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Dry Needling and Manual Therapy for Chronic Neck Pain: A Case Study and Literature Review

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Abstract

Background/Purpose

Neck pain is the second most common physical therapy diagnosis seen in outpatient clinics and is frequently associated with myofascial trigger points (MTrPs). MTrPs are treated directly with dry needling and manual mobilization. However, it is unclear if one technique is superior to the other. The purpose of this study is to discover in a young, active patient with chronic neck pain, if dry needling is more effective than manual mobilization in decreasing pain and improving function.

Case Description

The patient presented to an outpatient orthopedic clinic with reports of neck pain greater than 6 months. The patient was a young and active graduate student who bicycled and participated in recreational exercise. The patient exhibited decreased cervical range of motion and many MTrPs. Insurance approved four visits to therapy, allowing minimal time for treatment.

Outcomes

PubMed, PEDro, and CINAHL databases were searched for articles pertaining to dry needling, manual therapy, and neck pain. A total of thirty-one articles were narrowed down to eight. The eight articles were examined and evaluated to compile evidence to address the PICO question. Regarding the patient in clinic, both interventions were provided to the patient throughout their physical therapy treatment.

Discussion

There is no strong evidence to unequivocally say if dry needling is a superior treatment to manual mobilization for treating chronic neck pain in a young, active patient. The literature and case study support the use of both interventions in conjunction to achieve the best outcome possible.

Background and Purpose

It is estimated that up to 77% of the population will develop neck pain at one point in their life. It is postulated that almost half of people who develop an acute neck problem will progress to having a chronic issue. Rates of chronicity (>3 months) are high and are increasing with the technological age. Patients with chronic neck pain account for approximately 25% of patients seen in outpatient orthopedic physical therapy clinics. It is the second most frequently treated diagnosis in physical therapy, behind low back pain (Childs et al., 2008).

There are numerous categories of chronic neck pain, arising from different pathologies and etiologies. Neck pain has been linked to injury, poor posture, prolonged static positions of the upper quarter, degenerative changes of the spinal joints and discs, spondylosis, and disc herniation leading to radicular symptoms in the upper quarter (Childs et al., 2008)(De Meulemeester et al., 2017). Categorization of pathologies allows for the creation of unique treatment protocols, using proper interventions and techniques. This paper will focus on treatment strategies pertaining solely to the category of mechanical neck pain.

Risk factors associated with the development of mechanical neck pain include low back pain, office work, low level of physical activity, history of neck pain, cycling as a regular activity, and poor attitude (Childs et al., 2008)(Quek et al., 2017). These risk factors are addressed in the literature and in patient care settings through numerous interventions focusing on the physical and psychosocial aspects of the pain. Techniques being utilized by physical therapists include cervical and thoracic mobilization and manipulation, including thrust and non-thrust techniques, ischemic pressure, and massage interventions. Exercises

for larger muscle groups of the neck and shoulder girdle incorporating coordination, proprioception, and isometrics are frequently programmed into interventions. Stretching of the scalenes, pectorals, levator scapulae, sternocleidomastoid, and upper trapezius muscles are also frequently utilized (Campa-Moran et al., 2015). Further, training for the deep neck flexors has been demonstrated to be a valid and reliable intervention numerous times, as well as mechanical traction and upper quarter nerve mobilization (Childs et al., 2008). More recently, dry needling has become a prevalent modality to treat neck pain.

Dry needling is most often an applied technique for trigger points (Gattie et al., 2017). Myofascial trigger points (MTrPs) have been highly correlated with chronic neck pain in numerous studies (Gattie et al., 2017). MTrPs characteristics include spot tenderness to palpation, a taut band or nodule of musculature, referred pain, and motor dysfunction (Gattie et al., 2017). These MTrPs can be considered active or latent. A MTrP is considered active if it is painful or refers pain when palpated, and latent if there is no increase in pain when palpated (De Meulemeester et al., 2017). Often times, physical therapists treat MTrPs because patients are seeking relief from pain. An ever-growing popular name for mechanical neck pain due to irritated muscle tissue is known as myofascial pain syndrome, (MPS). In the clinical setting, the diagnosis of MPS is assigned with the presence of several of the following symptoms: pain, decreased range of motion, increased perceived disability, and MTrPs (Cerezo-Téllez et al., 2016).

There are several techniques to directly treat MTrPs, one of which is dry needling. This direct technique involves inserting a fine filament needle directly into the MTrP, possibly eliciting a twitch response and changing the neurochemical make-up of the MTrP itself (Cerezo-Téllez et al., 2016). This newer technique has shown promising results in the

literature and is becoming a widely accepted modality in outpatient physical therapy clinics. Soft tissue and joint mobilization is another technique that has been utilized for some time now and has proved to be a valid and reliable form of treatment for chronic neck pain associated with MPS (Childs et al., 2008)(Gattie et al., 2017).

It is important to treat as many impairments associated with a patient's symptoms as possible in order to optimize patient care. Therefore, providing the most effective treatment is always the goal. The purpose of this study was inspired by a younger patient presenting to an outpatient orthopedic physical therapy clinic reporting chronic neck pain for greater than 6 months. However, due to insurance and scheduling coordination, this patient had minimal time to be treated. Thus, the Patient, Intervention, Comparison, and Outcome (PICO) question was developed to retrospectively investigate how this patient's treatment could have been more successfully provided. PICO question: In a young, active patient with chronic neck pain, is dry needling more effective than manual mobilization in decreasing pain and improving function?

Case Description

A young, physically active patient presented self-referred to an outpatient orthopedic physical therapy clinic specializing in sports therapy, with reports of chronic neck pain.. The patient denied a history of traumatic injuries, neurological symptoms, or degenerative changes. The patient was a graduate student who spent many hours on a computer or in sedentary positions. He reported a high level of physical activity, including bicycling and resistance training. He had previously self-treated with stretches for the cervical and shoulder area, however he only experienced temporary relief from the pain. Prolonged study sessions and frequent cycling were reported to exacerbate symptoms.

Furthermore, he objectively presented with decreased cervical flexion, extension, right side bending, and right rotation. He performed poorly on the craniocervical flexion test, exhibiting poor proprioception. Forward head and rounded shoulder posture were observed in different static positions, with evidence of weakened scapular musculature including the left lower trapezius and serratus anterior. Upon palpation of the neck and shoulder area, the patient exhibited many different MTrPs, both active and latent, bilaterally in the upper trapezius, sternocleidomastoid, levator scapulae, and suboccipital muscles. Insurance approved four visits of physical therapy, making productive and proficient treatment imperative. Utilizing a multifaceted treatment approach has been shown to be most effective (Childs et al., 2008)(Gattie et al., 2017), however, with only four approved visits, treatment time needed to be optimized. The patient expressed strong interest in receiving dry needling, however, it was unknown if the treatment time used for dry needling would be an appropriate allocation of resources given a short plan of care window. As a result, the therapist decided to consult the research regarding the best appropriation of the patient's time: receiving manual therapy and mobilization or dry needling.

Methods

An exhaustive literature search was conducted using three different databases. PubMed, PEDro, and CINAHL were searched for literature pertaining to the cervical area and dry needling using several different keywords. In PubMed, the keywords "dry needling", "manual therapy", and "neck" were input into a simple search with no limitations. This search revealed forty-eight total results. In PEDro, the keywords "dry needling" and "neck" were also input into a simple search with no limits. This search

revealed forty-one results. CINAHL was also searched with the same keywords as PEDro, “dry needling” and “neck”, revealing nine total results.

Results were then scanned by title and date to establish relevancy to the PICO question and recency. No limits were placed on all searches due to the limited availability of evidence on dry needling. All results were scanned by a single examiner for applicability to the PICO question. Initial inclusion criteria were based upon whether or not the article pertained to dry needling of the cervical region, which was obtained based upon title and abstract. After this search, fourteen articles from PubMed, fifteen articles from PEDro, and two articles from CINAHL were chosen for further examination.

The thirty-one total articles were examined for level of evidence, outcome measures utilized, and applicability to the PICO question and patient. Outcome measures had to, at minimum, include a pain measure. Articles with outcome measures assessing function were also included. Applicability to the PICO question was assessed by the inclusion of both dry needling and a manual therapy technique. This, unfortunately, narrowed the pool of applicable articles down to an unacceptable number, thus expanding the applicability of the PICO to also include the efficacy of dry needling was necessary. Articles were excluded if they were published greater than five years before the search year of 2017.

After thirty-one articles were analyzed for applicability to the PICO within the inclusion criteria, ten articles remained. Of the ten articles, two were found to be duplicates from different databases, which were excluded. A total of eight articles (two systematic reviews, one prospective cohort, one retrospective cohort, and four randomized controlled trials) were found to be appropriate for assessment to address the PICO question. Articles were analyzed using the University of New Mexico Physical Therapy article analysis

worksheet (Appendix). After analysis, evidence was compiled to attempt to answer the PICO question.

Table 1. Flow chart of database

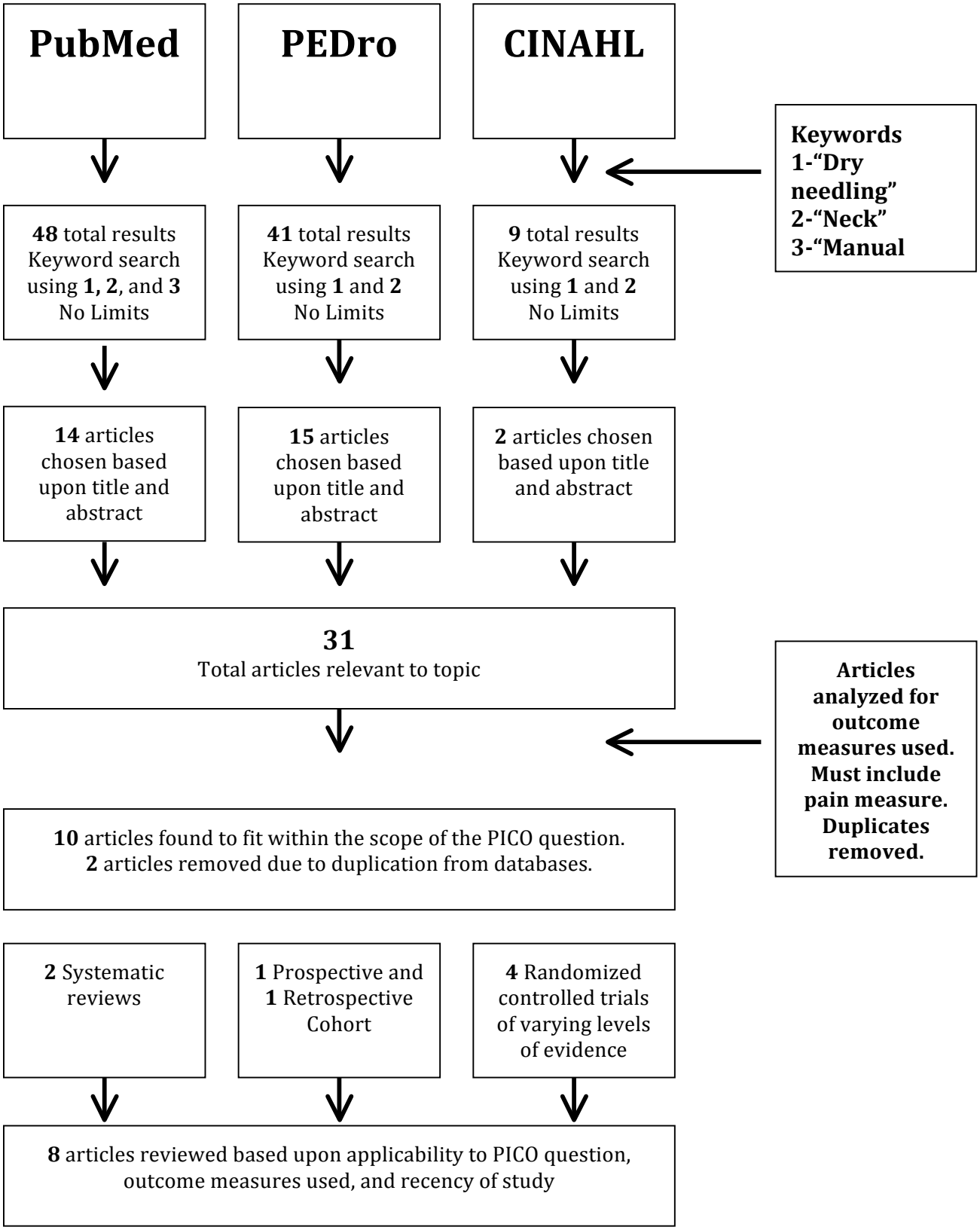

Table 2. Applicable studies and relevant information pertaining to PICO question.

#	Study	Level of Evidence	Purpose	Outcome Measures	Results	Answers PICO
1	Cagnie, B., et al. (2015) Systematic Review	1a	To describe the effects of dry needling and ischemic pressure on trigger points in the upper trapezius in people with neck pain and compare the effects to other therapeutic interventions.	Measures for pain, ROM, functionality, and quality-of-life were all utilized in the studies analyzed. The Neck Disability Index was also used,	There was no statistically significant difference between dry needling and ischemic pressure found for pain in any of the studies analyzed.	Yes
2	Campa-Moran, I., et al. (2015)	2b	To compare the efficacy of orthopedic manual therapy, dry needling and stretching, and soft tissue techniques for treatment of myofascial trigger points. Also, compare treatment effects over disability and pain catastrophizing.	Visual Analog Scale for pain, Neck Disability Index, Pain Catastrophizing Scale, cervical range of motion and pain pressure threshold.	All three interventions were statistically significant in reducing pain, although dry needling and orthopedic manual therapy showed largest decreases in pain at follow-up. Dry needling and orthopedic manual therapy had an immediate reduction in pain.	Yes
3	Cerezo-Téllez, E., et al. (2016)	1b	To evaluate the effectiveness of deep dry needling and manual stretching on chronic neck pain with people	Visual Analog Scale, cervical range of motion goniometer, pain pressure threshold, digital handheld dynamometry	Statistically and clinically significant results were found in favor of deep dry needling compared to	Yes

			presenting with myofascial trigger points compared to manual stretching alone.	for neck strength, and Neck Disability Index.	manual stretching. All outcome measures were in favor of deep dry needling with a P<0.001.	
4	De Meulemeester, et al. (2017)	2b	To compare dry needling to manual pressure of trigger points to see which has a better short and long-term effects in female office workers.	Neck Disability Index, general numeric rating scale for pain, pain pressure threshold, muscle characteristics.	No significant differences between dry needling and manual pressure on all outcome measures. Significant changes from baseline on all outcome measures for both dry needling and manual pressure.	Yes
5	Gerber, L. H., et al. (2015)	4	To assess how dry needling affects myofascial trigger points in patients with neck pain and to assess how the status of trigger points change along with mood and function.	Verbal analog scale, pain pressure threshold, Profile of Mood states, Oswestry Disability Index, Short-Form 36, and cervical range of motion.	A statistically significant reduction in all pain scores was seen indicated by a change from baseline with a P<0.001. The Oswestry disability index, Short Form-36, and cervical range of motion showed statistically significant change from baseline.	No. Does not compare dry needling to another form of manual therapy. Only establishes efficacy.
6	Gerber, L. H., (2017)	4	To assess the long-term effects of dry needling on pain, function and cervical	Visual analog scale, Short Form 36, Oswestry Disability Index,	All outcome measures showed statistically significant	No. Does not compare dry needling to another form of manual

			ROM in patients who have myofascial pain syndrome after only 1 course of treatment.	pain pressure threshold, and cervical range of motion.	improvement from baseline. Subjects who had a lower visual analog scale score at baseline were more likely to respond. Subjects with lower visual analog scale scores were more likely to have lasting effects.	therapy. Only establishes efficacy.
7	Liu, L., et al. (2015) Systematic Review	2a	To determine the short, medium, and long-term effectiveness of dry needling in relieving neck and shoulder pain caused by myofascial trigger points compared to wet needling, sham needling, physical therapy, and miniscalpel needling.	All studies used some form of pain rating measure such as the visual analog scale.	Dry needling was shown to be better than sham needling, but not better than physical therapy. Dry needling was equivocal to wet needling in short and long-term but not medium-term. miniscalpel needling was more effective than dry needling.	Yes. A limitation is that dry needling was only compared to "physical therapy", not a manual therapy technique.
8	Llamas-Ramos, R., (2014)	1b	To compare short-term effects of trigger point dry needling to trigger point manual therapy on pain and cervical range of motion in people with chronic neck pain.	Neck pain intensity, cervical range of motion, pain pressure threshold, Spanish version of the Northwick Park Neck Pain Questionnaire.	Dry needling and manual therapy both showed statistically significant results for all outcome measures from baseline, but not between each other.	Yes

Summaries of articles analyzed for PICO

#1: Cagnie, B., Castelein, B., Pollie, F., Steelant, L., Verhoeyen, H., & Cools, A. (2015). Evidence for the use of ischemic compression and dry needling in the management of trigger points of the upper trapezius in patients with neck pain: a systematic review. *American Journal of Physical Medicine & Rehabilitation*, *94*(7), 573–583. https://doi.org/10.1097/PHM.0000000000000266

Level of Evidence: 1a

Purpose: The purpose of this systematic review is to describe the effects of ischemic compression (IC) and dry needling (DN) on trigger points in the upper trapezius muscle in patients with neck pain. The secondary purpose is to compare IC and DN to other therapeutic interventions also targeting trigger points.

