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Efficacy of Dry Cupping Therapy as Treatment for Non-Specific Lower Back Pain

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Abstract

Lower back pain (LBP) is one of the most common conditions affecting adults globally. Non-specific lower back pain (NSLBP) is a diagnosis based on the exclusion of other pathoanatomical causes, and accounts for over 80% of cases of LBP.[1] Current treatments typically involve a multidisciplinary approach. Dry cupping therapy is a noninvasive treatment option that is used to treat musculoskeletal pain.[2] Three studies were analyzed which assess the utility of dry cupping therapy as a treatment modality for non-acute NSLBP; two of the studies were randomized control trials, and the third was a small pilot study. All three studies were carried out within the last 10 years, included participants with a diagnosis of NSLBP greater than eight weeks duration, and all participants were over the age of 18. Pain intensity scores taken after dry cupping therapy sessions were assessed in all three studies. Both randomized control trials compared the scores from their experimental groups to pain intensity scores after sham cupping therapy in their control groups. The pilot study was composed of only an experimental group, and the pain intensity scores were assessed after one dry cupping therapy session was carried out. One of the primary outcomes of all three studies was pain intensity reduction after treatment using the Visual Analog Scale (VAS) and the Numerical Pain Rating Scale. The larger randomized control trial (Almeida Silva, et al.) showed a similar reduction in pain intensity between both the experimental and control groups at all three tested time intervals, whereas in the smaller control trial (Salemi, et al.), the experimental group showed a greater reduction in pain intensity than the control group at both tested time intervals. The pilot study showed a reduction in pain intensity immediately post treatment. Additional trials with larger sample sizes are needed to determine the true efficacy of dry cupping therapy for pain reduction in NSLBP patients before it becomes a mainstay of treatment.

Introduction

Lower back pain (LBP) is the leading cause of disability globally, and is one of the leading reasons for primary care visits in the United States annually.[3] It is clinically defined as pain manifesting between the distal margins of the twelfth ribs, and the inferior gluteal folds.[1] While most people who experience LBP do ultimately regain their previous level of function, it is estimated that close to 20 percent of individuals with LBP will develop chronic symptoms. Consequently, it is one of the costliest healthcare issues in Western countries, with the majority of costs being indirect costs associated with loss of productivity and disability payments.[4,5]

Non-specific LBP (NSLBP), or pain without an identifiable nociceptive cause, accounts for over 80% of all cases of LBP, and it is considered a diagnosis of exclusion after vertebral and/or nerve pathologies have been ruled out. [4]

Chronic NSLBP, defined as pain of 12 weeks duration or greater, is often treated using a multidisciplinary approach but there is no consensus on which combined treatment modalities are most effective.[1] First-line treatment often includes behavioral therapy, patient education, and supervised exercise therapy, like core strengthening, body movement, and postural training.[1] Adjuvant pharmacologic therapy is also used, with NSAIDs and muscle relaxants being employed most often, but evidence for its effectiveness isn't conclusive. Additionally, opioids may be effective for acute management in certain patient populations, but opioids are not a long-term solution.[1] Although pharmacologic therapies continue to be the focus of research for NSLBP treatment, elements of complementary and alternative medicine are starting to be incorporated into mainstream treatment plans. For example, tens of millions of patients in the United States utilize the centuries old practices of acupuncture and chiropractic medicine for pain management.[6,7] Anecdotally, these therapies seem effective at reducing NSLBP, but meta-analyses of randomized control trials evaluating the effectiveness of both treatments individually provide mixed results.[1]

Among these alternative medicine therapies includes dry cupping, a treatment practiced in Traditional Chinese medicine for over three thousand years, where suction cups are applied to areas of localized pain to promote healing.[8,9] A jar or cup is applied to the skin and air is removed from inside the cup using a hand-pump or flame. The negative pressure inside the cup creates congestion in the myofascial tissue underneath the cup, promoting increased blood flow.[8] It is also theorized to work as a result of the gate control theory of pain, where stimulation of mechanoreceptors in the skin "close the gates" to nociceptive stimuli, preventing painful stimuli from reaching the brain.[10] However, the true mechanism of action is not well understood.[11] Dry cupping therapy has been utilized to promote self-healing and pain relief for several thousand years, but modern research proving its effectiveness is limited. We believe that, if it is found to be beneficial, its relatively risk-free administration and low side effect profile could drastically change the way we view and treat NSLBP and improve symptoms for millions of people.

