

Strain Counterstrain vs. Therapeutic Exercise for Low Back Pain

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Introduction

A 58-year-old female patient presented as an outpatient with a diagnosis of an exacerbation of chronic low back pain, which she had since 18 years of age following a rollover automobile accident. Since onset, she had experienced numerous exacerbations and remissions requiring her to explore a variety of options for treatment, including physical therapy, therapeutic exercise, chiropractic, massage, chronic pain clinics, several non-steroidal anti-inflammatory drugs (NSAIDs) and narcotics. She stated that although she was skeptical, her physician referred her to physical therapy for soft tissue mobilization using the technique of Strain-Counterstrain (Jones, Kusunose, Goering, 1995). She had purchased a gym membership for the family that she was unable to use for herself due to pain. As a homemaker, her primary goal was to be able to tolerate housework and recreational exercise with her family. She stated that her pain severely limited her activities and quality of life. She was able to tolerate no more than one half hour of continuous housework, including vacuuming, folding clothes, mopping, or preparing meals.

The visual analog scale (VAS), described by Boonstra, Schiphorst, Reneman, Posthumus, and Stewart (2008), rates pain using a 10cm rating scale from 0cm to 10cm, with 0cm being interpreted as no pain and 10cm being interpreted as the worst pain possible. This scale was used in assessing this patient. Over two weeks of exacerbation, her pain had been between 4cm and 8cm out of 10cm on a VAS.

The patient was on a maximum dose of the following analgesic medications: Vicodin (two tablets of 5mg/500mg every four hours or as needed) and Advil (800mg every four hours or as needed), as prescribed by her physician. She took no additional medications. She had concerns

that her medications were no longer sufficiently reducing her pain. Her pain was increasingly interfering with her overall function and quality of life. Physical therapy treatment at the time needed to accommodate for the possibility that she may have acquired a tolerance for or dependence on her vicodin, making weaning difficult (Miller & Greenfield, 2004). Due to her high ibuprofen intake, she may have also been at risk for potential gastrointestinal disturbances, myocardial infarction, or a cerebrovascular accident (Risser, Donovan, Heintzman, & Page, 2009). Recent radiographs and an MRI of her lumbar spine showed only subacute degenerative changes, none of which were clearly diagnostic for her symptoms. She had no history of low back pain in her immediate siblings or parents. Objectively, her primary limitation was in standing lumbar extension, which was limited by 90% and fully reproduced her pain in her low back. No radiculopathy was given in her history and none could be found with lumbar spinal motion testing in standing. Upon palpation, her bilateral iliopsoas muscles and quadratus lumborum muscles were found to be tender to light palpation.

After a comprehensive physical therapy evaluation, a diagnosis of low back pain primarily of musculogenic origin was determined. This is consistent with the physical therapy practice pattern 4F, defined by the American Physical Therapy Association's Guide to Physical Therapist Practice as follows, "Impaired Joint Mobility, Motor Function, Muscle Performance, Range of Motion, and Reflex Integrity Associated With Spinal Disorders" (p. 215).

Given this patient's presentation, the following clinical question was formed. For a 58-year-old patient with chronic low back pain, would Strain-Counterstrain be more effective than therapeutic exercise in reducing pain as measured by the visual analog scale?

Data Collection

Five databases were used to search for relevant articles; Cochrane Review, PubMed, PEDro, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Google Science. All searches were done June 23, 2011. From these, the most relevant eight articles were selected based upon their titles or a cursory review of their abstracts and how relevant they were to the clinical question (See Figure 1). Four final articles were chosen based on how closely they related to the parameters set forth in the clinical question as follows; (a) utilized a population with low back pain (LBP) or, better, chronic LBP, (b) measured pain with a visual analogue scale (VAS), (c) used Strain Counterstrain (SCS) and therapeutic exercise (TE) in the treatment, and (d) used high-quality research according to the Centre for Evidence-Based Medicine (CEBM, 2011) rating scale. (See Table1)

A simple search of the Cochrane Library was conducted initially using the keywords Strain Counterstrain, which yielded six articles. One article appeared to be a duplicate, therefore yielding a net gain of five articles. No Cochrane Review articles were found; all were clinical trials. The search was broadened using only the keyword Counterstrain, which yielded the same articles found above plus two more clinical trials. Again, one article appeared to be a duplicate, therefore yielding a net gain of six articles, from which one article was selected.