Methods: PubMed and World of Science were searched for randomized controlled trials that studied and/or compared the effects of DN and IC to each other or non-physiotherapeutic treatments on pain, range of motion , functionality, and quality-of-life in patients with trigger points in the neck. Fourteen studies met the inclusion criteria.

Results: Pain decreased in all studies using DN or IC. There were no statistically significant results between IC and DN. IC and DN both showed statistically significant changes in range of motion, but were never compared to each other. DN and IC demonstrated and statistically significant difference in functionality using the Neck Disability Index in two studies. Quality of life showed a significant difference in all studies except one where lidocaine injections and non-steroidal anti-inflammatories were superior to DN.

Critique: Some studies combined interventions, which might have influenced the results regarding the relative contribution of IC or DN to intervention effects. There is also higher heterogeneity between studies.

Bottom Line: The bottom line is that DN and IC are both valid and reliable techniques for decreasing pain, increasing range of motion, improving function, and improving quality of life. However, there is no conclusive evidence to support that DN is superior to other interventions.

#2: Campa-Moran, I., Rey-Gudin, E., Fernández-Carnero, J., Paris-Alemany, A., Gil-Martinez, A., Lerma Lara, S., … La Touche, R. (2015). Comparison of dry needling versus orthopedic manual therapy in patients with myofascial chronic neck pain: a single-blind, randomized pilot study. *Pain Research and Treatment*, *2015*, 327307. https://doi.org/10.1155/2015/327307

Level of Evidence: 2b

PEDro score: 10/11

Purpose: There are three main objectives of the study. The first is to compare the efficacy of orthopedic manual therapy (OTM), dry needling and stretching (DN-S), and soft tissue techniques (SST) for the treatment of myofascial trigger points in patients with myofascial neck pain. The second is to compare treatment effects over disability and catastrophizing in patients with neck pain. The third is to evaluate likely neurophysiological effects produced by these techniques in the neck.

Methods: The Neck Disability Index, Pain Catastrophizing Scale, visual analog scale, Cervical range of motion, and pain pressure threshold were all outcome measures. One way and two way ANOVAs were used for parametric data and nonparametric data was analyzed by the Kruskal-Wallis test, Friedman test, and Wilcoxin sign test.

Results: The results illustrated that all three treatments are effective in reducing neck pain to a statistically significant difference. However, the DN-S group and OMT had an almost immediate effect of reducing pain after two sessions. Overall, the OMT groups and the DN-S group had larger increases in range of motion and decreased in pain, however all were statistically significant at follow-up.

Critique: The subjects only received two treatments, which is fewer than would be provided in standard practice. The follow-up was only one week, which does not assess long-term effects.

Bottom Line: The bottom line is that all three interventions tested were statistically significant in reducing pain, indicated by the visual analog scale changes and increase in function, indicated by the Neck Disability Index.

#3 Cerezo-Téllez, E., Torres-Lacomba, M., Fuentes-Gallardo, I., Perez-Muñoz, M., Mayoral-del-Moral, O., Lluch-Girbés, E., … Falla, D. (2016). Effectiveness of dry needling for chronic nonspecific neck pain: a randomized, single-blinded, clinical trial. *PAIN*, *157*(9), 1905–1917. https://doi.org/10.1097/j.pain.0000000000000591

Level of Evidence: 1b
PEDro score: 8/11

Purpose: This study has a two-pronged focus. The first is to evaluate the effectiveness of Deep Dry Needling (DDN) on chronic neck pain of people with myofascial trigger points. The second is to evaluate the efficacy of DDN on hyperalgesia, neck active range of motion, neck strength, and neck disability compared to manual/passive stretching.

Methods: There were 64 participants analyzed in the treatment group and control group using outcome measures of pain intensity, mechanical hyperalgesia, neck active range of motion, neck strength, and neck disability measured at baseline, after two treatment sessions and 15, 30, 90, and 180 days after intervention. Bonferroni and Dunn tests were performed on all outcomes to analyze statistical significance.

Results: Significant and clinically relevant differences were found in favor of dry needling in all outcome measures at short and long-term follow-ups. All had a $P<0.001$.

Critique: The passive stretching techniques for the control group were performed by two different therapists. External interventions could not be controlled such as pain medication or anti-inflammatories.

Bottom Line: The bottom line of this study is that dry needling combined with stretching is more effective than manual stretching alone for chronic neck pain in the cervical region. The study uses long follow-up times and a large sample size, which increases the strength and power of the study.

#4: De Meulemeester, K. E., Castelein, B., Coppieters, I., Barbe, T., Cools, A., & Cagnie, B. (2017). Comparing trigger point dry needling and manual pressure technique for the management of myofascial neck/shoulder pain: a randomized clinical trial. *Journal of Manipulative and Physiological Therapeutics*, *40*(1), 11–20. https://doi.org/10.1016/j.jmpt.2016.10.008

Level of Evidence: 2b
PEDro score: 8/11

Purpose: The purpose of this study is to compare dry needling (DN) to manual pressure (MP) or trigger points to determine if DN has better effects than MP on both long-term and short-term outcomes, such as disability, pain, and muscle characteristics in treating myofascial neck and shoulder problems in women who work in an office.

Methods: Outcome measures included the Neck Disability Index (NDI), general numeric rating scale, pressure pain threshold (PPT), and muscle characteristics before and after treatment. For each outcome measure, a linear mixed-model analysis was applied to reveal group-by-time effects or main effects for the factor of time.

Results: There were no significant differences between groups that were found. Both groups showed significant improvement in the NDI ($P<0.001$). The general numeric rating

scale also significantly decreased at follow-up. PPT and muscle characteristics also showed significant difference from baseline, but not between each other.

Critique: Due to the nature of the treatments, therapists and patients could not be blinded to the interventions. Also, there is no control group, which means that improvement could be attributed to time and not to interventions provided.

Bottom Line: The bottom line of this study is that MP and DN of myofascial trigger points resulted in reduction of pain and increased function, but with no statistical difference between the two.

#5: Gerber, L. H., Shah, J., Rosenberger, W., Armstrong, K., Turo, D., Otto, P., … Sikdar, S. (2015). Dry needling alters trigger points in the upper trapezius muscle and reduces pain in subjects with chronic myofascial pain. *PM & R: The Journal of Injury, Function, and Rehabilitation*, *7*(7), 711–718. https://doi.org/10.1016/j.pmrj.2015.01.020

Level of Evidence: 4

Purpose: The purpose of the study is to assess whether dry needling of an active myofascial trigger point (MTrP) alters patient reported pain, alters the status of the trigger point to resolution or latency, and/or increases mood and function.

Methods: Subjects on a college campus were recruited if they had neck and/or shoulder girdle pain for greater than 3 months. Fifty-six subjects were recruited and 52 completed the study. Baseline pain was taken using the verbal analog scale and MTrP status was taken using pain pressure threshold. Secondary outcome measures used were the Profile of Mood States, Oswestry Disability Index (ODI), Short Form 36 (SF-36), and cervical range of motion.

Results: Reduction in all pain scores were statistically significant (P<0.001). A total of 41 subjects had a change in MTrP status from active/latent to resolved. Cervical range of motion also showed statistically significant improvements. The ODI and SF-36 also showed significant improvement from baseline, P=0.003 and P=0.019 respectively.

Critique: There is no control group, meaning the results could be attributed to time instead of the intervention. There was also no randomization of subjects since there was only one treatment group studied. There were also four dropouts.

Bottom Line: Dry needling is a valid intervention to reduce pain in the upper trapezius muscles in subjects with chronic myofascial pain. It is also correlated with a statistically and clinically significant change in MTrP status correlating to the reduction in pain. This change in status and reduction in pain is associated with improved mood, function, and level of disability.

#6: Gerber, L. H., Sikdar, S., Aredo, J. V., Armstrong, K., Rosenberger, W. F., Shao, H., & Shah, J. P. (2017). Beneficial effects of dry needling for treatment of chronic myofascial pain persist for 6 weeks after treatment completion. *PM & R: The Journal of Injury, Function, and Rehabilitation*, *9*(2), 105–112. https://doi.org/10.1016/j.pmrj.2016.06.006

Level of Evidence: 4

Purpose: The purpose of this study to assess the long-term treatment outcomes for pain, function, and range of motion from myofascial pain syndrome (MPS) of dry needling (DN) in subjects who received one course of treatment without any other treatment.

Methods: A convenience sample of 45 subjects, mean age of 37, were analyzed for pain on the visual analog scale (VAS), Short Form-36, Oswestry Disability Index, pain pressure threshold (PPT) and cervical range of motion. Subjects were treated once a week for three

weeks, and followed up at 8 weeks. Logistical regression analyses were used to calculate change from baseline scores.

Results: The VAS significantly improved post treatment, P<0.003. The SF-36 and ODI also significantly improved, P<0.01 and P<0.002 respectively. Side bending and PPT for subjects with unilateral MTrPs significantly changed, P<0.002. Subjects who had a lower VAS score at baseline were more likely to respond. Subjects with lower VAS scores were more likely to have lasting effects.

Critique: The research team was not blinded by performing all baseline and post treatment assessments. The recruiting population was subjects from a college campus and mostly young people spending time at computers and sitting.

Bottom Line: Dry needling can result in positive long-term outcomes in terms of pain and functionality. If a subject has a low pain rating on the VAS, they are more likely to have long-term effects than someone with a higher VAS score at baseline. If the subject experiences a large drop in their VAS score from dry needling, they are more likely to see long-term effects.

#7: Liu, L., Huang, Q.-M., Liu, Q.-G., Ye, G., Bo, C.-Z., Chen, M.-J., & Li, P. (2015). Effectiveness of dry needling for myofascial trigger points associated with neck and shoulder pain: a systematic review and meta-analysis. *Archives of Physical Medicine and Rehabilitation*, *96*(5), 944–955. https://doi.org/10.1016/j.apmr.2014.12.015

Level of Evidence: 2a

Purpose: The purpose of this systematic review is to determine the short, medium, and long-term effectiveness of dry needling (DN) in relieving pain with patients with neck and shoulder myofascial trigger points (MTrPs) compared to sham dry needling, wet needling, physical therapy, other interventions, and miniscalpel needling.

Methods: PubMed, EBSCO, PEDro, ScienceDirect, Cochrane Library, ClinicalKey, Wanfang Data Chinese database, Chinese Knowledge Resource Integrated Database, Chinese Chongqing VIP Information and Springer Link were all searched for randomized controlled trials studying DN. Twenty total RCTS were analyzed out of 1778 results. The authors used random-effects univariate meta-regression models to examine clinical and methodological variables that affected the association between DN and changes in pain intensity.

Results: DN showed statistically significance compared to sham needling. DN showed no statistical significance compared to wet needling in the short and long-term, and wet needling was significant in the medium term. Miniscalpel needling was found to be more effective than dry needling.

Critique: Physical therapy interventions were not described. The studies had high heterogeneity creating a higher inter-study variation.

Bottom Line: DN can be recommended in the short and medium term for relieving neck pain of MTrPs, but wet needling was found to be more effective in the medium term. Compared to other treatments, DN is valid and reliable to use, but is not necessarily the superior treatment.

#8: Llamas-Ramos, R., Pecos-Martín, D., Gallego-Izquierdo, T., Llamas-Ramos, I., Plaza-Manzano, G., Ortega-Santiago, R., … Fernández-de-las-Peñas, C. (2014). Comparison of the short-term outcomes between trigger point dry needling and trigger point manual therapy for the management of chronic mechanical neck pain: a randomized clinical trial. *Journal of Orthopaedic & Sports Physical Therapy*, *44*(11), 852–861. https://doi.org/10.2519/jospt.2014.5229

Level of Evidence: 1b

PEDro score: 9/11

Purpose: The purpose of the study is to compare short-term effects of trigger point dry needling (DN) to trigger point manual therapy (MT) on pain disability and cervical range of

motion on individuals with chronic neck pain and with active trigger points in the upper trapezius muscle.

Methods: This study had 94 subjects randomized into either a DN or MT group using the outcome measures of neck pain intensity, cervical range of motion, pain pressure threshold (PPT), and the Spanish version of the Northwick Park Neck Pain Questionnaire. Mixed model, repeated ANOVAs were used to determine time-by-group effects for each variable.

Results: DN and MT had similar outcomes for pain, function, and cervical range of motion with all results being statistically significant from baseline but not from each other. However, DN revealed a significant difference in PPT compared to MT ($P<0.001$) at 1 and 2-week follow-ups.

Critique: There is no control group included so it is not possible to tell if improvement happened from other means than the interventions. Three subjects were lost with no intention to treat analysis.

Bottom Line: Both techniques, manual trigger point therapy and dry needling trigger point therapy, are valid and reliable techniques for treating chronic neck pain, disability, restricted cervical range of motion, and achieving positive results in a short follow-up period.

Discussion

To answer the PICO question, eight total articles were analyzed to investigate if dry needling shows superior results to manual mobilization in reducing pain and increasing function in patients with chronic neck pain. Six articles compared dry needling to a form of manual mobilization or physical therapy intervention. Two articles only established the efficacy of dry needling in reducing pain. In the two articles by Gerber et al.(2015 and 2017) a statistically significant difference in pain and function, indicated by the verbal analog scale and Neck Disability Index, was discovered. These articles support dry needling as a valid intervention but do not directly address the PICO question. However, the remaining six articles do help answer the PICO question.