Clinical Question: Among men and women over age 18 with chronic non-specific lower back pain, does dry cupping, as compared to placebo, lead to reduction of back pain symptoms?

Methods

PubMed was used as the primary database to identify research articles. In September of 2022, the search terms “dry cupping” and “Chinese cupping” were used, which identified 458 articles; 456 articles remained after removing duplicates. Upon application of the inclusion and exclusion criteria, six articles remained. Inclusion criteria included: studies with adult male and female participants who had been experiencing non-acute non-specific lower back pain. Exclusion criteria included: studies that were not part of a clinical trial or randomized control trial, studies performed prior to 2010, studies that investigated wet cupping or dry-pulsatile cupping, studies that investigated dry cupping integrated with other treatments, studies whose primary outcomes excluded pain intensity reduction, and studies that investigated the effects of dry cupping on pain intensity reduction in areas not including the lower back. After reviewing the six remaining articles, the three that were chosen aligned most with the clinical question. Two of the articles were double-blind randomized control trials, and the third was a non-blinded pilot study.

Study #1 Salemi, et al.

Objective:

To assess the effects of dry cupping therapy on pain and functional disability in patients with non-specific lower back pain.[2]

Study Design:

This was a double-blinded, randomized controlled trial conducted in Recife, Brazil by the Department of Physiotherapy at the Federal University of Pernambuco that included a participant population of 38 patients, with 19 participants in the experimental group and 19 participants in the control group (one participant in the control group didn’t complete the study). Originally, 64 volunteers were invited to participate in the study, and 38 were included.[2] Inclusion criteria consisted of adults aged 18-59 years old with non-specific lower back pain for greater than three months. Exclusion criteria included anyone taking an anticoagulant, pregnant women, women in the puerperium period, those with anemia, those with systemic diseases, those with fibromyalgia, those presenting with red flags of lower back pain, any herniated discs in the lumbar region, previous spine surgery, altered skin integrity, symptomatic irradiated pain, or who had previously undergone cupping therapy. Of the 64 who were invited, three were unable to participate, 23 were excluded (due to herniated disc, non-lower back pain, skin

cancer, and deep vein thrombosis), and one study participant of the remaining 38 was lost during the study due to an undisclosed reason.[2]

The study consisted of 15 males and 22 females with an average age of 26.68 (SD = 7.64) in the experimental group and 23 (SD = 2.47) in the control group. Each group received five sessions with a total treatment time of 20 minutes per session. Every participant in both groups received therapy via seventeen reusable Dong Bang brand acrylic cups (3.5-cm diameter). If there were any signs of skin dehydration in an individual before a session, coconut oil was applied to the skin.[2]

The experimental group received dry cupping therapy that was administered via hand pumps to create a negative pressure of approximately 300 millibar. If the participant experienced immense discomfort, the pressure was minimized slightly to relieve some of this discomfort. The cups were applied to areas of the skin called “acupoints”, which are areas commonly used for acupuncture therapy. These areas were labeled BL23, BL24, BL25, HT3, ST36, GV4, BL30, BL40, and BL58.[2] A measurement called tsun, or cun, was used to locate the precise acupoint locations for each individual. This measurement is the fixed distance between two references, bone or morphological. The participants were first instructed to lay in the supine position, where the cupping therapy was applied to the HT3 and ST36 positions for 10 minutes. They were then instructed to get into the prone position and the cupping therapy was applied to the rest of the areas for another 10 minutes.[2] The participants in the control group underwent the same protocol, but their cups contained a 1.9-mm hole which allowed air to escape, therefore preventing sustained suction. In order to mimic the continued suction and maintain contact with participants’ skin, transparent double-sided tape was applied to the edge of the cups. After the conclusion of the study, the control group was given the option of undergoing true dry cupping therapy, and anyone who did not see improvements with dry cupping therapy was offered additional physiotherapy.[2]

The primary outcomes measured were intensity of pain, measured via the Visual Analog Scale (VAS), and functional disability, measured via the Oswestry Disability Index (ODI) questionnaire. The VAS is graded on a scale of 0-10, where the participants were asked to indicate their pain intensity on a line between 0 (no pain) and 10 (worst pain). The ODI is a 10-question assessment that is scored on a scale of 0-50 and is used to evaluate the patient’s permanent functional disability, with a higher score correlating to an increased level of disability. The Start Back Screening Tool (SBST) and a weekly pain diary were used as a secondary outcome. The SBST measured physical and psychosocial factors for those with lower back pain and the diary consisted of listing how many days per week the participants felt lower back pain.