A simple search of The PubMed database was conducted using the keywords Strain Counterstrain, which yielded 13 articles. The search was broadened using the keyword Counterstrain, which yielded 24 articles from which four articles were selected.

The PEDro database was selected because of its emphasis on physical therapy-related research. A simple search of the PEDro database was done using the keyword Counterstrain. Of the eight articles found, none were unique to this search and yielded no net results.

The CINAHL database was used because it offers a great number of full articles. A simple search of the CINAHL database was conducted using the keyword Counterstrain. This yielded 28 articles from which two articles were selected.

The Google Science database was used because it utilizes a capable search engine that allows the user to perform a general search of internet-accessible research articles. A search of the Google Science database was used with the search terms Strain Counterstrain Research. This yielded 18,200 articles in order of most to least relevant. Based upon relevance to the clinical question, a search of the first few pages yielded one article.

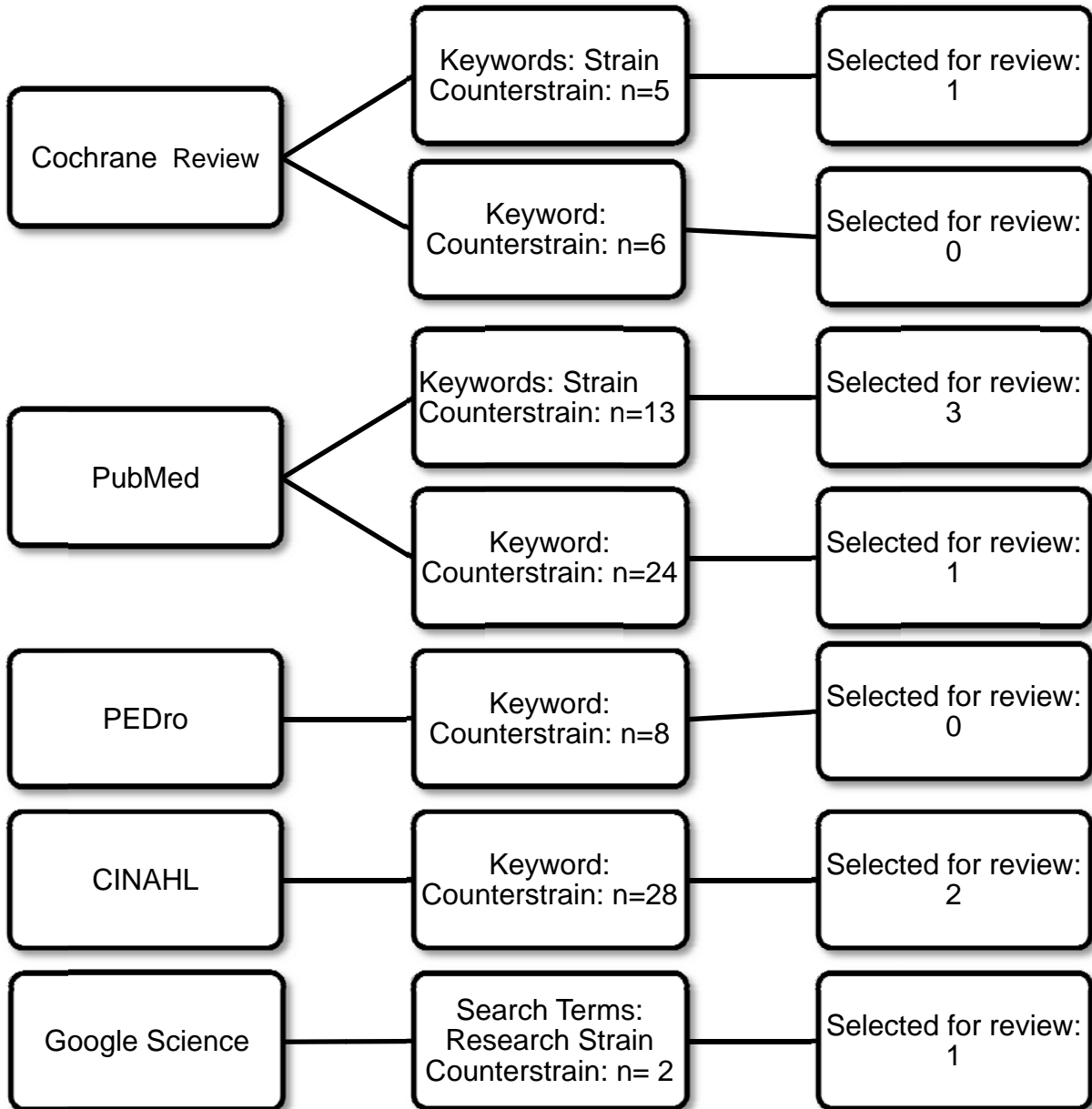


Figure 1

Summary of Data Collection. This figure illustrates the article selection process with keywords used or search terms.

Table 1

Summary of Article Selection

Author	Study design; Variables	Disposition	Rationale for disposition
Wong & Schauer	Randomized controlled trial; compares SCS vs. TE in reducing hip pain	Accepted	Answered the question; compared SCS & TE using a VAS
Lewis, & Flynn	Retrospective case series; addressed reduction in LBP following SCS	Accepted	Directly answered the question; compared LBP and SCS and some TE, but moderate level of evidence
Lewis, Souvlis, & Sterling	Randomized controlled trial; compared SCS vs. TE in reducing LBP	Accepted	Directly answered the question; compared SCS & TE for LBP using the VAS
Dardzinski, Ostrov, & Hamann	Retrospective cohort study; compared chronic LBP unresponsive to other treatment and SCS	Accepted	Directly answered question; compared chronic LBP with SCS in pain reduction
Lewis, C., Khan, Souvlis, & Sterling	Randomized controlled trial; compared SCS in reducing LBP	Rejected	Did not answer the question; Focus was on tenderpoint sensitivity not LBP