In the systematic review performed by Cagnie et al. (2015), both dry needling and ischemic pressure, a form of manual mobilization, demonstrated statistically significant differences in pain reduction from baseline, although there was not a statistically significant difference between interventions. The study performed by Llamas-Ramos et al. (2014) also demonstrated the same results, where both dry needling and manual therapy showed significant reduction in pain from baseline using the visual analog scale but not between each other. The dry needling group had a reduction of 6.3 points while the manual therapy group had a reduction of 6.2 points. The Spanish version of the Northwick Park Pain Questionnaire was utilized to assess function. The dry needling group had an improvement of 13.7 points and the manual therapy group had an improvement of 12.8 points. Both results are statistically significant from baseline, but are not significant between each other.

De Meulemeester et al. (2017) discovered the same results when comparing dry needling to manual pressure. The numeric rating scale for pain exhibited a significant difference from baseline to 3-month follow-up with a P=0.001, but there was no difference between groups. The Neck Disability Index, used to assess function a disability, revealed a P<0.001 for 3-month follow-up scores from baseline for both dry needling and manual pressure groups. Campa-Moran et al. (2015) compared three interventions (dry needling, manual therapy, and soft tissue techniques), determining that dry needling and manual therapy were better than soft tissue techniques in reducing pain according to the visual analog scale, but neither superior to the other. The Neck Disability index showed a statistically significant change for the dry needling and manual therapy groups with a P<0.001 from baseline to follow-up, indicating a significant change in function.

However, the article by Cerezo-Téllez et al. (2016) found dry needling to be better than manual stretching for reducing pain and improving scores on the Neck Disability Index. The visual analog scale, a 100 mm rating scale for pain, was utilized and indicated a significant change in pain from baseline (P>0.0006). Results from the Neck Disability Index were in favor of dry needling with a markedly small P-value of P<0.00000 in favor of the dry needling group. One article found dry needling to be less effective than physical therapy: Lui et al. (2015) performed a systematic review comparing dry needling to several other forms of needling, such as sham and wet needling, but also analyzed results comparing dry needling to physical therapy. Although, their results show physical therapy to be more effective, the authors did not elaborate on what physical therapy interventions were being compared. This is a limitation to the generalizability of the results because

"physical therapy" can encompass more interventions than manual therapy, such as exercises or other modalities.

Furthermore, each study illustrates limitations, which could be addressed in further research. For example, Campa-Moran et al. (2015), De Meulemeester et al. (2017), Gerber et al. (2015 and 2017), and Llamos-Ramos et al. (2014) all lacked control groups. The lack of control group can draw doubt about the generalizability of the results, because it is not assessed whether the intervention proved successful or subjects reported results due to time. In the systematic reviews performed by Cagnie et al. (2015) and Lui et al. (2015) high heterogeneity was found between the studies analyzed. This points to further standardization and further consistency needed for methodologies. Both studies performed by Gerber et al. (2015 and 2017) only point to the efficacy of dry needling because of the lack of comparison groups, thus the low scores on level of evidence. It is evident from the current research that future investigations should be performed to help close the gaps, including control groups and greater standardization to increase homogeneity.

Ultimately, the patient in question was treated with a full spectrum approach including many different techniques. He was treated with manual mobilization and manipulation of the cervical and thoracic spine, which has shown a correlation with pain reduction (Cross et al., 2011). Techniques such as muscle energy for the cervical and thoracic spine and manual stretching were also employed. The patient was also educated on the importance of good posture during deskwork and the potential hazards of sustaining poorly aligned postures for prolonged periods of time. Range of motion exercises were given to address the patient's specific deficits, and strengthening exercises

were given for the lower trapezius and serratus anterior. He received one course of dry needling to the upper trapezius, suboccipital, and levator scapulae muscles bilaterally, which occurred on the third visit.

There was a four-week time frame from initial evaluation to discharge, with the patient seen once per week in clinic. The patient reported performing specific home exercises and stretches daily between visits. Also, he reported a reduction in pain symptoms and increased range of motion after the second visit, during which many manual therapy techniques were applied. Unfortunately, the patient also reported a progressive return of symptoms by the third visit. Dry needling was employed in place of manual therapy techniques on the third visit. When the patient returned for the fourth visit, the patient reported an initial increase in symptoms followed by a significant decrease in pain from the previous treatment. A temporary increase in symptoms could be attributed to the twitch response (Gattie et al., 2017). The fourth visit was utilized for optimization of the patient's home exercise program because insurance did not approve further visits. Manual therapy was performed on the final visit, but dry needling was not. Upon discharge, the patient reported an overall decrease in pain symptoms and an increase in function from the initial evaluation, which they attributed to physical therapy interventions.

In retrospect, the articles examined support the treatment interventions performed with this patient. All articles analyzed support the use of manual mobilization techniques and dry needling as effective treatments for chronic neck pain. The major barrier to this patient's treatment was the four-visit limitation. The patient reported a significant decrease in symptoms after a treatment session utilizing dry needling, more so than after the visit utilizing extensive manual therapy. It is unclear if dry needling was more effective

than the manual therapy performed due to the limited time frame and follow-up. Because of this, for future patients with similar presentations, it would be beneficial to appropriate time for dry needling and manual therapy techniques in a single session. Further research is needed on the dosage of dry needling and manual therapy to optimize patient care and develop more effective treatment.

Conclusion

This review set out to examine if dry needling is more effective than manual manipulation and mobilization in treating chronic neck pain in a young and active patient. Analysis of eight articles and a case study of one patient showed dry needling to be equivocal to manual mobilization and manipulation in treating chronic neck pain. Both treatments proved to be effective and valid. There is a lack of strong evidence to support one treatment as superior, and further research should be completed with higher standards such as the inclusion of control groups. Even though the case study patient reported better outcomes from a session including dry needling, it cannot be definitively concluded that the intervention of dry needling is responsible. There are several confounding variables such as completion of a home exercise program and receiving prior treatment. However, upon discharge, the patient reported a decrease in symptoms and an increase in function, implying a successful physical therapy intervention.

In hindsight, treatment of this patient could have been improved by providing sessions with both manual therapy and dry needling together. This approach will provide future patients with the most exposure to valid interventions. This study shows that a successful approach to treating chronic neck pain in a young, active patient should involve

a multimodal approach, within which manual therapy and dry needling should be included and emphasized.

References

Cagnie, B., Castelein, B., Pollie, F., Steelant, L., Verhoeyen, H., & Cools, A. (2015). Evidence for the use of ischemic compression and dry needling in the management of trigger points of the upper trapezius in patients with neck pain: a systematic review. *American Journal of Physical Medicine & Rehabilitation*, *94*(7), 573–583. https://doi.org/10.1097/PHM.0000000000000266

Campa-Moran, I., Rey-Gudin, E., Fernández-Carnero, J., Paris-Alemany, A., Gil-Martinez, A., Lerma Lara, S., … La Touche, R. (2015). Comparison of dry needling versus orthopedic manual therapy in patients with myofascial chronic neck pain: a single-blind, randomized pilot study. *Pain Research and Treatment*, *2015*, 327307. https://doi.org/10.1155/2015/327307

Cerezo-Téllez, E., Torres-Lacomba, M., Fuentes-Gallardo, I., Perez-Muñoz, M., Mayoral-del-Moral, O., Lluch-Girbés, E., … Falla, D. (2016). Effectiveness of dry needling for chronic nonspecific neck pain: a randomized, single-blinded, clinical trial. *PAIN*, *157*(9), 1905–1917. https://doi.org/10.1097/j.pain.0000000000000591

Childs, J. D., Cleland, J. A., Elliott, J. M., Teyhen, D. S., Wainner, R. S., Whitman, J. M., … American Physical Therapy Association. (2008). Neck pain: clinical practice guidelines linked to the international classification of functioning, disability, and health from the orthopedic section of the American Physical Therapy Association. *The Journal of Orthopaedic and Sports Physical Therapy*, *38*(9), A1–A34. https://doi.org/10.2519/jospt.2008.0303

Cross, K. M., Kuenze, C., Grindstaff, T. L., & Hertel, J. (2011). Thoracic spine thrust manipulation improves pain, range of motion, and self-reported function in patients

with mechanical neck pain: a systematic review. *The Journal of Orthopaedic and Sports Physical Therapy*, *41*(9), 633–642. https://doi.org/10.2519/jospt.2011.3670

De Meulemeester, K. E., Castelein, B., Coppieters, I., Barbe, T., Cools, A., & Cagnie, B. (2017). Comparing trigger point dry needling and manual pressure technique for the management of myofascial neck/shoulder pain: a randomized clinical trial. *Journal of Manipulative and Physiological Therapeutics*, *40*(1), 11–20. https://doi.org/10.1016/j.jmpt.2016.10.008

Gattie, E. R., Cleland, J. A., & Snodgrass, S. J. (2017). Dry needling for patients with neck pain: protocol of a randomized clinical trial. *JMIR Research Protocols*, *6*(11), e227. https://doi.org/10.2196/resprot.7980

Gerber, L. H., Shah, J., Rosenberger, W., Armstrong, K., Turo, D., Otto, P., … Sikdar, S. (2015). Dry needling alters trigger points in the upper trapezius muscle and reduces pain in subjects with chronic myofascial pain. *PM & R: The Journal of Injury, Function, and Rehabilitation*, *7*(7), 711–718. https://doi.org/10.1016/j.pmrj.2015.01.020

Gerber, L. H., Sikdar, S., Aredo, J. V., Armstrong, K., Rosenberger, W. F., Shao, H., & Shah, J. P. (2017). Beneficial effects of dry needling for treatment of chronic myofascial pain persist for 6 weeks after treatment completion. *PM & R: The Journal of Injury, Function, and Rehabilitation*, *9*(2), 105–112. https://doi.org/10.1016/j.pmrj.2016.06.006

Liu, L., Huang, Q.-M., Liu, Q.-G., Ye, G., Bo, C.-Z., Chen, M.-J., & Li, P. (2015). Effectiveness of dry needling for myofascial trigger points associated with neck and shoulder pain: a systematic review and meta-analysis. *Archives of Physical Medicine and Rehabilitation*, *96*(5), 944–955. https://doi.org/10.1016/j.apmr.2014.12.015

Llamas-Ramos, R., Pecos-Martín, D., Gallego-Izquierdo, T., Llamas-Ramos, I., Plaza-Manzano, G., Ortega-Santiago, R., … Fernández-de-las-Peñas, C. (2014). Comparison of the short-term outcomes between trigger point dry needling and trigger point manual therapy for the management of chronic mechanical neck pain: a randomized clinical trial. *Journal of Orthopaedic & Sports Physical Therapy*, *44*(11), 852–861. https://doi.org/10.2519/jospt.2014.5229

Quek, J., Treleaven, J., Clark, R. A., & Brauer, S. G. (2017). An exploratory study examining factors underpinning postural instability in older adults with idiopathic neck pain. *Gait & Posture*, *60*(Supplement C), 93–98. https://doi.org/10.1016/j.gaitpost.2017.11.016

Appendix

#1

Cagnie, B., Castelein, B., Pollie, F., Steelant, L., Verhoeyen, H., & Cools, A. (2015). Evidence for the use of ischemic compression and dry needling in the management of trigger points of the upper trapezius in patients with neck pain: a systematic review. *American Journal of Physical Medicine & Rehabilitation*, *94*(7), 573–583. https://doi.org/10.1097/PHM.0000000000000266

Is the purpose and background information sufficient?	
Appraisal Criterion	***Reader's Comments***
Study Purpose Stated clearly? Usually stated briefly in abstract and in greater detail in introduction. May be phrased as a question or hypothesis. A clear statement helps you determine if topic is important, relevant and of interest to you. Consider how the study can be applied to PT and/or your own situation. What is the purpose of this study?	The purpose of the review is to describe the effects of ischemic compression (IC) and dry needling (DN) on myofascial trigger points (MTrPs) in the upper trapezius muscle in patients with neck pain. The secondary purpose is to compare ischemic pressure and dry needling to other therapeutic interventions also targeting trigger points.
Literature Relevant background presented? A review of the literature should provide background for the study by synthesizing relevant information such as previous research and gaps in current knowledge, along with the clinical importance of the topic. Describe the justification of the need for this study	The authors begin by discussing the prevalence of neck pain stating that anywhere from 45-54% of the general population will be affected by neck pain at some point in time. They discuss factors such as deskwork, poor posture, and repetitive use as triggers or causes of the neck pain. Neck pain is normally associated with MTrPs, which are taut bands, or nodules, of muscle that is palpable under the skin. These MTrPs are associated with referred pain, less functionality, decreased ROM, and increased disability according to the authors. The authors further discuss that many techniques have been developed to inactivate these MTrPs to address impairments. The most common are ischemic pressure and dry needling. Both have shown efficacy in reducing pain and improving function in RCTs and other systematic reviews. The authors claim that there is no systematic review that investigates the effects of both IC and DN.

	Thus the purpose for the study.

Does the research design have internal validity?	
Appraisal Criterion	***Reader's Comments***
➢ **Discuss possible threats to internal validity in the research design. Include:** ➢ **Assignment** ➢ **Attrition** ➢ **History** ➢ **Instrumentation** ➢ **Maturation** ➢ **Testing** ➢ **Compensatory Equalization of treatments** ➢ **Compensatory rivalry** ➢ **Statistical Regression**	Since this study is a systematic review and the methods being thoroughly described, this study has easy reproducibility. The authors made sure to blind investigators and researchers to the purpose of the study until after articles were analyzed. Disagreements on quality of studies were decided by a third party.