The VAS, ODI, and SBST outcomes were measured before the study began to establish a baseline, at the end of the study (after the fifth session), and then once more four weeks post-treatment as a follow-up. The diary was assessed at baseline, after the second session, after the fourth session, and after the fifth (final) session.[2]

Results:

For the primary outcomes, there was a lower VAS score post-treatment (after the fifth session) in the experimental group versus the control group by an average of 2.36 ($p < 0.001$). On follow-up four weeks later, the VAS score was again lower in the experimental group compared to the control group, this time by an average of 1.71 ($p < 0.042$). As for ODI, the experimental group presented with a lower score by an average of 4.68 ($p < 0.017$). However, the follow-up score differences between the groups was determined to be non-significant ($p < 0.001$). When comparing the VAS at baseline to post-treatment, the experimental group demonstrated a reduction in score by an average of 2.47 ($p < 0.001$). When comparing the VAS at baseline to follow-up, the experimental group also revealed a reduction in score by an average of 2.78 ($p < 0.001$). When comparing the post-treatment score to follow-up, there was no significant difference. The control group demonstrated no significant reduction in scores in either the VAS or ODI when comparing the baseline to post-treatment or follow-up.[2]

For secondary outcomes, the weekly pain diary demonstrated a reduction in the days the participants felt pain in both the experimental group and the control group. However, the experimental group experienced a larger reduction in days with pain, as they went from five days per week to about two days per week, and the control group went from five days per week to about 3.5 days per week. One adverse event was experienced, which was a change in skin pigmentation, but this was expected and it disappeared within four days. No other adverse effects were noted.[2]

Study Critique:

This study's strengths include that it was a double-blinded, randomized control trial, the sessions were completed in different environments to ensure the groups were not communicating, and they only lost one participant to follow-up. A statistical power of 80% and an alpha of 5% was used to determine the minimum requirement of 17 participants per group. In order to account for any potential losses, the researchers expanded their groups to 19 each. With only one participant lost, the number of participants was significant to fulfill this requirement.

The study did have some limitations. While there were both males and females in the experiment and control groups, there were more than twice the number of females than males in the experimental group, and it is unclear whether this disparity could have had any effects on the results. Additionally, although the study included participants from age 18-59, the average age was 26.68 in the experimental group and 23 in the control group. This age group is not representative of the general population, and more studies need to be done on older populations with non-specific lower back pain. Another issue was that while the researchers calculated that 17 participants per group would allow for adequate statistical power, a sample size of 37 is not large enough to draw any clinically significant conclusions from. Lastly, there was also some uncertainty surrounding participant analgesic-use during the study stemming from two somewhat contradictory statements made by the researchers. Early in the article, the researchers state that participants only received cupping or sham therapy, however "they also performed routine drug treatment according to medical prescription".[2] It is unclear whether this means that participants were able to continue their other doctor-prescribed medications, which may or may not have included analgesics. Later on in the article, in the study discussion section, the researchers make the argument that cupping "achieved a large effect size on both post-treatment and follow-up pain relief without being associated to any medication".[2] This statement makes the claim that the researchers believe the study results were independent of pharmacologic therapy, even though it was previously mentioned that participants were allowed to remain on their prescribed medications, which could have included analgesics. Since the study failed to detail what medications the participants continued taking, it is difficult to support the argument that the study results were entirely independent of adjunct pharmacologic therapy.

Study #2 Almeida Silva, et al.

Objective:

Assess the effects of dry cupping on pain intensity, physical function, functional mobility, trunk range, perceived overall effect, quality of life, psychological symptoms, and medication use in patients with chronic NSLBP as compared to sham dry cupping.[10]

Study Design:

This study was a two-armed, randomized sham-control trial with blinded participants and blinded outcome assessment conducted over 8 weeks at the Federal University of Rio Grande do Norte in Brazil in 2020. The eligibility criteria included low back pain >12 weeks duration, pain level between 3-8 on the 10 point numerical pain scale, age between 18-59, and BMI <35.