Cislo, Ramirez, & Schwartz	Descriptive article about the discovery of new sacral tenderpoints to treat sacral or LBP	Rejected	Did not answer the question; lowest level of evidence, no measurements taken
Meseguer, Fernández-de-las-Peñas, Navarro-Poza, Rodríguez-Blanco, & Gandía	Randomized controlled trial; compared SCS in reducing pain measured with the VAS in the upper trapezius muscle	Rejected	Did not answer the question; addressed mainly the effects SCS using the VAS in reducing tenderpoint sensitivity, not LBP,
Posadzki, & Ernst	Systematic review; compared general osteopathic techniques including SCS	Rejected	Did not answer the question; very general article

Results

Four articles were selected based upon how closely they answered the clinical question.

The results are as follows.

Wong, C.K., & Schauer, C. (2004). Reliability, validity and effectiveness of strain counterstrain techniques [PDF]. *Journal of Manual & Manipulative Therapy*, 12, 107-112.

This article was selected because although it assessed hip pain and not LBP, it compared the results of SCS vs. TE in reducing pain measured with a VAS. The authors sought to answer two main questions. They sought to assess whether SCS or TE was best to reduce pain at specific tender points manually palpated at the hips. They also sought to compare the reliability and validity of measuring tenderness using a pain scale (PS) from zero to three, which is traditionally used in the practice of SCS, as compared to the VAS. Forty-nine volunteers were randomly assigned to one of three treatment groups as follows; SCS alone, SCS and TE, and TE alone. The participants were assessed pre-treatment to serve as a control. Treatment was performed at the hips two times per week over two weeks, and pain was assessed both before and after the intervention. The post-intervention results showed that the PS measurements did not show concurrent validity and reliability to the VAS. However, all groups showed a significant ($p < 0.05$) reduction in point tenderness whether measured by the PS or the VAS. In addition, the groups that utilized SCS showed nearly twice the pain relief compared to the TE group after treatment as measured by the VAS. Although this study focused on the pain response at specific tender points and not strictly LBP, this study showed that using a VAS to measure pain showed that SCS may be superior to TE in reducing hip muscle tenderness, and it validated the use of the VAS in that process.

The level of evidence of this study is high (1b according to CEBM, 2011). Although the control group and the study group used the same participants and this may have introduced bias, this study did establish the reliability and validity of using the VAS to assess muscle tenderness using the SCS technique. In terms of answering the clinical question, this study demonstrated that SCS treatment may be superior to TE in treating muscle pain as measured with the VAS. However, it did not provide direct evidence of reduction of LBP.

Lewis, C., & Flynn, T.W. (2001). The use of strain-counterstrain in the treatment of patients with low back pain [PDF]. *Journal of manual and manipulative therapy*, 2, 92-98.

This article was selected because it presents an overview of research describing the use of SCS in patients with LBP. The authors sought to answer the question of whether SCS can reduce pain in patients with both chronic and acute LBP. This is a retrospective case series study that reviewed four case reports. Each case included treatment using only SCS for two or three sessions over a one-week period. Pain was initially assessed using a VAS, but only prior to treatment. Rather than using the VAS further, pain was assessed before and after treatment using two other scales: the McGill Pain Questionnaire and the Oswestry Low Back Pain Disability Questionnaire.

Lewis and Flynn (2001), found that each patient in all four case reports indicated a reduction in LBP after treatment. Although the research did not generate information on statistical significance, due to the limited number of participants, the results were stated as follows, “All patients reported a dramatic reduction in pain: Three reported a complete relief and the fourth a 74% reduction...” (p. 97).

Notwithstanding the dramatic improvements in outcomes, the quality of this evidence is low (level of evidence, 4 according to CEBM, 2011). Regardless, it provided information on the effectiveness of SCS in treating LBP.

Lewis, C., Souvlis, T., & Sterling, M. (2011). Strain-Counterstrain therapy combined with exercise is not more effective than exercise alone on pain and disability in people with acute low back pain: a randomised trial [PDF]. *Journal of physiotherapy*, 57, 91-98.

This article was selected because it is a randomized controlled trial (RCT) comparing SCS with TE in a population with LBP. The authors sought to answer the question of which is more effective in pain reduction, SCS plus TE or TE alone. A total of 89 participants with acute LBP for less than three months were randomly assigned to either the SCS and TE group or the TE only group. The treatment in the SCS and TE group consisted of SCS treatment and verbal reinforcement in TE whereas the control group received supervised TE only. Treatment consisted of four treatment sessions over a two-week period. Numerous assessments of pain and function were applied. Among the methods used to rate pain was the VAS, which was assessed before intervention and at two, six and 28 weeks after intervention.

The results showed that pain rated on the VAS demonstrated no difference between groups over time and neither did any of the other measured outcomes at two, six or 28 weeks, except one. The only significant difference between groups was shown at two weeks; the participants in the SCS group showed a significant perception of general improvement compared to the control group. Therefore, the long-term effect of SCS and TE vs. TE alone was shown to be equivocal in treating acute LBP.

Although the level of evidence of this study is high (1b according to CEBM, 2011), no attempt was made to compare SCS alone with TE alone. Therefore, it is possible that TE being performed in both the experimental and control groups may have skewed the results. This may be especially true since the TE performed in the experimental group and the control group differed.

That this article showed no long-term differences between groups may reflect issues of construct validity. One reason for this, as suggested by the authors, may be due to the possibility of spontaneous recovery in patients with acute LBP. For example, Pengel, Herbert, Maher, and Refshauge (2003), found that pain spontaneously reduces by an average of 58% after one month of recovery from acute LBP. This may partially account for the homogeneity of results. In addition, no true control group was included, and this might have partially introduced bias. Therefore, the information from this research may not directly compare with the patient with chronic LBP considered in the clinical question, because the participants tested had acute LBP. Regardless, this research article demonstrated that the long-term effects of either SCS or TE may be equivocal in treating patients with LBP.

Dardzinski, J.A., Ostrov, B.E., & Hamann, L.S. (2000). Myofascial pain unresponsive to standard treatment: successful use of a strain and counterstrain technique with physical therapy [PDF]. *Journal of clinical rheumatology*, 4, 169-174.

This article was selected because it addressed the use of SCS on a population of patients with chronic LBP unresponsive to conventional treatment. The authors sought to answer the question whether patients with chronic pain can reduce their pain with application of the SCS technique. This is a retrospective cohort study that examined the effects of SCS on 20 patients with chronic pain lasting an average of 2.7 years who did not respond to prior treatment that

included pharmacology, standard physical therapy, biofeedback, acupuncture and TE. Treatment consisted of between two and 10 total SCS treatment sessions over an average of 4.4 weeks.

Although a VAS was not used, pain was rated before and after intervention and compared based on a percentage of improvement. The results after treatment showed a complete resolution of pain in 10 patients, 9 showed a reduction in pain between 50% and 75% and one participant showed no change. At the six month follow up, results showed that four patients remained pain-free, 11 maintained a reduction in pain between 50% and 75%, three maintained improvement between 25% and 50%, while two had no overall improvement.

Being a retrospective cohort study, the level of evidence is fair (1c according to CEBM, 2011). Although the study used a small sample size and pain was not rated by a formally validated pain scale, it provided evidence that SCS treatment in a population of patients with chronic LBP with failed previous conventional treatment can show dramatic results with a lasting effect. Therefore, it provides useful information to answer the clinical question, because no other research article found addressed LBP that was unresponsive to conventional treatment.

Discussion

The technique of strain counterstrain is an osteopathic technique first published in 1964 (Jones, 1964). The technique is based on the palpation of tenderpoints used to both diagnose and treat musculoskeletal pain throughout the human body. Although not completely understood, strain has been described as being caused by a precipitating musculoskeletal injury, which leads to somatic pain and the formation of tenderpoints through a persistent neuromuscular reflex loop primarily involving hypersensitivity of the spindle fibers (Jones, Kusunose, and Goering, 1995; Basmajian, J.V., & Nyberg, R., 1993). Tenderpoints have been described as being areas of the

body usually many times more painsensitive than normal, sometimes causing the patient to jump in response to digital palpation(Carriere&Feldt, 2006; Lewis, C., Souvlis, T., & Sterling, M., 2010). Counterstrain is the treatment ofstrain by passively approximating the origin and insertion of the strained muscle andmaintained for 90 seconds (Jones, Kusunose, Goering, 1995). This positioning has been shown to reduce tenderpointsensitivityand somatic pain (Howell, Cabell, Chila, & Eland, 2006; Meseguer, A.A., Fernández-de-las-Peñas, C., Navarro-Poza, J.L., Rodríguez-Blanco, C., &Gandia, J.J.B., 2006).

Osteopathic techniques, including SCS, have been addressed in peer-reviewed literature (Posadzki& Ernst, 2011), showing success, but few research articles directly address the technique of SCS and even fewer address the technique of SCS in treating patients with LBP. As a result, finding relevant research articles can be a challenge. After researching the five databases above, it became evident that many repeat articles were found, reflecting a general dearth of evidence to compare the treatment effect of the technique of SCS. Although it is generally accepted that Google Science lacks the controls and inclusion criteria of the traditional databases, searching the other databases yielded few results, necessitating the decision to use Google Science.

Of the four selected articles discussed above, one showed success in treating hip pain with high-quality evidence, one showed equivocal results in treating LBP with high-quality evidence, and two showed dramatic success in treating LBP with lesser-quality evidence. This may be interpreted as three positive results and one neutral. However, the two lesser quality articles (Lewis & Flynn, 2001; Dardzinski, Ostrov, &Hamann, 2000) are greater than nine years old with few participants. In addition, the statistical analyses utilized were less than optimal, as they both relied on statistics no higher than percent improvement. One of the higher quality

articles (Lewis, Souvlis & Sterling, 2011) showed little to no difference between SCS and TE although higher statistical analyses were offered. Finally, the remaining higher quality article (Wong & Schauer, 2004) demonstrated that both SCS and TE significantly ($p < 0.05$) reduced point tenderness, but SCS was two times more effective than TE in reducing point tenderness. However, as stated previously, this study addressed hip pain and not LBP. Furthermore, this article did not establish whether a reduction in point tenderness equates to a reduction in the baseline LBP perceived by the patient.

Overall, the greatest improvement was shown by the lesser quality research and the least improvement was shown by the best quality research. Any conclusions drawn from such research may be risky, as the evidence is limited. Regardless, the weight of the evidence given in the research cited above indicates a potential for success with the use of SCS to treat LBP equal to or greater than that of TE.

Contrary to SCS, the evidence for the use of TE is abundant. For example, a simple search of the PubMed database, which accesses over 20 million articles, using the keywords Therapeutic Exercise and Low Back Pain yielded 1295 articles. A similar search using the keywords Counterstrain and Low Back Pain yielded three results.

Research comparing patients with LBP treated with TE are generally positive in their outcomes. For example, Filiz, Sibel, Hale, Kazim, and Yesim (2009), in a randomized controlled trial, showed that progressive resistive exercise can significantly ($p < 0.05$) reduce chronic low back pain in a population of outpatient physical therapy patients. In addition, a systematic review comparing 13 randomized controlled trials of TE in patients with chronic low back pain showed positive outcomes in between 50% and 80% of patients (Slade, Ther,

&Keating, 2006). Therefore, the decision was made to compare SCS to, what might be considered a typically successful mainstream treatment, TE.

The patient's clinical response to treatment is an important source of evidence-based practice (Cormack, 2002). Based on the findings from the literature review, the decision was made to treat the patient first with SCS treatment and then to incorporate TE as able. The patient was treated two times per week for four weeks initially entirely with SCS and instructed on self-treatment with regard to specific tenderpoints related to the lumbar spine, as recommended by Jones, Kusunose, and Goering (1995). Baseline pain was assessed using the VAS before intervention as 8cm out of 10cm. At the first two visits, she rated her pain as 8cm out of 10cm on the VAS before treatment and 4cm out of 10cm after treatment, which lasted one and four hours after treatment, respectively, for visits one and two. On the first visit, 11 tenderpoints were treated, and on the second, 10 tenderpoints were treated. Over time, fewer tenderpoints were found and, therefore, fewer were treated until none was left by the seventh and eighth treatment sessions. Pain reported using the VAS also decreased in similar fashion until no pain was reported by the seventh visit. At the sixth visit, TE was initiated using progressive resistance exercise with abdominal curls, seated rows and pull-down exercises at three sets of ten repetitions using from 20 pounds to 30 pounds of resistance. By the sixth visit, the patient reported that she was able to vacuum the entire house without needing to stop due to pain, and by the seventh visit, she was encouraged to return to the gym and exercise with her family (patient's goals). The eighth, and final, treatment session was spent re-assessing the patient, as no pain was reported and no tenderpoints were found; therefore, no further treatment was needed, and she was discharged from physical therapy services. The lumbar extension improved from being 90% limited to being 50% limited and remained pain-free at end range. SCS was

replaced entirely by TE at the end of four weeks, and pain was reduced from a baseline of 8cm out of 10cm to 0cm out of 10cm-a successful intervention.

Conclusion

For a 58-year-old patient with chronic low back pain, would Strain-Counterstrain be more effective than therapeutic exercise in reducing pain as measured by the visual analog scale?Based on the information above, it appears that SCS is not only a viable treatment modality, but it could be more effective than TE if used in patients who are not able to tolerate TE initially. Therefore, the question can be answered affirmatively.This is especially true since the patient was not able to tolerate TE prior to treatment and was able to tolerate TE after treatment.Further research is needed to examine the effects of SCS in a population of patients with chronic LBP.

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