Are the results of this therapeutic trial valid?	
Appraisal Criterion	***Reader's Comments***
1. **Did the investigators randomly assign subjects to treatment groups?** a. **If no, describe what was done** b. **What are the potential consequences of this assignment process for the study's results?**	There is no randomization process in a systematic review. Articles were collected using the PICO method of investigation. However, three blinded and independent researches scored the articles according to the checklist for RCTs developed by the Dutch Cochrane Centre and Dutch Institute for Healthcare Improvement.
2. **Were the groups similar at the start of the trial? Did they report the demographics of the study groups?** a. **If they were not similar – what differences existed?**	There were no groups. The authors found 15 studies assessing the effects of IC and/or DN compared with other (non-) physiotherapy treatments on pain, ROM, functionality, and quality-of-life in patients with MTrPs that met the criteria of having at least a level of evidence of A2 and B according to the 2005 classification system of the Dutch institute for Healthcare

	Improvement.
3. Did the subjects know to which treatment group they were assign? **a. If yes, what are the potential consequences of the subjects' knowledge for this study's results**	There are no subjects in the study.
4. Did the investigators know who was being assigned to which group prior to the allocation? **a. If they were not blind, what are the potential consequences of this knowledge for the study's results?**	The investigators knew which articles they would be using after the vetting process. To be included in the systematic review, studies had to be RCTs, participants must have had neck pain diagnosed with active or latent MTrPs in the upper trap, DN and/or IC must be used as an intervention, and only articles concerning therapeutic effects of treatment were included.
5. Were the groups managed equally, apart from the actual experimental treatment? **a. If not, what are the potential consequences of this knowledge for the study's results?**	All articles were treated fairly without discrimination by two independent analysts.
6. Was the subject follow-up time sufficiently long to answer the question(s) posed by the research? **a. If not, what are the potential consequences of this knowledge for the study's results?**	There is no follow-up period needed.
7. Did all the subjects originally enrolled complete the study? **a. If not how many subjects were lost?** **b. What, if anything, did the authors do about this attrition?** **c. What are the implications of the attrition and the way it was handled with respect to the study's findings?**	All articles accepted into the study completed the study.
8. Were all patients analyzed in the	All articles were analyzed the same way.

groups to which they were randomized (i.e. was there an intention to treat analysis)? **a. If not, what did the authors do with the data from these subjects?** **b. If the data were excluded, what are the potential consequences for this study's results?**	80% of the articles received a B classification for quality with the remaining 20% receiving the higher A2 classification.
Are the valid results of this RCT important?	
Appraisal Criterion	***Reader's Comments***
9. What were the statistical findings of this study? **a. When appropriate use the calculation forms below to determine these values** **b. Include: tests of differences? With p-values and CI** **c. Include effect size with p-values and CI** **d. Include ARR/ABI and RRR/RBI with p-values and CI** **e. Include NNT and CI**	• Pain was an outcome measure used in all studies analyzed by the authors whether DN or IC was the intervention. Pain decreased in all studies investigating DN. However, only one study found that DN demonstrated a statistically significant decrease as compared to other interventions. Two studies demonstrated other treatments to be more effective than DN; the interventions were discussed in this article. Miniscalpel needling was shown to have a longer effect in one study than DN. Pain decreased in all studies investigating IC, however, it was only shown to be better than exercise alone. All other studies did not find a statistically significant difference between outcomes with IC and other interventions. Pain pressure threshold (PPT) was also investigated in most studies. All DN studies showed a statistically significant decrease in PPT, with a larger decrease than IC. • ROM was also an outcome of many studies. Six studies evaluating DN investigated the effect on ROM. DN was only compared to lidocaine injections in these studies, and all studies found that ROM increased in patients after treatment. IC was

10. What is the meaning of these statistical findings for your patient/client's case? What does this mean to your practice?	found to be most effective when used in conjunction with stretching, MET, and strain counterstrain. It did not show significant changes when used alone. • Functionality using the NDI was assessed in two studies. Both studies showed a statistically significant difference after treatment with either DN or IC. • Quality-of-Life and depression were assessed in four studies investigated by the authors. One study found that DN was equivalent to lidocaine injection and NSAID combination therapy. All other studies showed a statistically significant change toward a higher QOL and depression. These findings support the use of DN and validate its use for pain, ROM, functionality, and QOL. However, they do not provide enough evidence to say that DN is superior to other interventions. This means that DN is a viable tool to use in conjunction with other techniques to achieve the greatest outcome possible.
11. Do these findings exceed a minimally important difference? **a. If not, will you still use this evidence?**	These findings do support a minimally important difference. Across the board, all studies showed a statistically significant change in the positive direction for pain, ROM, functionality, and QOL. That evidence is convincing enough to use DN as a valid intervention.
Can you apply this valid, important evidence about an intervention in caring for your patient/client? What is the external validity?	
Appraisal Criterion	***Reader's Comments***
12. Does this intervention sound appropriate for use (available, affordable) in your clinical setting?	Both interventions in the study, DN and IC, are appropriate for clinical use. IC is inexpensive and with proper training can be performed effectively. DN is becoming a

	widely accepted treatment option and with the proper training is safe and affordable.
13. Are the study subjects similar to your patient/ client? **a. If not, how different? Can you use this intervention in spite of the differences?**	There are no subjects in this study, however, the abundance of articles analyzed show consistency of results, which increases the generalizability to the patient.
14. Do the potential benefits outweigh the potential risks using this intervention with your patient/client?	When done properly, the risks of DN are outweighed by the results. Across the board, it is shown that DN produces positive results. As long as the patient is comfortable with DN then it is a valid and reliable intervention.
15. Does the intervention fit within your patient/client's stated values or expectations? **a. If not, what will you do now?**	If the patient is comfortable with needles and invasive techniques, this intervention will fit within the patient's stated values and expectations.
16. Are there any threats to external validity in this study?	Due to the nature of a systematic review, generalizing results directly can be difficult. Although, this study provides conclusive evidence that DN has been proven to be effective through many different populations giving this study strong external validity.

What is the bottom line?

The bottom line is that DN and IC are both valid and reliable techniques for decreasing pain, increasing ROM, improving function, and improving QOL. However, there is no conclusive evidence to support that DN is superior to other interventions.

#2

Campa-Moran, I., Rey-Gudin, E., Fernández-Carnero, J., Paris-Alemany, A., Gil-Martinez, A., Lerma Lara, S., … La Touche, R. (2015). Comparison of dry needling versus orthopedic manual therapy in patients with myofascial chronic neck pain: a single-blind, randomized pilot study. *Pain Research and Treatment*, *2015*, 327307. https://doi.org/10.1155/2015/327307

Is the purpose and background information sufficient?	
Appraisal Criterion	***Reader's Comments***
Study Purpose Stated clearly? Usually stated briefly in abstract and in greater detail in introduction. May be phrased as a question or hypothesis. A clear statement helps you determine if topic is important, relevant and of interest to you. Consider how the study can be applied to PT and/or your own situation. What is the purpose of this study?	There are three main objectives of the study. The first is to compare the efficacy of orthopedic manual therapy (OTM), dry needling, stretching (DN-S), and soft tissue techniques (SST) for the treatment of Myofascial Trigger Points (MTrPs) in patients with myofascial neck pain. The second is to compare treatment effects over disability and catastrophizing in patients with neck pain. The third is to evaluate likely neurophysiological effects produced by these techniques in the neck.
Literature Relevant background presented? A review of the literature should provide background for the study by synthesizing relevant information such as previous research and gaps in current knowledge, along with the clinical importance of the topic. Describe the justification of the need for this study	The justification for the study is to help fill a gap in the literature about how different groups of patients will respond to different types of manual therapy. The authors discuss how dry needling has shown efficacy in treating MTrPs, how mobilization and manipulation of the cervical spine have also shown efficacy, and finally how ischemic pressure has shown efficacy as well. The authors claim that a multimodal approach is likely to be most successful, however, there is no evidence to support how many modalities or which combinations work the best. Overall though, the investigators do a fair, at best, justification for their study. There could have been more obvious and explicit statements providing information on their intentions to fill a gap in research.

Does the research design have internal validity?	
Appraisal Criterion	***Reader's Comments***
➢ **Discuss possible threats to internal validity in the research design. Include:** ➢ **Assignment** ➢ **Attrition** ➢ **History**	There are minimal threats to internal validity in the research design. The assignment was randomized and blinded. There were no dropouts. All measurements were taken by the same therapist or outcome measure. All outcome measures

➢ **Instrumentation** ➢ **Maturation** ➢ **Testing** ➢ **Compensatory Equalization of treatments** ➢ **Compensatory rivalry** ➢ **Statistical Regression**	used are standardized and validated through empirical testing. The follow-up time was only one week, leaving little chance of clients getting better do to time. Subjects were not informed of other treatments, limiting the chance of equalization or rivalry. Overall, the study was well designed to deter threats to internal validity. However, it cannot be overlooked that nature of some of the measurements, such as pain pressure threshold (PPT) can be difficult to reproduce even though there is a quantitative measure applied to it.

Are the results of this therapeutic trial valid?	
Appraisal Criterion	***Reader's Comments***
17. Did the investigators randomly assign subjects to treatment groups? **a. If no, describe what was done** **b. What are the potential consequences of this assignment process for the study's results?**	A computer randomization was used to assign subjects to one of the three groups.
18. Were the groups similar at the start of the trial? Did they report the demographics of the study groups? **a. If they were not similar – what differences existed?**	Groups were similar in the fact that they all passed the inclusion criteria of bilateral neck pain involving the upper traps or levator scapulae, pain of at least months duration, pain corresponding to 20mm to 100mm on the VAS, symptoms provoked by either neck postures or movement, pain localized to the cervical or suboccipital area, NDI score of 15 or greater, restricted cervical ROM, and presence of MTrPs in the upper traps or levator scapulae. Subjects had to be between the ages of 18-75. Overall, this can lead to groups that may not be similar depending on the random

	allocation. However, between group differences were reported with no significant differences indicated by p values all greater than 0.05.
19. Did the subjects know to which treatment group they were assign? **a. If yes, what are the potential consequences of the subjects' knowledge for this study's results**	Subjects did not know which group they were assigned until they received treatment. Due to the nature of the interventions, patients became aware of which group they were in, however they were not aware of what treatments other groups were receiving which helped maintain some sort of blindness.
20. Did the investigators know who was being assigned to which group prior to the allocation? **a. If they were not blind, what are the potential consequences of this knowledge for the study's results?**	The investigators did not know who was being assigned to the groups prior allocation. Groups were randomly selected by a computer program.
21. Were the groups managed equally, apart from the actual experimental treatment? **a. If not, what are the potential consequences of this knowledge for the study's results?**	Groups were managed equally apart from the actual interventions given. Each group received 2 treatments with a 48-hour time period between treatments.
22. Was the subject follow-up time sufficiently long to answer the question(s) posed by the research? **a. If not, what are the potential consequences of this knowledge for the study's results?**	The follow-up time was immediately after two different treatment sessions, 48 hours apart, and 1 week after the second treatment session. In terms of short-term results, this is sufficient, but the study does not look at long-term results of the treatment. The authors provide this as a limitation of their study because they only performed two sessions and only followed up one week later. This could change the results of their study because not following up at one month or longer, between group differences could have arisen, which were not originally found.
23. Did all the subjects originally	All of the subjects enrolled in the study

enrolled complete the study? **a. If not how many subjects were lost?** **b. What, if anything, did the authors do about this attrition?** **c. What are the implications of the attrition and the way it was handled with respect to the study's findings?**	completed it. There were no dropouts.
24. Were all patients analyzed in the groups to which they were randomized (i.e. was there an intention to treat analysis)? **a. If not, what did the authors do with the data from these subjects?** **b. If the data were excluded, what are the potential consequences for this study's results?**	All patients were analyzed in the groups to which they were randomized.
Are the valid results of this RCT important?	
Appraisal Criterion	***Reader's Comments***
25. What were the statistical findings of this study? **a. When appropriate use the calculation forms below to determine these values** **b. Include: tests of differences? With p-values and CI** **c. Include effect size with p-values and CI** **d. Include ARR/ABI and RRR/RBI with p-values and CI** **e. Include NNT and CI**	Starting with the Catastrophizing and Neck Disability Index, statistically significant differences were found between pretreatment and follow-up using the ANOVA. The OMT group showed statistical significance (P<0.001) in results with the Pain Catastrophizing scale, however the STT and DN-S groups did not (P<0.41 and P<0.45 respectively). On the visual analog scale (VAS), all groups showed a statistically significant difference in the reduction of pain between pretreatment and follow-up, all having P<0.001. For the PPTs the Kruskal-Wallis test was utilized and differences were found between baseline and follow-up, for all groups, at pressure points at C5-C6 (P<0.05) and the upper trapezius muscle (P<0.05). However, for post-1 and post-2 results, only the OMT group showed a statistically significant difference with P<0.001. For ROM, statistically significant differences were

	found for both flexion and extension. In flexion, the Kruskal-Wallis test revealed a P<0.036 between baseline and follow-up. Extension exhibited a P<0.005 between baseline and follow-up. Mann-Whitney U tests were run to see the difference between groups. In flexion, the DN-S group versus OMT and STT versus OMT showed significant difference with P<0.014 and P<0.046 respectively. In extension, the DN-S versus OMT and STT versus OMT showed significant difference with P<0.022 and P<0.001 respectively.
26. What is the meaning of these statistical findings for your patient/client's case? What does this mean to your practice?	The overarching meaning of these results is that all three treatments are effective in reducing neck pain to a statistically significant difference. However, the DN-S group and OMT group had an almost immediate effect of reducing pain after two sessions. Although there was increased soreness between treatment 1 and 2 for the DN-S group, this can be attributed to the twitch response most likely. The STT group did not show an immediate change in neck disability, but was equivocal at follow-up. Overall, the OMT groups and the DN-S group had larger increases in ROM, however all groups were statistically significant at follow-up. To my patient/client's case, this means I have several viable options for treating their neck pain, especially if they have a needle phobia. To my practice, this means all techniques tested in this study will lead to the same destination. Looking at 2-week outcomes, all showed statistically significant differences. However, if I want more immediate results and a larger magnitude of change, orthopedic manual therapy and dry needling with stretching are the two techniques to employ.

27. Do these findings exceed a minimally important difference? **a. If not, will you still use this evidence?**	All findings exceed a minimally important difference. The results for the VAS show that all results exceed an 8.5 mm change. Only the STT group did not exceed the difference and show statistical significance on the NDI, which is 7 points. All groups exceeded the minimally detectable change for ROM, which is 6.5 degrees for flexion and 5.1 for extension. The OMT group showed the greatest gain in ROM at follow-up.
Can you apply this valid, important evidence about an intervention in caring for your patient/client? What is the external validity?	
Appraisal Criterion	***Reader's Comments***
28. Does this intervention sound appropriate for use (available, affordable) in your clinical setting?	All interventions in this study are appropriate for clinical use. Both OMT and SST do not require materials, however they require training and practice. Although, training and practice can be obtained easily within an orthopedic clinic, dry needling requires training and materials. However, this is becoming a more widely accepted and used modality in the clinical setting. Albeit, this modality is a good tool to have in the tool box for an orthopedic clinician and is appropriate.
29. Are the study subjects similar to your patient/ client? **a. If not, how different? Can you use this intervention in spite of the differences?**	The subjects in this study have a wide range of age and demographics, which can easily be applied to most clinical settings and my patient in question. The major difference is that they are not excluded to "active" adults. This could pose a small issue because of the creation of the trigger points. However, there is no evidence I could find to support the different origins of trigger points. Thus, this difference can be overlooked for now and this study has external validity to my patient in question.
30. Do the potential benefits outweigh the potential risks using this	The potential benefits outweigh the potential risks of this intervention. All

intervention with your patient/client?	interventions showed a statistically significant difference for reduction of pain and increase of function. There are two potential risks to the OMT and DN-S groups. Due to manipulation of the cervical spine in the OMT group and the potential risk of pleural cavity puncture with dry needling, special care must be taken in the cervical area. Vertebral artery rupture and pneumothorax are potential risks that should be considered by the clinician.
31. Does the intervention fit within your patient/client's stated values or expectations? **a. If not, what will you do now?**	All interventions tested in this study fit within the client's values and expectations because they are interventions statistically proven to reduce pain and increase function.
32. Are there any threats to external validity in this study?	The only threat to external validity in this study is the lack of follow-up. In a clinical setting, one week of improvement is not as relevant as six weeks or six months. It is important to address impairments and give a much more long-term solution. Additional follow-up will be needed in other similar studies, as a stated by the authors.

What is the bottom line?

The bottom line is that all three interventions tested, orthopedic manual therapy, dry needling and stretching, and soft tissue techniques were statistically significant in reducing pain, indicated by the VAS changes, and increase in function, indicated by the NDI. One thing that should be noted from this study is that only the OMT group had a reduction in pain catastrophizing. This is an important point to consider with patients who exhibit chronic pain symptoms and characteristics.

What pedro score would you give this trial?

10/11

#3

Cerezo-Téllez, E., Torres-Lacomba, M., Fuentes-Gallardo, I., Perez-Muñoz, M., Mayoral-del-Moral, O., Lluch-Girbés, E., … Falla, D. (2016). Effectiveness of dry needling for chronic nonspecific neck pain: a randomized, single-blinded, clinical trial. *PAIN*, *157*(9), 1905–1917. https://doi.org/10.1097/j.pain.0000000000000591

Is the purpose and background information sufficient?	
Appraisal Criterion	***Reader's Comments***
Study Purpose Stated clearly? Usually stated briefly in abstract and in greater detail in introduction. May be phrased as a question or hypothesis. A clear statement helps you determine if topic is important, relevant and of interest to you. Consider how the study can be applied to PT and/or your own situation. What is the purpose of this study?	The purpose of this study has two parts. The first is to evaluate the effectiveness of Deep Dry Needling (DDN) on pain in people with chronic non-specified neck pain attributed to myofascial pain and trigger points. The second is to evaluate the efficacy of DDN on mechanical hyperalgesia, neck AROM, neck strength, and perceived neck disability.
Literature Relevant background presented? A review of the literature should provide background for the study by synthesizing relevant information such as previous research and gaps in current knowledge, along with the clinical importance of the topic. Describe the justification of the need for this study	The justification for this study arises from the lack of proper controls, small sample size, lack of long-term follow-up, and methodological issues regarding blinding in other studies. The authors state that even though there are numerous studies showing the effectiveness of DN on pain, ROM, and disability, there is still a need for more research to make the claims unequivocally established. They discuss studies that have proven that neck pain is linked with myofascial pain syndrome and that dry needling has been shown to reduce pain and increase ROM, but the studies have been attacked for their methodology.

Does the research design have internal validity?	
Appraisal Criterion	***Reader's Comments***
➢ **Discuss possible threats to internal validity in the research design. Include:** ➢ **Assignment** ➢ **Attrition**	Overall, the process of assignment was well done and randomized and blinded to the therapist administering treatment. Two participants dropped out, but this was before group allocation and didn't affect the

➢ **History** ➢ **Instrumentation** ➢ **Maturation** ➢ **Testing** ➢ **Compensatory Equalization of treatments** ➢ **Compensatory rivalry** ➢ **Statistical Regression**	study. The same instrumentation was used and the same therapist took all measurements. Maturation is not a problem since subjects reported a significant change after a 2-4 sessions and it was maintained to the 6-month follow-up. Groups were treated equally besides the administration of dry needling. Also, if given time and no intervention, most subjects would not have made a change on their own. The only threat to validity is that not all subjects completed 4 treatment sessions. This is because they reported complete relief from their symptoms and decided more treatment was not necessary. In my opinion, this is only a small threat because subjects stopped coming because they were healed, not because they were dropping out.

Are the results of this therapeutic trial valid?	
Appraisal Criterion	***Reader's Comments***
33. Did the investigators randomly assign subjects to treatment groups? **a. If no, describe what was done** **b. What are the potential consequences of this assignment process for the study's results?**	Equal number of participants, 128 total, were randomly assigned to two groups by the computer program EPIDAT.
34. Were the groups similar at the start of the trial? Did they report the demographics of the study groups? **a. If they were not similar – what differences existed?**	It is difficult to discern if the groups are similar because the only information given are means, standard deviations, and a group difference values for demographics. It is possible to assume the difference value is the effect size between the groups, however there is no clear statement as to what the value in the table represents. If the group difference value is assumed to be the effect size, then the majority of characteristics

	between groups are similar.
35. Did the subjects know to which treatment group they were assign? **a. If yes, what are the potential consequences of the subjects' knowledge for this study's results**	By the nature of the treatments given, participants did know which group they were assigned to. They knew if they were receiving dry needling or just manual stretching techniques. It does not state if the participants knew the purpose of the study though. If they did not know what the other treatment group was receiving, this would not create a problem. However, if the participants knew the purpose of the study, this could alter results due to compensatory rivalry.
36. Did the investigators know who was being assigned to which group prior to the allocation? **a. If they were not blind, what are the potential consequences of this knowledge for the study's results?**	The investigators knew who were assigned to the groups. However, the investigators were not the therapists providing treatment. A single therapist providing treatment was blinded to the groups, however, it would be obvious to them who was receiving dry needling and stretching, or just stretching.
37. Were the groups managed equally, apart from the actual experimental treatment? **a. If not, what are the potential consequences of this knowledge for the study's results?**	Groups were not managed equally due to the fact that some patients reported a significant decrease or elimination of symptoms. In the DDN group, 12 participants received 3 treatment sessions, 37 received 2 sessions, and 3 received only 1 session. In the control group, 15 subjects received 2 sessions while the remaining finished the 4 scheduled sessions. Overall, this doesn't affect the results drastically because patients didn't receive treatment due to positive effects, instead of negative effects or dropping out.
38. Was the subject follow-up time sufficiently long to answer the question(s) posed by the research? **a. If not, what are the potential consequences of this knowledge for the study's results?**	One strength of the study is the follow-up time is much longer than other studies. The authors wanted to follow up at 1, 3, and 6 months, which is appropriately long to discern long-term effects of the intervention.

39. Did all the subjects originally enrolled complete the study? **a. If not how many subjects were lost?** **b. What, if anything, did the authors do about this attrition?** **c. What are the implications of the attrition and the way it was handled with respect to the study's findings?**	There were no drop outs. All 64 subjects in each group completed all interventions and follow-ups even though some may have received fewer treatments. Two subjects were lost after randomization but were not included in group allocation.
40. Were all patients analyzed in the groups to which they were randomized (i.e. was there an intention to treat analysis)? **a. If not, what did the authors do with the data from these subjects?** **b. If the data were excluded, what are the potential consequences for this study's results?**	All subjects were analyzed in the groups to which they were randomized. There was no intention to treat analysis performed, however, since all subjects completed the study, this does not pose a problem to validity.
Are the valid results of this RCT important?	
Appraisal Criterion	***Reader's Comments***
41. What were the statistical findings of this study? **a. When appropriate use the calculation forms below to determine these values** **b. Include: tests of differences? With p-values and CI** **c. Include effect size with p-values and CI** **d. Include ARR/ABI and RRR/RBI with p-values and CI** **e. Include NNT and CI**	Across both groups, pain significantly decreased after treatment with a $P<0.00001$ however the effect was much larger for the DDN group at 3.24 units. This was maintained through the 6-month follow-up and was clinically meaningful at all follow-ups. For the pain pressure threshold of every muscle except splenius capitus, both groups showed a statistically significant change, however only the DDN group had a clinically meaningful change. The DDN group had a much larger effect of 1.82 units and $P<0.0000$ of the trapezius muscle and an effect of 1.17 units larger for other muscles in the DDN. This is a clinically and statistically significant change. Neck AROM significantly increased in all directions for the DDN group and no significant change was found in the control group ($P<0.00001$). AROM showed a significant change after two sessions and was maintained at the 6-month

	follow up. No significant change between groups was detected for muscle strength. For neck disability, mean values decreased significantly for both groups, with a much larger, clinically significant change, in the DDN group with an effect of 10.1 units larger than the control group (P<0.00000). This was maintained at the 6-month follow-up.
42. What is the meaning of these statistical findings for your patient/client's case? What does this mean to your practice?	The meaning of these findings is that, compared to stretching alone, DDN is more effective at reducing pain, increasing AROM, decreasing disability, and increasing pressure tolerance to trigger points. According to the study, the changes found at 1 month were maintained at 6 months as well. This means that dry needling is better than just manual stretching. For my practice, this means that if I have access and the proper training to needles, I should choose this modality over just stretching.
43. Do these findings exceed a minimally important difference? **a. If not, will you still use this evidence?**	The findings for AROM, pain reduction, and disability all exceeded a minimally importance difference.
Can you apply this valid, important evidence about an intervention in caring for your patient/client? What is the external validity?	
Appraisal Criterion	***Reader's Comments***
44. Does this intervention sound appropriate for use (available, affordable) in your clinical setting?	This intervention is appropriate for use in the clinical setting. It is available and affordable with the proper training.
45. Are the study subjects similar to your patient/ client? **a. If not, how different? Can you use this intervention in spite of the differences?**	The subjects in the study are similar to the patient in question, except for a few small differences. All subjects had chronic neck pain of 3 months or more, however their activity level was not reported. However, the evidence is strong enough to generalize the results to the patient in question.

46. Do the potential benefits outweigh the potential risks using this intervention with your patient/client?	The potential benefits do outweigh the risks, as long as the dry needling is performed by a trained physical therapist. The risk for pneumothorax is always present and should be considered during treatment.
47. Does the intervention fit within your patient/client's stated values or expectations? **a. If not, what will you do now?**	The intervention fits within the stated values and expectations of the patient in question. Phobia of needles is an obvious precaution, and treatment should not be performed on an immunocompromised individual.
48. Are there any threats to external validity in this study?	Threats to external validity are minimal. The only threat to external validity to this study in consideration to the patient in question is the activity level of the participants. The patient in question is active and the origin of neck pain is attributed to over activity instead of under activity.

What is the bottom line?

The bottom line of this study is that dry needling is more effective than manual stretching for chronic neck pain in the cervical region. The study uses long follow-up times and a large n, which increases the strength and power of the study. The dry needling group maintained statistically significant changes at the 6-month follow-up for AROM, pain, PPT, and disability. However, demographics of the subjects are not given in detail and some procedures are vaguely described.

What pedro score would you give this trial?

8/11

#4

De Meulemeester, K. E., Castelein, B., Coppieters, I., Barbe, T., Cools, A., & Cagnie, B. (2017). Comparing trigger point dry needling and manual pressure technique for the management of myofascial neck/shoulder pain: a randomized clinical trial. *Journal of Manipulative and Physiological Therapeutics*, *40*(1), 11–20. https://doi.org/10.1016/j.jmpt.2016.10.008

Is the purpose and background information sufficient?	
Appraisal Criterion	***Reader's Comments***
Study Purpose Stated clearly? Usually stated briefly in abstract and in greater detail in introduction. May be phrased as a question or hypothesis. A clear statement helps you determine if topic is important, relevant and of interest to you. Consider how the study can be applied to PT and/or your own situation. What is the purpose of this study?	The purpose of this study is to compare dry needling (DN) to manual pressure (MP) on trigger points to determine if DN has better effects than MP on both long-term and short-term outcomes, such as disability, pain, and muscle characteristics in treating myofascial neck and shoulder problems in women who work in an office.
Literature Relevant background presented? A review of the literature should provide background for the study by synthesizing relevant information such as previous research and gaps in current knowledge, along with the clinical importance of the topic. Describe the justification of the need for this study	Background cited in the study includes the efficacy for both dry needling (DN) and manual pressure (MP) as successful interventions for treating Myofascial Trigger Points (MTrPs). Further information given supports both interventions for treating pain intensity, high pressure pain threshold, improved function, increased ROM, reduction of stiffness, and improvement in muscle strength. The authors also discussed the prevalence of neck and shoulder pain in office workers. The justification given for the need of this study is to compare both efficacious treatments to each other, since past studies have only studied them to placebo.

Does the research design have internal validity?	
Appraisal Criterion	***Reader's Comments***
➢ **Discuss possible threats to internal validity in the research design. Include:**	The internal validity of the study is sound. The assignment of subject groups was done blindly to the researchers, however it was

➢ **Assignment** ➢ **Attrition** ➢ **History** ➢ **Instrumentation** ➢ **Maturation** ➢ **Testing** ➢ **Compensatory Equalization of treatments** ➢ **Compensatory rivalry** ➢ **Statistical Regression**	impossible to blind the participants. There was no attrition. Manual pressure was measured in Newtons and recorded for reproducibility, and performed by the same therapist. Dry needling was performed by the same therapist. Subjects were not aware of who was participating in the groups. Outcome measurement was done in a timely manner to record progress without delay. The recognition of trigger points due to muscle characteristics is the one area that could dampen the reproducibility of the study. Determining muscle characteristics is subjective, however can be reliable by using a trained myofascial therapist.

Are the results of this therapeutic trial valid?	
Appraisal Criterion	***Reader's Comments***
49. Did the investigators randomly assign subjects to treatment groups? **a. If no, describe what was done.** **b. What are the potential consequences of this assignment process for the study's results?**	The investigators did randomly assign subjects to the treatments groups using block randomization. An independent researcher performed the block allocations in which subjects chose a card from an envelope labeled A (manual pressure) or B (dry needling). One interesting point is that the 42 subjects were not divided equally. The MP group had 22 subjects, while the DN group had 20. This could be a result from how the subjects were blocked originally. This could affect the external validity of the study slightly and was not elaborated on by the authors.
50. Were the groups similar at the start of the trial? Did they report the demographics of the study groups? **a. If they were not similar – what differences existed?**	The groups were similar at the start of the trial except that one group had 20 subjects and the other had 22. Demographics were reported but not exhaustive. These demographics included were female office workers, self reported neck or shoulder pain for greater than 3 months, performing

	at least 20 hours of computer work a week, and a Neck Disability Index (NDI) score of greater than or equal to 10/50. No further demographics were given on age.
51. Did the subjects know to which treatment group they were assign? **a. If yes, what are the potential consequences of the subjects' knowledge for this study's results**	Due to the nature of the intervention, subjects knew which group they were assigned once they received the intervention. The article does not explicitly say if the subjects were aware of the other intervention they were not receiving. If subjects knew which intervention they were not receiving this could lead to a compensatory rivalry threat to internal validity. A subject could modify their response on the follow up NDI because they did not receive the intervention they desired.
52. Did the investigators know who was being assigned to which group prior to the allocation? **a. If they were not blind, what are the potential consequences of this knowledge for the study's results?**	The investigators did not know which subjects were being assigned. An independent researcher was utilized for group allocation.
53. Were the groups managed equally, apart from the actual experimental treatment? **a. If not, what are the potential consequences of this knowledge for the study's results?**	The groups were managed equally besides the experimental treatment. Both groups received baseline measurements of muscle characteristics at 4 of the most sensitive trigger points out of 6 pre-chosen trigger points and a high pressure pain threshold (PPT) measurement, which was their first treatment. Treatments 2, 3, and 4 consisted of measurement of NDI, PPT, and muscle characteristics. With a final assessment three months later of the NDI, PPT, and muscle characteristics.
54. Was the subject follow-up time sufficiently long to answer the question(s) posed by the research? **a. If not, what are the**	The follow-up time was sufficiently long enough to answer the question posed by the research. The investigators intended on measuring pain directly after treatment and 3 months later to assess short and

potential consequences of this knowledge for the study's results?	long-term outcomes. Due to the nature of the interventions, a quick change is anticipated and can be measured shortly after administration of the techniques.
55. Did all the subjects originally enrolled complete the study? **a. If not how many subjects were lost?** **b. What, if anything, did the authors do about this attrition?** **c. What are the implications of the attrition and the way it was handled with respect to the study's findings?**	Not all subjects completed the study. One subject in the MP group dropped out and three in the DN group dropped out. The authors did nothing about the dropouts. There is no report of an intention to treat analysis. This attrition could lead to skewed results, especially for the DN group from baseline to final results. This could skew the results to be more favorable of DN if the three dropped out did not have positive treatment results.
56. Were all patients analyzed in the groups to which they were randomized (i.e. was there an intention to treat analysis)? **a. If not, what did the authors do with the data from these subjects?** **b. If the data were excluded, what are the potential consequences for this study's results?**	All patients were analyzed in the groups to which they were randomized. However, there was no intention to treat analysis set up before hand. If a subject did drop out, this could have affected their results slightly, especially if the subject dropped out of the DN group since this group started with two less subjects.
Are the valid results of this RCT important?	
Appraisal Criterion	***Reader's Comments***
57. What were the statistical findings of this study? **a. When appropriate use the calculation forms below to determine these values** **b. Include: tests of differences? With p-values and CI** **c. Include effect size with p-values and CI** **d. Include ARR/ABI and RRR/RBI with p-values and CI** **e. Include NNT and CI**	Overall, the results showed statistical significance for both the DN and MP group on the primary outcome measures; the Neck Disability Index and the general numeric rating scale (NRS). Immediately after treatment both received $P<0.001$, and three months after treatment both received $P<0.001$ as compared to baseline. This indicates a significant decrease in neck disability and a significant decrease in pain reported. Secondary outcome measures such as the pressure pain threshold (PPT) and muscle characteristics showed similar results. PPT demonstrated a significant increase demonstrated by $P=0.004$ and $P<0.001$ for trigger points at

	location 2 and 1, 3 and 4 respectively. Muscle characteristics showed a decrease in stiffness on the right (P=0.009) and left (P=0.012) on the left after treatment. No other statistics besides p-values were given.
58. What is the meaning of these statistical findings for your patient/client's case? What does this mean to your practice?	The meaning of these statistical findings for the patient is simple. Both DN and MP are viable and valid treatments for myofascial neck/shoulder pain, however neither is superior to the other. To my practice this means that either intervention can be used with confidence, and it could be extrapolated that both in conjunction will work better than a single treatment.
59. Do these findings exceed a minimally important difference? **a. If not, will you still use this evidence?**	These findings do exceed a minimally importance difference from baseline to post treatment, however they do not show a minimally important difference between treatments. This means that both treatments are viable and equal for treating neck pain and this evidence can and should be used.
Can you apply this valid, important evidence about an intervention in caring for your patient/client? What is the external validity?	
Appraisal Criterion	***Reader's Comments***
60. Does this intervention sound appropriate for use (available, affordable) in your clinical setting?	Both interventions sound appropriate for use in the clinic. MP is the easiest to employ since it requires no tools, only training and skill. DN requires certification and equipment such as the needles and guide tubing for insertion. However, it is becoming more extensively used and therefore is becoming more easily accessible in clinics. Judging from the

	results of the study, both interventions are acceptable, but MP would be an easier, quicker, and safer modality to employ.
61. Are the study subjects similar to your patient/ client? **a. If not, how different? Can you use this intervention in spite of the differences?**	The subjects have similarities to the target patient for the PICO, however some differences do exist. The first being that all subjects were female. It is not explicitly stated in the PICO, whether the patient is male or female, so there is no direct connection. All subjects reported pain of 3 months or greater suggesting chronicity of the problem, which is consistent with the PICO. However, the main difference between subjects on the study and the patient of the PICO is the fact that the subjects were sedentary and not active adults. This poses the greatest issue for external validity of the article's results toward the patient in question. The difference between the mechanisms of the origin of the pain is enough that it could raise doubt toward the applicability of the results. However, both interventions proved successful in reducing pain, so clinically it is worth attempting both interventions on an active patient with the same symptoms.
62. Do the potential benefits outweigh the potential risks using this intervention with your patient/client?	The potential benefits do outweigh the risks of this intervention. MP is safe when performed by a trained therapist, even who has minimal manual therapy experience, and it is non invasive. DN is safe only when performed by a trained and licensed therapist. It is an invasive procedure and dry needling around the thoracic cavity has risks such a puncturing the pleural cavity creating a pneumothorax. However, the proven benefits of pain reduction outweigh those risks when performed appropriately.
63. Does the intervention fit within your patient/client's stated values or expectations?	Both interventions fit within the values and expectations of the patient. Some patients may have fear of needles, which

a. If not, what will you do now?	can be a barrier to performing DN. Since this study provided results of no difference between interventions, MP can be used in place of DN if this concern arises.
64. Are there any threats to external validity in this study?	There are no apparent threats to external validity to this study in general. However, in terms of validity toward the PICO question, there are two concerns. The first being that this study was only performed on women. Even though the gender of the patient is not described in the PICO question, applicability to the male gender is in question. Although, it is unlikely gender will make a difference in terms of the outcomes of the interventions since they are not gender dependent. The second threat to validity toward the PICO question is that the mechanism of developing painful trigger points is different. The development and reaction to treatment of painful cervical trigger points from being sedentary could be different than trigger points developed from activity. The difference in mechanism of development could result in different trigger point reactions to treatment, although this is unlikely.

What is the bottom line?
The bottom line of this study is that Manual Pressure and Dry Needling of Myofascial Trigger Points resulted in reduction of pain and increased function with no statistical difference between the two. This means that both interventions are appropriate modalities for treating trigger points in the neck and shoulder region and can be used in place of each other. As a clinician, this is important because it provides good evidence for both interventions, so if one is not being received successfully, the other technique can be applied as a different way form of treatment.

What pedro score would you give this trial?
8/11

#5

Gerber, L. H., Shah, J., Rosenberger, W., Armstrong, K., Turo, D., Otto, P., … Sikdar, S. (2015). Dry needling alters trigger points in the upper trapezius muscle and reduces pain in subjects with chronic myofascial pain. *PM & R: The Journal of Injury, Function, and Rehabilitation*, *7*(7), 711–718. https://doi.org/10.1016/j.pmrj.2015.01.020

Is the purpose and background information sufficient?	
Appraisal Criterion	***Reader's Comments***
Study Purpose Stated clearly? Usually stated briefly in abstract and in greater detail in introduction. May be phrased as a question or hypothesis. A clear statement helps you determine if topic is important, relevant and of interest to you. Consider how the study can be applied to PT and/or your own situation. What is the purpose of this study?	The purpose of the study is to assess whether dry needling of an active myofascial trigger point (MTrP) alters patient reported pain, alters the status of the trigger point to resolution or latency, and increases mood and function.
Literature Relevant background presented? A review of the literature should provide background for the study by synthesizing relevant information such as previous research and gaps in current knowledge, along with the clinical importance of the topic. Describe the justification of the need for this study	The authors begin by introducing the debate of what myofascial pain syndrome (MPS) is and the characteristics that remain unclear in diagnosing the condition. The main debate illustrated by the authors is whether or not MTrPs are a necessary condition for the diagnosis of MPS. According to the authors, most clinicians would agree that active MTrPs are an objective finding associated with MPS. Travell and Simons' definition of MPS is applied for the purpose of this article, which is "regional pain associated with a palpable, discrete nodule within a taut band of skeletal muscle that is spontaneously painful". The authors then introduce the modality of dry needling and discuss that the effectiveness of it has been hard to demonstrate due to lack of objective pain measures. The authors state that this is because patient reported outcome measures have made validation difficult. The authors claim that this is the first study to investigate dry needling and its effects on pain reduction and MTrP status.

Does the research design have internal validity?	
Appraisal Criterion	***Reader's Comments***
➢ **Discuss possible threats to internal validity in the research design. Include:** ➢ **Assignment** ➢ **Attrition** ➢ **History** ➢ **Instrumentation** ➢ **Maturation** ➢ **Testing** ➢ **Compensatory Equalization of treatments** ➢ **Compensatory rivalry** ➢ **Statistical Regression**	There are two major threats to internal validity to this study. The first being that there was no randomization of subjects. There was no randomization because there was no control group or comparison group to randomize subjects between. This reduces the power and generalizability of the results. There were also 4 dropouts leading to a threat from attrition.

Are the results of this therapeutic trial valid?	
Appraisal Criterion	***Reader's Comments***
65. Did the investigators randomly assign subjects to treatment groups? **a. If no, describe what was done** **b. What are the potential consequences of this assignment process for the study's results?**	There is only one group in this study, and it is the group receiving the intervention of dry needling. There is no comparison group. The purpose of the study is to only establish efficacy, not compare treatments. This weakens the validly of the study because it only confirms whether or not a treatment works to decrease pain, instead of seeing which treatments work best. This means that extrapolating the results from the study should be done cautiously.
66. Were the groups similar at the start of the trial? Did they report the demographics of the study groups? **a. If they were not similar – what differences existed?**	Since there were no groups, it is not possible to compare them. Inclusion and exclusion criteria were given, as well as minuscule demographics. Inclusion criteria required an age of 18-65, pain without provocation for at least three months in the neck and shoulder girdle, and a

	palpable MTrP in the upper trapezius. Exclusion criteria included chronic fatigue syndrome, fibromyalgia, chronic Lyme disease, cervical radiculopathy, head/neck/shoulder surgery, new medication change within 6 weeks, and current use of acupuncture.
67. Did the subjects know to which treatment group they were assign? **a. If yes, what are the potential consequences of the subjects' knowledge for this study's results**	The subjects did know which group they were assigned to because there was only one treatment group. Also because of the nature of dry needling, patients knew which intervention they were receiving. This can bias results because a subject may report increased symptoms or an inflated decrease in symptoms because of preconceived notions and expectations of the treatment.
68. Did the investigators know who was being assigned to which group prior to the allocation? **a. If they were not blind, what are the potential consequences of this knowledge for the study's results?**	The investigators did know who was assigned to the treatment group because there was only one group. Since there is not blinding, the investigators could provide or tailor the treatment to specifically treat an individual's impairments instead of following the specific procedure for the study. This specific treatment could skew the results toward being more valid.
69. Were the groups managed equally, apart from the actual experimental treatment? **a. If not, what are the potential consequences of this knowledge for the study's results?**	All patients were managed equally. All subjects received 3 sessions of dry needling with a follow-up of three weeks post final treatment. They all received DN to the most, or only, active MTrP.
70. Was the subject follow-up time sufficiently long to answer the question(s) posed by the research? **a. If not, what are the potential consequences of this knowledge for the study's results?**	In order to evaluate short to medium term effects of DN, the three-week follow-up time is sufficiently long to determine pain reduction, ROM changes, and pain pressure threshold (PPT).

71. Did all the subjects originally enrolled complete the study? **a. If not how many subjects were lost?** **b. What, if anything, did the authors do about this attrition?** **c. What are the implications of the attrition and the way it was handled with respect to the study's findings?**	Not all of the original 56 subjects completed the study. There were 52 subjects who completed the study. Two subjects did not complete the three DN sessions for unknown reasons. One subject decided to start formal treatment after the first DN session and one did not have complete follow-up data for unknown reasons. Also, it seems that the authors included their baseline statistics and excluded them in the final results. This can skew the results because these four dropouts could of have drastic improvement, increasing the validity of DN, or they could have experienced no change in symptoms, weakening the results of this study. The authors do make a note that their study population well exceeded power levels, which help maintain validity of the results.
72. Were all patients analyzed in the groups to which they were randomized (i.e. was there an intention to treat analysis)? **a. If not, what did the authors do with the data from these subjects?** **b. If the data were excluded, what are the potential consequences for this study's results?**	All subjects were analyzed in the treatment group. The authors conducted a conditional power analysis to see if there was a positive probability of a non-significant result using the full sample size. The conditional power was 1 meaning there was no positive probability of a non-significant result using the full sample size.
Are the valid results of this RCT important?	
Appraisal Criterion	***Reader's Comments***
73. What were the statistical findings of this study? **a. When appropriate use the calculation forms below to determine these values** **b. Include: tests of differences? With p-values and CI** **c. Include effect size with p-values and CI** **d. Include ARR/ABI and**	In total there were 41 responders and 11 non-responders. To become a responder, the active MTrP must become a latent MTrP, an asymptompmatic palpable nodule, or no nodule palpable. Non-responders still have an active MTrP. There was a statistically significant improvement in rotation asymmetry in both unilateral and bilateral groups, (P=0.001 and P=0.021, respectively).

RRR/RBI with p-values and CI **e. Include NNT and CI**	Flexion and extension ROM showed no improvement. Side-bending in the unilateral group significantly improved (P=0.001). PPT showed a statistically significant difference in both unilateral and bilateral groups, at the MTrP treated, (P=0.006 and P=0.012, respectively). BPI scores showed a statistically significant difference (P<0.001). There was a statistically significant reduction on the VAS for the unilateral group and the bilateral group on both sides (P<0.001). There was also a significant increase in the SF-36 mental health (P=0.002) and in the POMS tension and mood scores (P=0.012 and P=0.013).
74. What is the meaning of these statistical findings for your patient/client's case? What does this mean to your practice?	The meaning of these statistical findings is that dry needling, when used alone, can create a statistically significant change in pain, ROM, and psychosocial factors. A drop of greater than or equal to 2 on the VAS represents a clinically significant difference, which the authors report was achieved in the results.
75. Do these findings exceed a minimally important difference? **a. If not, will you still use this evidence?**	The findings exceed a minimally important difference in ROM, pain rating, and overall function. Unfortunately, minimally clinically important differences are not given in the article, but there are drastic changes in most outcome measures. Also, it is to be noted that a change in function and pain reduction of any kind are significant to patients in general.
Can you apply this valid, important evidence about an intervention in caring for your patient/client? What is the external validity?	
Appraisal Criterion	***Reader's Comments***
76. Does this intervention sound appropriate for use (available,	This intervention is appropriate for use in the clinical setting. Dry needling is

affordable) in your clinical setting?	becoming more widely used and available in the clinic. Once a therapist has received the proper certification and training, the supplies are relatively inexpensive and easy to administer.
77. Are the study subjects similar to your patient/ client? **a. If not, how different? Can you use this intervention in spite of the differences?**	The subjects in this study are similar to the patient in question. The patient in question is a graduate student and all the subjects were recruited from a college campus. There is no comment on activity level of the subjects however.
78. Do the potential benefits outweigh the potential risks using this intervention with your patient/client?	The benefits outweigh the potential risks when dry needling is used appropriately by a trained therapist. Dry needling has been proven to reduce pain and increase ROM in more than just this study. However, when dry needling is performed in the thoracic region the risk of puncturing the pleural cavity and creating a pneumothorax is a possibility but can be avoided with proper technique.
79. Does the intervention fit within your patient/client's stated values or expectations? **a. If not, what will you do now?**	This intervention does fit within the patient's stated values because it is validated to reduce pain and increase function. However, it must be noted that any patient must be screened for a phobia of needles, and this must be addressed before dry needling is performed.
80. Are there any threats to external validity in this study?	The threat to external validity in this study is the generalizability of the results to a population who is not sedentary. Since the college students recruited reported spending most of their time sitting, the development of their neck and shoulder pain and the subsequent results may not be generalizable to an active or older population.

What is the bottom line?
Dry needling is a valid intervention to reduce pain in the upper trapezius muscles in subjects with chronic myofascial pain. It is also related with a statistically and clinically significant change in MTrP status correlating to the reduction in pain. This change in status and reduction in pain is associated with improved mood, function, and level of disability.

#6

Gerber, L. H., Sikdar, S., Aredo, J. V., Armstrong, K., Rosenberger, W. F., Shao, H., & Shah, J. P. (2017). Beneficial effects of dry needling for treatment of chronic myofascial pain persist for 6 weeks after treatment completion. *PM & R: The Journal of Injury, Function, and Rehabilitation*, *9*(2), 105–112. https://doi.org/10.1016/j.pmrj.2016.06.006

Is the purpose and background information sufficient?	
Appraisal Criterion	***Reader's Comments***
Study Purpose Stated clearly? Usually stated briefly in abstract and in greater detail in introduction. May be phrased as a question or hypothesis. A clear statement helps you determine if topic is important, relevant and of interest to you. Consider how the study can be applied to PT and/or your own situation. What is the purpose of this study?	The purpose of this study to assess the long-term treatment outcomes for pain from myofascial pain syndrome (MPS) of dry needling in subjects who received 1 course of treatment without any other treatment.
Literature Relevant background presented? A review of the literature should provide background for the study by synthesizing relevant information such as previous research and gaps in current knowledge, along with the clinical importance of the topic. Describe the justification of the need for this study	The authors being by discussing the disagreement of healthcare professionals on the sources of MPS and how this lack of consensus needs treatment guidelines. The authors discuss how they have devised a standard evaluation for patient with MPS that will help to develop standard of practice guidelines. The authors discuss how they will locate and assess latent and active MTrPs in the hopes to directly tie these MTrPs to MPS with ultrasound and Doppler imaging. The authors discuss results to a study they recently conducted in hope that this study would be a piggyback to it. Their results claimed that 3 dry needling treatments over the course of 3-weeks significantly reduced pain and MTrP

	characteristics. This study will report on outcomes at a follow-up six weeks after the last treatment.

Does the research design have internal validity?	
Appraisal Criterion	***Reader's Comments***
➢ **Discuss possible threats to internal validity in the research design. Include:** ➢ **Assignment** ➢ **Attrition** ➢ **History** ➢ **Instrumentation** ➢ **Maturation** ➢ **Testing** ➢ **Compensatory Equalization of treatments** ➢ **Compensatory rivalry** ➢ **Statistical Regression**	The first threat to internal validity is that the treatment, dry needling, is not compared to another treatment. The study only compares effects from baseline. Also, not all subjects that were enrolled in the original study returned. This can skew results because there is a possibility that subjects returned because they had a positive initial experience, and those who saw adverse reactions did not return, which does not allow their results to be included. The authors used the same outcome measures from the original study, which maintains the reliability and validity of the results.

Are the results of this therapeutic trial valid?	
Appraisal Criterion	***Reader's Comments***
81. Did the investigators randomly assign subjects to treatment groups? **a. If no, describe what was done** **b. What are the potential consequences of this assignment process for the study's results?**	Since this study is a follow-up to a previous study, there was no assignment used. Assignment in the primary study was not discussed in this study. There was no comparison group used in the primary study, so it can be assumed that there was no assignment needed because there was no control group or comparison group.
82. Were the groups similar at the start of the trial? Did they report the demographics of the study groups? **a. If they were not similar – what differences existed?**	The demographics of the primary study group were included in this study with ages from 18-65, plus inclusion and exclusion criteria to the primary study. There were 45 subjects who returned for the follow-up study, but the original number who completed the dry needling treatment was

	not given to compare.
83. Did the subjects know to which treatment group they were assign? **a. If yes, what are the potential consequences of the subjects' knowledge for this study's results**	Subjects did know which treatment group they were assigned to due to the nature of the intervention. They had to consent to be dry needled and there was no comparison group reported in the primary study. For this study, there is no comparison between groups. Even though subjects reported no other intervention for their MTrPs, there are many confounding variables such as change in level of activity or maturation that could have occurred to skew the results.
84. Did the investigators know who was being assigned to which group prior to the allocation? **a. If they were not blind, what are the potential consequences of this knowledge for the study's results?**	The investigators did know who was being assigned to the group because there was only one treatment group. This can bias the results because there is not another group to compare results to. Even though the researchers were only providing one intervention with no comparison group, there can still be implicit bias toward the treatment.
85. Were the groups managed equally, apart from the actual experimental treatment? **a. If not, what are the potential consequences of this knowledge for the study's results?**	There was no comparison group in the primary study and the study under review is comparing the same group. So, it can be interpreted that the subjects were treated equally. The purpose of the primary study was to simply see the efficacy for DN in general, not compare it to another treatment.
86. Was the subject follow-up time sufficiently long to answer the question(s) posed by the research? **a. If not, what are the potential consequences of this knowledge for the study's results?**	The 6-week follow time is sufficiently long to answer the question of long-term effect of DN. Although, it would be beneficial to follow-up at 12 and 24 weeks to establish more permanency for dry needling.
87. Did all the subjects originally enrolled complete the study? **a. If not how many subjects**	This is not reported on in the study. All 45 subjects who participated in the follow-up study were assessed and their results

were lost? **b. What, if anything, did the authors do about this attrition?** **c. What are the implications of the attrition and the way it was handled with respect to the study's findings?**	analyzed. However, since the original number of subjects is not reported, it is hard to determine if all were included in the follow-up. This creates a problem for this study's validity because the subjects who returned could be the ones who had positive outcomes and would like to continue to participate. Subjects who did not have desirable outcomes, or whose symptoms returned, may not have wanted to return for the follow-up because they were discouraged.
88. Were all patients analyzed in the groups to which they were randomized (i.e. was there an intention to treat analysis)? **a. If not, what did the authors do with the data from these subjects?** **b. If the data were excluded, what are the potential consequences for this study's results?**	Since there were no groups in this study, all subjects were analyzed according to their original assignment. All 45 subjects who returned for the follow-up were included in the results. There was not an intention to treat analysis.
Are the valid results of this RCT important?	
Appraisal Criterion	***Reader's Comments***
89. What were the statistical findings of this study? **a. When appropriate use the calculation forms below to determine these values** **b. Include: tests of differences? With p-values and CI** **c. Include effect size with p-values and CI** **d. Include ARR/ABI and RRR/RBI with p-values and CI** **e. Include NNT and CI**	45 patients were analyzed in this study. 13 male and 32 female, with a mean age of 37 years old. Asymmetry of side bending for subjects with unilateral MTrPs and PPT remain significantly improved from baseline (P=0.002). Pain measures were significantly improved from baseline (P<0.003). The SF-36 physical functioning score showed significant improvement from baseline (P=0.012). The Oswestry Disability Index also remained significantly improved (P=0.002). Change in status of MTrPs from baseline was also measured and those who had a change from an active MTrP to a latent MTrP were called "responders". The number of subjects who were responders at 3 weeks, were also responders at 8 weeks (P<0.001). The results for the VAS indicated that those who were responders at the 3-week follow-

	up were also responders at the 8-week follow-up (P=0.006). Essentially, this means that if subjects reported a statistically significant decrease in pain at 3-weeks, they also reported a statistically significant decrease at 8-weeks. Change from baseline to 8-weeks in BPI was also statistically significant for responders and non-responders (P=0.026). Change in baseline for PPT was not statistically significant for both groups (P=0.17). The authors also found that the higher a baseline score for pain, the less likely a subject would become a responder. They also found that the higher the reduction in the VAS score from baseline the more likely a subject would be a responder.
90. What is the meaning of these statistical findings for your patient/client's case? What does this mean to your practice?	The meaning of these statistical findings is fairly simple. If someone responds well to the dry needling treatment, or has a lower VAS baseline score, they are more likely to have beneficial long-term effects from dry needling. This means that after the initial dry needling treatment, it will be important to reassess pain at the next visit because their response can dictate how successful it will be. If they have a large reduction in pain, they are more likely to respond well to another treatment and have the effects remain for a longer period of time.
91. Do these findings exceed a minimally important difference? **a. If not, will you still use this evidence?**	These findings do exceed a minimally important difference because of the statistical significance in pain reduction. Pain reduction is an important outcome because it will improve functionality and the patient's quality-of-life.
Can you apply this valid, important evidence about an intervention in caring for your patient/client? What is the	

external validity?	
Appraisal Criterion	***Reader's Comments***
92. Does this intervention sound appropriate for use (available, affordable) in your clinical setting?	Dry needling is an appropriate treatment in clinic with the proper training. It is becoming more widely accepted and, besides the cost of training, needles are affordable.
93. Are the study subjects similar to your patient/ client? **a. If not, how different? Can you use this intervention in spite of the differences?**	The wide age ranges of the subjects in this study make it hard to definitively say they are similar. However, it can be generalized that if someone has MTrPs in the upper trapezius, the treatment could be effective regardless of demographic.
94. Do the potential benefits outweigh the potential risks using this intervention with your patient/client?	When properly trained, the benefits do outweigh the risk. There is a chance of a pneumothorax when needling near the thorax. This means the patient must consent and the therapist must be properly trained and practiced to administer the treatment safely.
95. Does the intervention fit within your patient/client's stated values or expectations? **a. If not, what will you do now?**	This intervention fits within the patient's values and expectations because it is backed by evidence to reduce pain and increase function. As long as the patient is ok with needles, this treatment is viable.
96. Are there any threats to external validity in this study?	This is an interesting study because it is a follow-up to a previous study. Standing alone, this study is fairly weak because it does not describe in detail the original parameters and outcomes of its preceding study. However, when used in conjunction with the primary study, the validity of this study increases and is easier to understand.

What is the bottom line?

The bottom line to this study is dry needling can result in positive long-term outcomes in terms of pain and functionality. If a subject has a low pain rating on the VAS, they are more likely to have long-term effects than someone with a higher VAS score at baseline. If the subject experiences a large drop in their VAS score from dry needling, they are more likely to see long-term effects. The downside to the study is that their long-term outcomes are

measured in weeks, not months. It would be interesting to see if the benefit from dry needling remained 6 months after treatment.

#7

Liu, L., Huang, Q.-M., Liu, Q.-G., Ye, G., Bo, C.-Z., Chen, M.-J., & Li, P. (2015). Effectiveness of dry needling for myofascial trigger points associated with neck and shoulder pain: a systematic review and meta-analysis. *Archives of Physical Medicine and Rehabilitation*, *96*(5), 944–955. https://doi.org/10.1016/j.apmr.2014.12.015

Is the purpose and background information sufficient?	
Appraisal Criterion	***Reader's Comments***
Study Purpose Stated clearly? Usually stated briefly in abstract and in greater detail in introduction. May be phrased as a question or hypothesis. A clear statement helps you determine if topic is important, relevant and of interest to you. Consider how the study can be applied to PT and/or your own situation. What is the purpose of this study?	The purpose of the systematic review and meta-analysis was to determine the short, medium, and long term effectiveness of dry needling (DN) in relieving pain with patients with neck and shoulder myofascial trigger points (MTrPs) compared to sham dry needling, wet needling, physical therapy, Botox, and miniscalpel needling.
Literature Relevant background presented? A review of the literature should provide background for the study by synthesizing relevant information such as previous research and gaps in current knowledge, along with the clinical importance of the topic. Describe the justification of the need for this study	The authors begin by discussing MTrPs; their characteristics and prevalence in the general public. The authors further tie the presence of MTrPs and pain by discussing how many studies have shown they are linked and how in a recent survey, the majority of respondents reported MTrPs in the infraspinatus, upper trapezius, and teres major. Furthermore, the authors discuss current treatments for MTrPs including dry needling, wet needling (lidocaine injection), ischemic pressure, physical therapy, laser, and oral drugs. The efficacy of dry needling is discussed further with evidence from several SRs. The first claims that MTrPs can be relieved by insertion of needles of any kind (2001). The second SR found that DN can reduce pain immediately following treatment and 4 weeks post treatment. Another SR found no significant difference between DN and lidocaine injections, and

	another found that DN had no statistically significant difference than physical therapy. The authors claim that all of these SRs have some methodological error, which weakens their validity, thus the inspiration for their SR.

Does the research design have internal validity?	
Appraisal Criterion	***Reader's Comments***
➢ **Discuss possible threats to internal validity in the research design. Include:** ➢ **Assignment** ➢ **Attrition** ➢ **History** ➢ **Instrumentation** ➢ **Maturation** ➢ **Testing** ➢ **Compensatory Equalization of treatments** ➢ **Compensatory rivalry** ➢ **Statistical Regression**	Threats to internal validity in this study are limited. There is a detailed explanation of inclusion and exclusion criteria. There are also numerous and extensive tables provided to explain the findings of each individual article, which makes further investigation of each article succinct.. The methods used for analyzing each article were described and allow for reproducibility. Also, the detailed explanation of DN compared to sham and wet needling provide for valid results that can be used. However, the authors combined many interventions under "physical therapy" which detract from the quality and reliability of these results due to too much generalization.

Are the results of this therapeutic trial valid?	
Appraisal Criterion	***Reader's Comments***
97. Did the investigators randomly assign subjects to treatment groups? **a. If no, describe what was done** **b. What are the potential consequences of this assignment process for the study's results?**	There is no randomization needed for an SR. The authors describe the databases and key search terms utilized. The authors utilized PubMed, EBSCO, PEDro, ScienceDirect, The Cochrane Library, ClinicalKey, Wanfang Data Chinese database, Chinese Knowledge Resource Integrated Database, Chinese Chongqing VIP Information, and SpringerLink.

98. Were the groups similar at the start of the trial? Did they report the demographics of the study groups? **a. If they were not similar – what differences existed?**	The authors discuss their inclusion and exclusion criteria for their articles: articles had to be an RCT, including patients with MTrPs and shoulder/neck pain, used acupuncture or dry needling, and used pain as an outcome. Studies were excluded if MTrPs were not defined or found in patients, the patients had latent MTrPs, different types of dry needling were compared, RCTs were animals, and RCTs reported no results.
99. Did the subjects know to which treatment group they were assign? **a. If yes, what are the potential consequences of the subjects' knowledge for this study's results**	This is not an issue since the study is an SR. However, it is reported that two authors initially scanned the titles and abstracts for inclusion and exclusion criteria. Data was extracted for demographics, outcome measures, symptoms, diagnosis, interventions, time, and PEDro scores. Further data was extracted for length of follow-up. Any discrepancies were settled by a third reviewer.
100. Did the investigators know who was being assigned to which group prior to the allocation? **a. If they were not blind, what are the potential consequences of this knowledge for the study's results?**	The investigators began a quality assessment of the articles chosen. Two reviewers independently assessed the validity of studies including using the PEDro scale. Studies with a score of greater than or equal to 6/10 were considered high quality and less than or equal to 5/10 were considered low quality.
101. Were the groups managed equally, apart from the actual experimental treatment? **a. If not, what are the potential consequences of this knowledge for the study's results?**	All articles were managed equally and appraised according to the same criterion. Nine separate meta-analyses were performed according to the pain on VAS/NRS as outcome measures. The meta-analyses are as follows: DN compared with control/sham in the short, medium, and long term; DN compared with wet needling in the short, medium, and long-term; and DN compared with other treatments in the short, medium, and long-term. Heterogeneity was explored between the studies using Strata 12.0. The authors used random-effects univariate meta-regression

	models to examine clinical and methodological variables that affected the association between DN and changes in pain intensity.
102. Was the subject follow-up time sufficiently long to answer the question(s) posed by the research? **a. If not, what are the potential consequences of this knowledge for the study's results?**	The authors made sure to include short, medium, and long- term follow-ups when searching for RCTs, which increases the strength and validity of their SR.
103. Did all the subjects originally enrolled complete the study? **a. If not how many subjects were lost?** **b. What, if anything, did the authors do about this attrition?** **c. What are the implications of the attrition and the way it was handled with respect to the study's findings?**	Twenty total RCTs were included in the study out of 1778 total articles found in the initial searches.
104. Were all patients analyzed in the groups to which they were randomized (i.e. was there an intention to treat analysis)? **a. If not, what did the authors do with the data from these subjects?** **b. If the data were excluded, what are the potential consequences for this study's results?**	All RCTs were held to the same standard and assessed by two independent researchers. Any discrepancies were settled by a third researcher. 19/20 RCTs were considered of a high level of evidence (greater than or equal to 6/10 on PEDro) and only one was found to have a low level of evidence. The authors report that most studies did not score points for concealed random allocation and blinding of therapists.
Are the valid results of this RCT important?	
Appraisal Criterion	***Reader's Comments***
105. What were the statistical findings of this study? **a. When appropriate use the calculation forms below to determine these values** **b. Include: tests of differences? With p-values**	In terms of the effect of DN versus control/sham DN, the authors found 14 RCTs that investigated this. The meta-analysis revealed statistically significant effects of DN compared with control/sham DN in the short-term (SMD=-1.91, 95% CI, -3.10 to -0.73, P=0.002). A statistically

and CI **c. Include effect size with p-values and CI** **d. Include ARR/ABI and RRR/RBI with p-values and CI** **e. Include NNT and CI**	significant result was also discovered for the medium term (SMD=-1.07, 95% CI, -1.87 to -0.27, P=0.009). The meta-analysis revealed no statistically significant effects of dry needling compared to sham in the long-term (SMD=-1.15, 95% CI, -3.34 to 1.04, P=0.30). In terms of the effects of dry needling versus wet needling 7 RCTs were analyzed. After the meta-analysis it was found that only the medium term revealed statistically significant results in the favor of wet needling (SMD=1.69, 95% CI, 0.40 to 2.98, P=0.01). Statistically significant results were not found in the short term (SMD=-0.01, 95% CI, -0.41 to 0.40, P=0.98) and the long term (SMD=0.33, 95% CI, -0.11 to 0.78, P=0.14). In terms of effects of DN vs other treatments 10 RCTs were analyzed. There were no statistically significant difference in the short term (SMD=0.33, 95% CI, -0.12 to 0.78, P=0.15) and the long term (SMD=0.58, 95% CI, -0.18 to 1.34, P=0.13). However in the medium term, statistically significant effects were observed for other treatments (SMD=0.62, 95% CI, 0.02 to 1.21, P=0.04).
106. What is the meaning of these statistical findings for your patient/client's case? What does this mean to your practice?	The authors included a note about publication bias. They reported that three funnel plots were created and two of them demonstrated symmetry. The authors noted that one funnel plot demonstrated asymmetry. This particular funnel plot indicated a potential for publication bias for the study involving DN versus wet needling in the medium term. This should be considered when using the results in favor of wet needling in the medium term. The overall meaning of these statistical findings is the DN can be considered

	superior to sham needling, however, DN is not superior or inferior to wet needling or physical therapy intervention. It must be noted that physical therapy intervention is a broad category and results were not reported on the individual interventions described in the beginning of the article.
107. Do these findings exceed a minimally important difference? **a. If not, will you still use this evidence?**	These findings do support a minimally important difference. DN versus sham and DN versus wet needling both exceeded the MCID. However, it should be noted that DN versus physical therapy did not exceed the MCID.
Can you apply this valid, important evidence about an intervention in caring for your patient/client? What is the external validity?	
Appraisal Criterion	***Reader's Comments***
108. Does this intervention sound appropriate for use (available, affordable) in your clinical setting?	DN is an intervention that is appropriate for use in the clinical setting. It is becoming more widely used, and with the proper training, it is available and affordable. The process of becoming trained is the most expensive component of the modality.
109. Are the study subjects similar to your patient/ client? **a. If not, how different? Can you use this intervention in spite of the differences?**	Since this study is an SR, it is hard to say explicitly that the subjects are directly similar. However because numerous studies are included in a SR, it is possible that the patient's demographics are somewhere included. Also, the magnitude of the results generated make it easier to generalize from a SR than a RCT.
110. Do the potential benefits outweigh the potential risks using this intervention with your patient/client?	The potential benefits do outweigh the potential risks if the therapist is properly trained and the patient is comfortable with an invasive procedure. There is always a risk of a pneumothorax when dry needling around the thoracic cavity, so the proper steps must be taken to ensure safety.
111. Does the intervention fit	This intervention does fit within the

within your patient/client's stated values or expectations? **a. If not, what will you do now?**	patient's stated values and expectations, as long as the patient is comfortable with needles.
112. Are there any threats to external validity in this study?	The only possible threat to external validity is the generalization of "physical therapy". There are numerous treatments within that umbrella term, so results for this should be hesitantly accepted.

What is the bottom line?
The bottom line is that DN is a valid and reliable intervention for treating MTrPs related to pain in the neck and shoulder area, however it is not proven to be the superior treatment. According to this systematic review, DN is superior to sham needling in the short and medium term. Although, it was found that wet needling produces better results in the medium term as compared to DN. It should be noted that there is no statistical difference in the short and long-term outcomes when comparing dry needling and wet needling. In conclusion, there is no conclusive evidence that DN should be used instead of other treatments. It should be noted that it could be extrapolated that the combination of interventions could result in the best outcome for pain reduction and DN should not be used in isolation**.**

#8

Llamas-Ramos, R., Pecos-Martín, D., Gallego-Izquierdo, T., Llamas-Ramos, I., Plaza-Manzano, G., Ortega-Santiago, R., … Fernández-de-las-Peñas, C. (2014). Comparison of the short-term outcomes between trigger point dry needling and trigger point manual therapy for the management of chronic mechanical neck pain: a randomized clinical trial. *Journal of Orthopaedic & Sports Physical Therapy*, *44*(11), 852–861. https://doi.org/10.2519/jospt.2014.5229

Is the purpose and background information sufficient?	
Appraisal Criterion	***Reader's Comments***
Study Purpose Stated clearly? Usually stated briefly in abstract and in greater detail in introduction. May be phrased as a question or hypothesis. A clear statement helps you determine if topic is important, relevant and of interest to you. Consider how the study can be	The purpose of the study is to compare short term effects of trigger point dry needling (TrP DN) to trigger point manual therapy (TrP MT) on pain disability and cervical ROM on individuals with chronic neck pain with active TrPs in the upper trapezius muscle.

applied to PT and/or your own situation. What is the purpose of this study?	
Literature Relevant background presented? A review of the literature should provide background for the study by synthesizing relevant information such as previous research and gaps in current knowledge, along with the clinical importance of the topic. Describe the justification of the need for this study	The authors begin by establishing the prevalence of neck pain and describe that up to 80% of patients who report pain also report the same symptoms at a 5-year follow-up if no interventions were utilized. Background is further offered to discuss current clinical guidelines for cervical neck pain including manual therapy, which includes mobilization, manipulation, and training of the deep neck flexors. Evidence is provided to elaborate on the efficacy of soft tissue interventions on cervical pain as well. The authors tie together the use of soft tissue therapies and active TrPs to the reduction of neck pain and discuss how some evidence points to dramatic reductions in pain intensity after DN treatment of TrPs. However, the authors criticize this evidence as having imprecision of results due to small sample sizes and large confidence intervals. At the time of publication, valid evidence has not been produced to compare DN to MT in treating TrPs. Thus, the purpose for this study arises.

Does the research design have internal validity?	
Appraisal Criterion	***Reader's Comments***
➢ **Discuss possible threats to internal validity in the research design. Include:** ➢ **Assignment** ➢ **Attrition** ➢ **History** ➢ **Instrumentation** ➢ **Maturation** ➢ **Testing** ➢ **Compensatory Equalization of treatments** ➢ **Compensatory rivalry** ➢ **Statistical Regression**	There are little threats to internal validity, especially since the study received a 1b level of evidence. However, there was attrition of three subjects and an intention to treat analysis was not performed. The short follow-up period made it unlikely that patient's got better simply due to time. Also, the investigators were blinded to the allocation and subjects were blinded to the purpose of the study, helping avoid any compensatory equalization of treatments or rivalry. All instrumentation was done consistently and all measurements were

	taken by the same therapist from baseline through all follow-ups maintaining good validity.

Are the results of this therapeutic trial valid?	
Appraisal Criterion	***Reader's Comments***
113. Did the investigators randomly assign subjects to treatment groups? **a. If no, describe what was done** **b. What are the potential consequences of this assignment process for the study's results?**	The investigators did randomly assign subjects to their treatment groups. Concealed allocation was performed using a computer generated randomization prior to data collection by a researcher not involved in the recruitment or treatment of patients.
114. Were the groups similar at the start of the trial? Did they report the demographics of the study groups? **a. If they were not similar – what differences existed?**	Subjects were similar in the fact that they were referred to PT by their primary care physician, had active trigger points in the upper trapezius, and had referred pain upon deep palpation to the active TrP. No other demographics are given, which can decrease the generalizability of the study. However, extensive exclusion criteria were included helping to increase the reproducibility of the study.
115. Did the subjects know to which treatment group they were assign? **a. If yes, what are the potential consequences of the subjects' knowledge for this study's results**	By the nature of the intervention, the subjects knew which treatment group they were assigned to. However, it is stated that patients were unaware of the comparison between groups, which maintained patient blindness and did not affect internal validity.
116. Did the investigators know who was being assigned to which group prior to the allocation? **a. If they were not blind, what are the potential**	The investigators did not know who was being assigned to groups prior to allocation. Assignment was produced by an independent researcher.

consequences of this knowledge for the study's results?	
117. Were the groups managed equally, apart from the actual experimental treatment? **a. If not, what are the potential consequences of this knowledge for the study's results?**	The groups were managed equally. Each patient received 2 treatments, each one week apart. Data was collected at every visit. Patients were required to come into the clinic 1 and 2 weeks later following the last treatment for data collection.
118. Was the subject follow-up time sufficiently long to answer the question(s) posed by the research? **a. If not, what are the potential consequences of this knowledge for the study's results?**	The purpose of the study is to discover short-term effects, thus a two week follow-up is sufficiently long. However for clinical purposes, it would be beneficial to have a longer follow-up. This is because permanency of results is important in a real clinical setting, and 2 weeks does not establish permanency.
119. Did all the subjects originally enrolled complete the study? **a. If not how many subjects were lost?** **b. What, if anything, did the authors do about this attrition?** **c. What are the implications of the attrition and the way it was handled with respect to the study's findings?**	Not all subjects completed the study. Two subjects out of 47 were lost in the DN group. This attrition happened between 1 and 2 week follow-up. One subject was lost at the same time in the MT group. The authors report nothing about these dropouts in their results. This could affect their results by skewing them to appear to have a more drastic change than should have appeared. Also, the drop-outs could have had no change in symptoms from their treatment, ultimately skewing results further. There is no report of an intention to treat analysis.
120. Were all patients analyzed in the groups to which they were randomized (i.e. was there an intention to treat analysis)? **a. If not, what did the authors do with the data from these subjects?** **b. If the data were excluded, what are the potential consequences for this study's results?**	All subjects were analyzed in the groups to which they were originally assigned, except the three dropouts. There is no report of an intention to treat analysis. This could skew the results slightly. However, the investigators have a large n in each group, minimizing the impact of the results not included.
Are the valid results of this RCT important?	

Appraisal Criterion	*Reader's Comments*
121. What were the statistical findings of this study? **a. When appropriate use the calculation forms below to determine these values** **b. Include: tests of differences? With p-values and CI** **c. Include effect size with p-values and CI** **d. Include ARR/ABI and RRR/RBI with p-values and CI** **e. Include NNT and CI**	A mixed model ANOVA found no statistically significant time-by-group interaction for neck pain (F=0.425, P=0.516) or disability (F=0.681, P=0.411) at baseline. There is a main effect for time at the one and two week follow-ups with a decrease in neck pain (F=129.73, P<0.001) and disability (F=67.175, P<0.001) for both groups. A 4-by-2 mixed-model ANOVA revealed a statistically significant difference between groups at both follow-ups for PPT. The DN group experienced a greater increase in the PPT (F=76.486, P<0.001). All ROM measurements showed no statistically significant difference between groups, however both groups experienced statistically significant differences in all ROM measurements from baseline (P<0.001). All CIs were at 95%.
122. What is the meaning of these statistical findings for your patient/client's case? What does this mean to your practice?	The meaning of these findings is fairly simple to interpret. Both groups experienced statistically significant changes in AROM, pain, disability, and PPT. Only the DN group experienced a statistically significant difference compared to the MT group for PPT, resulting in a higher PPT threshold. Ultimately, this means that both options are viable option for treating neck pain, disability, and reduced AROM successfully. This is good because it illustrates that both techniques are valid and it can be extrapolated that when used in conjunction they will achieve even better results than alone.
123. Do these findings exceed a minimally important difference? **a. If not, will you still use this evidence?**	There is no minimally important difference reported in the study. However as a clinician, these results are valid enough that I would consider the findings an important difference. All P-values were <0.001, which

	is very strong evidence for large amounts of change.
Can you apply this valid, important evidence about an intervention in caring for your patient/client? What is the external validity?	
Appraisal Criterion	***Reader's Comments***
124. Does this intervention sound appropriate for use (available, affordable) in your clinical setting?	Both interventions are appropriate for the clinical setting. MT is obviously cheaper and does not require invasive techniques, which makes it ideal for most therapists and patients. However, DN did show a greater increase in PPT, and with proper training DN can be utilized fairly easily because needles are relatively inexpensive and many clinics are adopting this modality.
125. Are the study subjects similar to your patient/ client? **a. If not, how different? Can you use this intervention in spite of the differences?**	It is hard to generalize the subjects in the study to the patient. This is because little data is given on the demographics of the patients. One commonality is that the subjects of the study all had to have chronic neck pain, which corresponds with the patient's condition. Also, there is no statement as to the activity level of the patient's in the study.
126. Do the potential benefits outweigh the potential risks using this intervention with your patient/client?	If a therapist is properly trained in the DN the upper trapezius, the benefits certainly outweigh the potential risks. Of course, an invasive procedure with a needle near the lungs is dangerous and must be done with care to avoid a pneumothorax, however proper training will help avoid any unwanted consequences.
127. Does the intervention fit within your patient/client's stated values or expectations? **a. If not, what will you do now?**	DN and MT would fit within the patient's stated values. As long as the patient is comfortable with needles, both procedures are appropriate because of the consistency and intensity of results observed.
128. Are there any threats to external validity in this study?	The only threat to external validity is that only two therapists performed the

	treatments. This may limit the generalizability of study because the treating therapists may have certain techniques or nuances that were not reported on in the study . Also, they did not include a control, instead they only compared two treatment groups.

What is the bottom line?
Bottom line from this study is that both techniques, manual trigger point therapy and dry needling trigger point therapy, are valid and reliable techniques for treating chronic neck pain, disability, restricted cervical ROM, and achieving positive results in a short follow-up period. It would be interesting to see if a third group, of combined techniques, had even greater results than each technique in isolation.

What pedro score would you give this trial?
9/11