Individuals were excluded if they'd ever been treated with cupping therapy before, if they had a contraindication to cupping, if they were undergoing physical therapy for LBP, if they had neurological or sensory deficits that could interfere with assessments, signs of serious pathology of the spine, or travel plans within the two months of the study.[10]

Using a statistical power of 90 percent, an alpha of five percent, and a loss rate of 10 percent, it was concluded that a sample size of 90 participants would be sufficient to detect clinically significant differences between the experimental and control groups. One hundred twenty individuals were assessed for eligibility, and the 90 participants who matched criteria were randomly sorted into experimental and control groups; 86 participants completed the full study. The average age of the experimental group was 30 with a standard deviation (SD) of 11, and the average age of the control group was 32 (SD = 13). Overall, there were 67 female and 23 male participants.[10]

The treatments consisted of eight dry cupping or sham cupping sessions performed once weekly for 10 minutes at a time. For the experimental group, participants were placed in a prone position and four Dong Bang acrylic cups (4.5-cm diameter) were applied bilaterally to the lower back.The cups were placed parallel to vertebrae L1-L5, with a 3-cm distance between them.[10] Using a hand pump, 300 millibars of negative pressure was applied to the inside of each cup, which remained in place for 10 minutes. The exact same procedure was followed for the control group except that each cup contained several 2-mm holes, which allowed for release of negative pressure within 3 seconds. Double-sided tape was applied to the base of the control cups in order for them to maintain contact with the participants skin.[10] The participants were evaluated before the treatment, and immediately after the first, fourth, and eighth treatment.

The primary outcome measured was pain intensity using the Numeric Pain Rating Scale (NPRS), where participants were asked to score their pain on a scale of 0 to 10 (0 = no pain, 10 = worst pain possible). [12] Scores were collected from the participants at rest, during evaluation of trunk range of motion (ROM) with forward flexion, and during the "timed up and go test" where patients were asked to get up from a chair, walk 3-m, turn around, return to the chair, and sit down.[12] These scores were averaged. While pain intensity was the primary outcome measured, the study also evaluated: physical function, trunk ROM with forward flexion, perception of overall effect of treatment, participant quality of life, participant psychological symptoms, efficacy of participant blinding, and participant expectations. The mean difference and a 95% confidence interval were calculated for every outcome measure in order to assess between-group effects.[10]

Results:

Both the experimental group and the control group showed similar reductions in pain intensity after the first, fourth, and eighth treatment interventions, and no clinically significant differences were seen at any measured point in time throughout the treatment. The minimum between-group difference in pain intensity that was needed to indicate clinical significance was 2.4 points, and the mean between-group differences for pain intensity after the first, fourth, and eighth treatment intervention were 0.0, 0.4, and 0.6 points respectively.[10] Additionally, the study found that there were no clinically worthwhile differences seen within any of the secondary outcome groups. The researchers also question the mechanism by which dry cupping is supposed to work, which is through the application of negative pressure. Similar improvements in pain intensity were seen in both the experimental and control groups throughout the trial, despite the control group not receiving true negative pressure treatment. This supports the argument that symptom improvement after dry cupping therapy is a result of positive patient expectations prior to treatment, and is an example of the placebo effect.[10]

Study Critique:

This study had several strengths. It was a blinded, two-armed randomized control trial, where the participants were blinded to their treatment, the assessors were blinded to the intervention groups, and after completion of the trial, participant blinding was evaluated and found to be effective. A statistical power of 90 percent was used to determine the optimal sample size for the study, the appropriate number of participants (90) was used, the statistical analysis of the data was performed using an intention-to-treat protocol, and only four participants were lost to follow up.

While this study was very high-quality, it did have a few limitations. The study included both male and female participants, but 74% (n = 67) of the participants were female. Additionally, of the 23 total male participants, only seven were randomly assigned to the control group (16% of the control group). There is no way to know whether greater parity between males and females might have affected the final results. The researchers did make a point to explain that they could not control for the menstrual cycle stages of the female participants, and that it is theorized that female pain thresholds can vary based upon where they are in their menstrual cycle, so it is interesting that they failed to address the disparity between the number of male and female participants. One other limitation was that they could not control analgesia use by the participants. The participants were given a medication diary to document use, and

between the two groups, only seven total patients used analgesics between one and eight times over the course of the trial.

Study #3, Markowski, et al.

Objective:

To evaluate the effectiveness of dry cupping therapy at acutely reducing pain, tenderness to palpation, and improving ROM in patients with sub-acute and chronic lower back pain.[8]

Study Design:

This was a non-blinded pre-post pilot study carried out by Northeastern University's Department of Physical Therapy in 2013. Eligibility criteria included subacute (>8 weeks duration) to chronic NSLBP. Exclusion criteria included evidence of neurologic deficits, recent history of lower back surgery, and acute pain (<8 weeks duration). Twenty one participants were recruited to participate, and 17 participants completed the study. The age range for those who completed the study was 30-56, with an average age of 40 (SD = 7.2). Overall, eight men and nine women completed the study.[8]

The treatment consisted of one session of dry cupping therapy which lasted for 10 minutes. Participants were placed in a prone position on an exam table and four Dong Bang glass cups (6.67-cm diameter) were placed bilaterally along the paraspinous muscles at the L2 and L4 vertebral levels. A hand pump was used to apply enough suction to the cups so that the skin within the cups was raised to an elevation of 1.6-cm (an elevation which was shown in previous studies to achieve appropriate suction effect without patient discomfort).[8] After 10 minutes, the cups were removed, and heat was applied to the participants' lower backs for five minutes. The participants were evaluated immediately before treatment, and 24 hours after treatment.

The primary outcomes measured were pain reduction and improvement in spinal ROM. Prior to application of treatment, participants filled out a medical questionnaire form which included the pain VAS, and the Oswestry Disability Index.[8] Spinal ROM measurements and pain-pressure-thresholds (PPT) were also documented at this time. Lumbar flexion/extension, lateral flexion, and straight leg raises (SLR) were measured using an inclinometer device. PPTs of the erector spinae muscle bellies at L2 and L4 were measured bilaterally using a pressure algometer. Twenty four hours after completing the therapy, participants repeated this full set of evaluations.[8]

Results:

The data obtained pre- and post-treatment were compared using the Wilcox signed-rank test. This data analysis showed statistically significant pre- to post-treatment improvements in the following outcome measures: VAS scores (p<0.0001), SLR ROM on the left side (p=0.043), lumbar flexion ROM (p=0.016), and all four PPT points (p<0.0007). Spearman rho correlations were also used to determine relationships between the changes in percentages in pain intensity, ROM measurements, PPT, and disability index. Spearman rho is a parametric test that can be used to analyze continuous data for a pair of variables whose relationship to one another is not linear, but monotonic, which generally means that as one variable increases, the other variable increases or decreases, but not in linear fashion.[13] The calculations found a positive correlation between high disability index scores and improvements in lower back flexion after cupping (those who had higher scores felt more improved after the therapy), as well as a positive correlation between improved lower back flexion and increased PPTs (those with improved lower back flexion saw increased pain thresholds).[8]

Study Critique:

This study had a few strengths. Both males and females were equally represented in the trial, and the mean age of 40 was an accurate representation of those affected by NSLBP in the general public (seen more often in middle-aged to older adults). Additionally, the ROM and PPT measurements were all assessed objectively; the examiners actually measured ROM angles and applied pressure both before and after treatment. Comparing objective measurements from pre- and post-treatment lends some credibility to any changes observed. Lastly, there were no conflicts of interest for any of the researchers participating.

This study had several limitations, some of which were addressed by the researchers. The sample size used for the study was small. Pilot studies have different objectives than larger RCTs, so they are not expected to follow the same formal statistical power guidelines as larger studies.That being said, it is necessary to explain the reasoning behind the chosen sample size, which this study failed to do.[14] In addition to this, the participants were not blinded; they knew prior to the intervention that they would be receiving therapy, which can lead to placebo effects. This study was also limited by its failure to demonstrate precision or long term results. There is no way to know whether the results seen post-treatment were reproducible, because only one therapy session was provided. Additionally, the failure to collect follow-up measurements in the weeks and months post-treatment prevent any conclusion that this therapy provides relief long term. Lastly, despite demonstrating statistically significant differences between the outcome

measures before and after treatment, the study failed to demonstrate clinical significance. That being said, this was a pilot study, so the main objective is really to assess the utility and/or feasibility of conducting a similar study on a larger scale, not to establish efficacy.[8]

Discussion

The purpose of this review was to determine the utility of dry cupping therapy as an effective treatment for NSLBP as compared to placebo. The experimental groups in all three studies showed some level of pain reduction immediately post treatment, but only one of the studies, Salemi et al., attempted to assess long term pain reduction by evaluating participant pain status four weeks post treatment completion. This study did show a statistically significant reduction in VAS score between the experimental and control groups at the four week follow up, but it was only by a mean difference of 1.71 points, and the clinical significance of this reduction cannot be concluded. Using the ODI, the difference between the experimental and control groups four weeks post treatment was not statistically significant. Additionally, Almeida Silva et al. demonstrated an almost equivalent level of pain reduction between the experimental group and the control group at all three post-treatment tested intervals, and the between-group mean difference in pain reduction never exceeded 2.4 points, which was the score required to indicate clinical significance. This begs the question of whether the participants in the experimental group really experienced pain reduction or whether this was an example of the placebo effect. Lastly, Markowski et al. showed statistically significant improvements in VAS, ODI, SLR ROM, and trunk ROM immediately after one dry cupping session, but the participants were not blinded, and the study could not draw any conclusions about long term pain relief.

While dry cupping did show some evidence of pain reduction in the three studies, there were some limitations across the three studies, and the potential influence of these limitations should be considered. For example, in Salemi et al, the study failed to address the possible use of concurrent analgesics as a confounding variable. Analgesics are effective at treating NSLBP, and are usually one component of a multidisciplinary approach to treating NSLBP; if participants were using analgesics, the study cannot conclude that the observed reductions in pain intensity were due to the dry cupping therapy alone. Additionally, while the tested intervals and the outcome evaluation tools used for measuring pain intensity and functional disability across the three studies were similar (and for some outcomes, the evaluation tools used were the same), there was some variation between the three studies, making direct comparisons between the studies more difficult. An overview of the studies' outcomes, evaluation tools, and participant

demographics can be seen in Table 1. These studies are a good starting point, and something that future research can build off of, but more research needs to be done to determine any long term benefits from dry cupping therapy, and whether the improvements seen among these study participants can be replicated on a larger scale.

Conclusion

NSLBP disrupts the lives of millions of people and is the leading cause of disability across the globe. As it is such a large problem, appropriate treatments for managing something so significant are crucial to the wellbeing of so many people. It is crucial for safer, cheaper, more effective methods to be developed so that those with NSLBP can improve their quality of life. Other options exist for managing pain, like medications and physical therapy, and these methods can be great solutions for some. However, they can also have significant side effects or be too costly.

The purpose of this research was to evaluate the effectiveness of dry cupping therapy as a potential non-invasive treatment for NSLBP. As we continue to learn more about pain and what causes it, we also continue to expand our understanding of how to treat it. With dry cupping therapy, there might be some promise, but there is not enough validated evidence to support the use of dry cupping as stand-alone therapy. While two of the studies showed some statistically significant evidence of pain relief, the third study revealed that this pain relief could all be placebo. Ultimately, it is up to patients to decide what course of treatment works best for them. If dry cupping is a treatment modality they would like to pursue, they should just be aware that current evidence, although limited, does not demonstrate the utility of this treatment for NSLBP at this time.

Appendix

Table 1. Overview of Studies and Outcomes

	Salemi et al.	Almeida Silva et al.	Markowski et al.
Participants (n)	37	90	17
Study Groups (n)	Experimental: 19 Control: 18	Experimental: 45 Control: 45	Experimental: 17
Participant Population	Brazil, 2020	Brazil, 2020	Massachusetts, 2014
Participant Sex	Male: 15 Female: 22	Male: 23 Female: 67	Male: 8 Female: 9
Participant Age (Average)	Experimental: 26.6 Control: 23	Experimental: 30 Control: 32	Experimental: 40
Primary Outcome Evaluation Tool(s)	Pain Intensity (VAS) Functional Disability (ODI)	Pain Intensity (NPRS)	Pain Intensity (VAS) Trunk ROM
Additional Outcome Evaluation Tools	Physical and Psychosocial Factors (SBST) Weekly Pain Diary	Functional Disability (ODI) Functional Mobility Trunk ROM Quality of Life Perceived Overall Effect	Physical Function Straight Leg Raise Tenderness to Palpation

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