Additional considerations include whether the treatment effect was big enough to be clinically worthwhile, whether the positive effects of the treatment outweigh its negative effects, and the cost-effectiveness of the treatment. The scale should not be used to compare the "quality" of trials performed in different areas of therapy, primarily because it is not possible to satisfy all scale items in some areas of physiotherapy practice.

Notes on administration of the PEDro scale:

All criteria **Points are only awarded when a criterion is clearly satisfied**. If on a literal reading of the trial report it is possible that a criterion was not satisfied, a point should not be awarded for that criterion.

Criterion 1 This criterion is satisfied if the report describes the source of subjects and a list of criteria used to determine who was eligible to participate in the study.

Criterion 2 A study is considered to have used random allocation if the report states that allocation was random. The precise method of randomisation need not be specified. Procedures such as coin-tossing and dice-rolling should be considered random. Quasi-randomisation allocation procedures such as allocation by hospital record number or birth date, or alternation, do not satisfy this criterion.

Criterion 3 *Concealed allocation* means that the person who determined if a subject was eligible for inclusion in the trial was unaware, when this decision was made, of which group the subject would be allocated to. A point is awarded for this criteria, even if it is not stated that allocation was concealed, when the report states that allocation was by sealed opaque envelopes or that allocation involved contacting the holder of the allocation schedule who was “off-site”.

Criterion 4 At a minimum, in studies of therapeutic interventions, the report must describe at least one measure of the severity of the condition being treated and at least one (different) key outcome measure at baseline. The rater must be satisfied that the groups’ outcomes would not be expected to differ, on the basis of baseline differences in prognostic variables alone, by a clinically significant amount. This criterion is satisfied even if only baseline data of study completers are presented.

Criteria 4, 7-11 *Key outcomes* are those outcomes which provide the primary measure of the effectiveness (or lack of effectiveness) of the therapy. In most studies, more than one variable is used as an outcome measure.

Criterion 5-7 *Blinding* means the person in question (subject, therapist or assessor) did not know which group the subject had been allocated to. In addition, subjects and therapists are only considered to be “blind” if it could be expected that they would have been unable to distinguish between the treatments applied to different groups. In trials in which key outcomes are self-reported (eg, visual analogue scale, pain diary), the assessor is considered to be blind if the subject was blind.

Criterion 8 This criterion is only satisfied if the report explicitly states *both* the number of subjects initially allocated to groups *and* the number of subjects from whom key outcome measures were obtained. In trials in which outcomes are measured at several points in time, a key outcome must have been measured in more than 85% of subjects at one of those points in time.

Criterion 9 An *intention to treat* analysis means that, where subjects did not receive treatment (or the control condition) as allocated, and where measures of outcomes were available, the analysis was performed as if subjects received the treatment (or control condition) they were allocated to. This criterion is satisfied, even if there is no mention of analysis by intention to treat, if the report explicitly states that all subjects received treatment or control conditions as allocated.

Criterion 10 A *between-group* statistical comparison involves statistical comparison of one group with another. Depending on the design of the study, this may involve comparison of two or more treatments, or comparison of treatment with a control condition. The analysis may be a simple comparison of outcomes measured after the treatment was administered, or a comparison of the change in one group with the change in another (when a factorial analysis of variance has been used to analyse the data, the latter is often reported as a group · time interaction). The comparison may be in the form hypothesis testing (which provides a “p” value, describing the probability that the groups differed only by chance) or in the form of an estimate (for example, the mean or median difference, or a difference in proportions, or number needed to treat, or a relative risk or hazard ratio) and its confidence interval.

Criterion 11 A *point measure* is a measure of the size of the treatment effect. The treatment effect may be described as a difference in group outcomes, or as the outcome in (each of) all groups. *Measures of variability* include standard deviations, standard errors, confidence intervals, interquartile ranges (or other quantile ranges), and ranges. Point measures and/or measures of variability may be provided graphically (for example, SDs may be given as error bars in a Figure) as long as it is clear what is being graphed (for example, as long as it is clear whether error bars represent SDs or SEs). Where outcomes are categorical, this criterion is considered to have been met if the number of subjects in each category is given for each group.

Appendix C: CASP for Systematic Review



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[CASP Checklist: 10 questions to help you make sense of a Systematic Review](#)

[How to use this appraisal tool:](#) Three broad issues need to be considered when appraising a systematic review study:

- ▮ Are the results of the study valid? (Section A)
- ▮ What are the results? (Section B)
- ▮ Will the results help locally? (Section C)

The 10 questions on the following pages are designed to help you think about these issues systematically. The first two questions are screening questions and can be answered quickly. If the answer to both is “yes”, it is worth proceeding with the remaining questions. There is some degree of overlap between the questions, you are asked to record a “yes”, “no” or “can’t tell” to most of the questions. A number of italicised prompts are given after each question. These are designed to remind you why the question is important. Record your reasons for your answers in the spaces provided.

About: These checklists were designed to be used as educational pedagogic tools, as part of a workshop setting, therefore we do not suggest a scoring system. The core CASP checklists (randomised controlled trial & systematic review) were based on JAMA 'Users' guides to the medical literature 1994 (adapted from Guyatt GH, Sackett DL, and Cook DJ), and piloted with health care practitioners.

For each new checklist, a group of experts were assembled to develop and pilot

the checklist and the workshop format with which it would be used. Over the years overall adjustments have been made to the format, but a recent survey of checklist users reiterated that the basic format continues to be useful and appropriate.

Referencing: we recommend using the Harvard style citation, i.e.: *Critical Appraisal Skills Programme (2018). CASP (insert name of checklist i.e. Systematic Review) Checklist. [online] Available at: URL. Accessed: Date Accessed.*

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Paper for appraisal and

reference:.....

Section A: Are the results of the review valid?

1. Did the review address a clearly focused question?

HINT: An issue can be 'focused' In terms of

- the population studied • the outcome considered
- intervention given • the

Comments:

2. Did the authors look for the right type of papers?

HINT: 'The best sort of studies' would • address the review's question

design (usually RCTs for papers evaluating interventions)

- have an appropriate study

Comments:

Is it worth continuing?

3. Do you think all the important, relevant studies

databases were

HINT: Look for • which bibliographic were included?

used

- follow up from reference lists
- personal contact with experts

- unpublished as well as published studies
- non-English language studies

Comments:



HINT: The authors need to consider the

4. Did the review's authors do

enough to assess quality of the included studies?

have identified. Lack of 'glisters is not gold'

rigour of the studies they rigour may affect the Merchant of Venice – Act studies' results ("All that II Scene 7)

Comments:

5. If the results of the review have been combined, was it reasonable to do so?

HINT: Consider whether

- results were similar from study to study
- results of all the included studies are clearly displayed
- results of different studies are similar
- reasons for any variations in results are discussed

Comments:

Section B: What are the results?

6. What are the overall results of the review? HINT: Consider

- If you are clear about the review's 'bottom line' results
 - what these are (numerically if appropriate)
 - how were the results expressed (NNT, odds ratio etc.)

Comments:

7. How precise are the results? HINT: Look at the confidence intervals, if given

Comments:

Section C: Will the results help locally?

8. Can the results be applied to the local population?

Comments:

9. Were all important outcomes considered?

HINT: Consider whether • there is other information you would like to have seen

Comments:

10. Are the benefits worth the harms and costs?

HINT: Consider • even if this is not addressed by the review, what do you think?

Comments: