

2011

Effect of Therapeutic Exercise Versus Manual Therapy on Athletes with Chronic Low Back Pain

Haley Dvorak

Christina Kujat

Jason Brumitt

Follow this and additional works at: http://digitalcommons.georgefox.edu/pt_fac

Recommended Citation

Published in Journal of Sport Rehabilitation, 2011, 20(4): 494-504.

This Article is brought to you for free and open access by the School of Physical Therapy at Digital Commons @ George Fox University. It has been accepted for inclusion in Faculty Publications - School of Physical Therapy by an authorized administrator of Digital Commons @ George Fox University. For more information, please contact arolfe@georgefox.edu.

Effect of Therapeutic Exercise Versus Manual Therapy on Athletes With Chronic Low Back Pain

Haley Dvorak, Christina Kujat, and Jason Brumitt

Clinical Scenario

Rehabilitation professionals treat individuals suffering from chronic low back pain (CLBP) using a variety of treatment approaches including manual therapy and the prescription of therapeutic exercises. The use of manual therapy, specifically joint mobilization of the lumbar spine, may significantly decrease a patient's pain and contribute to improvement in his or her functioning.¹ Exercise may also improve pain and functioning, with some patients reporting gains up to 1 year after the last treatment session.²

Numerous investigations have assessed the potential benefits associated with either joint mobilization or therapeutic exercise for patients with acute or subacute low back pain or CLBP. Despite the literature to guide clinical decision making, clinicians often struggle to successfully or expeditiously treat patients with low back pain. A recent trend reported in the literature has been to use treatment-based classifications or clinical prediction rules.^{1,3,4} These reports provide evidence or clinical suggestions for treating patients with acute or subacute low back pain. To the best of our knowledge, there is a lack of these types of reports that address evaluation and treatment for patients with CLBP.

When treating patients with CLBP it is not uncommon for some rehabilitation professionals to use 1 treatment approach primarily or exclusively. Using a treatment program supported by the research literature should generate the most effective outcomes for patients with CLBP.

Focused Clinical Question

For individuals with CLBP, does joint mobilization or joint manipulation to the lumbar spine decrease pain and improve function better than lumbar-stabilization or -strengthening exercises?

Dvorak is a physical therapist with Beaverton Physical Therapy, Beaverton, OR. Kujat is a physical therapist with Scappoose Physical Therapy, Scappoose, OR. Brumitt is with the School of Physical Therapy, Pacific University (Oregon), Hillsboro, OR.

Summary of Search, Best Evidence Appraised, and Key Findings

- A literature review was conducted to identify randomized controlled trials comparing 1 treatment group that received joint mobilization and/or manipulation to the lumbar spine and a second treatment group that received a therapeutic exercise program consisting of lumbar-stabilization and/or -strengthening exercises.
- We identified 4 randomized controlled trials of level 2b evidence.
- Two studies reported that the prescription of a therapeutic exercise program was superior, 1 reported that a manual therapy program was superior (however, those in the stabilization exercise group also experienced significant improvements), and 1 reported that both the manual therapy and the therapeutic exercise groups experienced improvements in outcomes measures.

Clinical Bottom Line

For individuals suffering from CLBP, joint mobilization or manipulation is no better than lumbar-stabilization or -strengthening exercises. Those who were prescribed a therapeutic exercise program experienced significant improvements in all 4 studies. Only 1 study reported that patients in a manual therapy cohort demonstrated significantly better outcomes than those in the therapeutic exercise cohort. However, those in the therapeutic exercise cohort did experience significant improvement in measured outcomes. Each technique may contribute to the improvements observed in patients with CLBP. Because of the lack of homogeneity between studies, we cannot conclude that 1 approach is superior to the other. We do recommend that patients with CLBP be prescribed a therapeutic exercise program. The clinician may also want to include joint mobilization and/or manipulation based on findings during the initial patient evaluation. Further research is necessary to definitively identify the most effective treatment technique or strategy for individuals suffering from CLBP.

Strength of Recommendation: There is level B evidence suggesting that therapeutic exercise may help decrease pain in patients with CLBP. The use of joint mobilization and manipulation may benefit patients with CLBP; however, their use is no better than that of a therapeutic exercise program.

Search Strategy

Terms Used to Guide Search Strategy

chronic low back pain, passive therapy, manual therapy, spine manipulation, therapeutic exercise, lumbar stabilization, active therapy

- **Patient/Client group:** Chronic low back pain with or without pain radiating into the lower extremity
- **Intervention:** Manual therapy consisting of joint mobilization and/or joint manipulation to the spine
- **Comparison:** Therapeutic exercises addressing lumbar-spine stabilization and/or strengthening
- **Outcomes:** A decrease in disability and a reduction in pain

Sources of Evidence Searched

- MEDLINE
- PubMed
- CINAHL
- SPORTDiscus
- Cochrane Database for Systematic Reviews

Inclusion and Exclusion Criteria

Inclusion Criteria

- Patients with CLBP ≥ 6 weeks in duration
- Pain or disability scores as an outcome
- Limited to randomized controlled trials; 1 group treated with joint mobilization and/or manipulation to the spine and 1 group treated with lumbar-stabilization and/or -strengthening therapeutic exercises
- Limited to adult human subjects
- Limited to studies published from 1994 to 2009

Exclusion Criteria

- Patients with low back pain ≤ 6 weeks in duration
- Patients receiving both treatments
- Treatments performed by someone other than a physical therapist, an athletic trainer, or a chiropractic physician.
- Nonrandomized investigations

Results of Search

We identified 4 relevant studies during the literature search. Only randomized controlled trials that compared a cohort receiving a therapeutic exercise program and a cohort receiving joint mobilization or manipulation as treatment were retrieved for analysis. The primary reason for using this criterion was to determine whether 1 approach was superior to the other in decreasing pain and improving function. Table 1 presents the levels of evidence of each article (Centre for Evidence Based Medicine).⁵

Table 1 Summary of Study Designs and Levels of Evidence of Articles Retrieved

Level of evidence	Study design	Number located	Authors
2b	Randomized controlled trial	4	Aure et al ⁶ Rasmussen-Barr et al ⁷ Goldby et al ⁸ Ferreira et al ⁹

The studies presented in Table 2 met the inclusion and exclusion criteria selected for this CAT. Each study received a grade of 2b, which is considered a high level of evidence.⁵

Implications for Practice, Education, and Future Research

Many people in the United States experience low back pain at some point in their life.⁷ Most patients recover after an acute bout of low back pain; many heal without or despite intervention. However, for some individuals, pain fails to resolve, progressing to CLBP. Numerous treatment approaches for patients with CLBP are reported in the literature. The 2 treatments analyzed for this study are lumbar-spine stabilization exercises and manual therapy (Table 2).

Rasmussen-Barr et al⁷ found that patients with CLBP who participated in a stabilization therapy program demonstrated greater improvement on a functional test and experienced a greater mean decrease in pain than those in the manual therapy treatment group. In addition, those in the stabilization therapy cohort required less follow-up care. At the 3-month follow-up assessment there were significantly more individuals in the stabilization therapy group meeting the authors' minimal clinically important difference (MCID) on a visual analogue scale and the Oswestry Low Back-Pain Questionnaire.⁷ Patients in the manual therapy group reported the need for more recurrent treatment than patients in the ST group. The MCID was set at <10 mm on the visual analogue scale and >10% on the Oswestry Low Back-Pain Questionnaire by the authors of the study.⁷

Aure et al⁶ found that both manual therapy and exercise therapy interventions led to significant improvements in outcomes. However, those in the manual therapy group experienced significantly better outcomes than those in the exercise therapy group.

Goldby et al⁸ report that ten 1-hour spine-stabilization exercise sessions led to better results than a 10-session manual therapy program or an education program over a 1-year period. However, both the manual therapy and the spine-stabilization groups experienced significant pain reduction.

Ferreira et al⁹ found that in the short term (8 wk) the use of either manual therapy or lumbar-stabilization exercises led to significantly better improvements in function and global perception outcomes than were found in a general exercise group. At 6 and 12 months, all groups improved, with no significant differences between groups.

Despite each of the 4 studies having a manual therapy group and a spine-stabilization group, there is a lack of homogeneity between research designs. There are similarities between studies including similar patient populations, outcome measures, treatment durations, and assessment periods. Although some of the authors provided detail for each exercise or manual therapy program, it would be difficult to replicate each study because of either omissions or allowed variability.

Our recommendation for treating CLBP is to conduct a thorough examination and evaluation to determine the most effective treatment for the individual patient. Clinicians who practice evidenced-based therapy incorporate knowledge from available research, their own clinical experience, and the patient's values.¹⁰

Table 2 Characteristics of Included Studies

Study design	Rasmussen-Barr et al ⁷	Aure et al ⁶	Goldby et al ⁸	Ferreira et al ⁹
Participants	47 patients (12 men, 35 women) with CLBP >6 wk were recruited from a physical therapy clinic in Stockholm, Sweden. Five dropped out before the start of the study; final groups consisted of 22 in ST and 20 in MT.	49 patients were randomized into MT (27) or ST(22) groups. Patients were recruited by mailing to individuals who were "sick listed." The treatments were performed at several facilities. A blocking design was used to randomize patients into age and gender strata. The article did not state whether randomization was concealed from the subjects. The randomization was successful; both groups were similar at baseline. Three subjects dropped out of the study, 2 from the MT group and 1 from the ET group. Subjects who dropped out for reasons other than those related to the treatments were given baseline registration scores for missing data points. Subjects who dropped out because of treatment were given the worst score registered for any patient in their assigned group. All subjects were analyzed in their respective groups. Inclusion Criteria: male and female patients, age range 20–60 y, who had been sick-listed with CLBP or radicular pain for at least 8 wk but no more than 6 mo. Exclusion Criteria: being unemployed or forced to retire early because of CLBP history; surgery for herniated disk; pregnancy; spondylolisthesis; spondylolysis; fractures; suspicion of malignancy; osteoporosis; previous back surgery; known rheumatic, neurologic, or mental disease; lack of pain with musculoskeletal testing.	346 patients with a diagnosis of CLBP were recruited for this study. Patients had been referred to the St George's Hospital (London, UK) physical therapy department. After the initial evaluation, 44 were excluded. In addition, some subjects withdrew or failed to attend any treatment sessions (n = 89). A total of 213 subjects (ST = 84, MT = 89, education = 40) completed the treatment sessions. 122 failed to complete all follow-up tests (ST = 35 subjects, 49 dropouts, 55.7% dropouts; MT = 37 subjects, 52 dropouts, 58.4% dropouts; education = 19 subjects, 21 dropouts, 52.5% dropouts). Subjects were randomized into 1 of 3 treatment groups and stratified by age, gender, and referral location. Subjects in each group were similar at baseline. Inclusion Criteria: diagnosis of CLBP at least 12 wk in duration, age 18–65 y, and ability to comprehend and communicate in English. Exclusion Criteria: A diagnosis of nonmechanical low back pain, pregnancy, anxiety neurosis, mechanical back pain that could be treated with alternative treatments, history of metastatic disease, or lower limb pathology.	240 patients with a diagnosis of CLBP for at least 3 mo were recruited from 3 hospitals in Sydney, Australia. Subjects were randomized to general exercise (GE; n = 80), motor control exercise (MCE; n = 80), or MT (n = 80) groups. Randomization was blinded from all but 1 investigator and concealed from patients. Subjects were similar at baseline except for the MT group's having more individuals working full-time. Inclusion Criteria: 3-plus mo of nonspecific low back pain, age 18–80. Exclusion Criteria: previous back surgery, malignancy, inflammatory joint or bone disease, neurological signs. Twenty-nine subjects were lost to follow-up at 12 mo; 91% of the GE group, 81% of the MCE group, and 91% of the MT were tested at 12 mo.

(continued)

Table 1 (continued)

Study design	Rasmussen-Barr et al ⁷	Aure et al ⁶	Goldby et al ⁸	Ferreira et al ⁹	
Intervention investigated	<p>ST: 6-wk exercise program; 45-min session once a wk for 6 wk. A physical therapist (PT) led the sessions; however, it is not clear if the same PT treated all patients. The program emphasized deep abdominal and lumbar multifidus muscles. Instructed to perform home exercise program (10–15 min/d).</p> <p>MT: patients treated 1 time/wk for 6 wk by a PT performing joint mobilization and manual therapy for 45 min. It is unclear whether the same PT performed all treatments.</p> <p>The authors did not mention blinding, so none was assumed. It is unclear whether the same PT performed all the treatments for one group or if multiple PTs performed treatments for each group.</p>	<p>Exercise Therapy (ET): The patients in the ET group (n = 22) were treated by 2 PTs who were not certified in manual therapy. Both groups received 16 treatments for 45 min, 2 times/wk for 8 wk.⁶ Participants randomized into the ET group exercised for 45 min, including a 10-min warm-up on a bike and then 35 min of individually designed exercise. The ET program could consist of stabilization exercises, stretching, and mobilizing techniques for the abdominal, back, pelvic, and lower extremity muscles.</p> <p>The MT group was treated with spinal manipulation, specific mobilization, and stretching techniques. The MT group also participated in general exercises for about 2/3 of the treatment time.</p> <p>Both groups were provided a daily home exercise program, were encouraged to do cardiovascular exercise 3 times/wk, and received information regarding ergonomic considerations.</p> <p>No information regarding blinding of subjects was provided in the article, so none was assumed. The treating PTs were not blinded; they knew which type of therapy they were administering.</p>	<p>Spine-stabilization (SS) Group: A 10-wk (1 time/wk) ET program with an emphasis on training the transversus abdominis, pelvic floor muscles multifidi, and the muscles of the diaphragm. Two PTs conducted each 1-h class. Patients also watched a spine-related educational video before and after each training session. At the completion of 10 sessions the patients were discharged to the Back School.</p> <p>Subjects in the MT group were treated by PTs for up to 10 sessions. Any form of MT was not allowed. Specific examples were not provided. The aforementioned SS exercises were not allowed to be performed, but the PTs were allowed to prescribe any other form of exercise. Again, there is a lack of information regarding what exercises may have been prescribed. At the end of the 10 sessions, the subjects were discharged to the Back School.</p> <p>The patients in the education group were educated from the booklet “Back in Action.” In addition, they were enrolled in the Back School.</p> <p>Back School: Each group participated in a 13-h class addressing spine anatomy, ergonomics, treatment, and exercise.</p> <p>A research assistant was blinded to group allocation.</p>	<p>Patients in the GE group participated in a GE class (up to 8 patients) under the supervision of a PT. Each exercise session lasted 1 h. Exercise intensity was progressed by the PT during the course of the 12 sessions.</p> <p>MCE: Patients in this group were prescribed specific lumbar-stabilization exercises including those for the transversus abdominis, the multifidi, and the pelvic floor. Sessions were performed 1-on-1 with a PT.</p> <p>The researchers asked members of the GE and MCE groups to exercise daily and attend all 12 training sessions.</p> <p>MT: Patients in this group received joint-mobilization and -manipulation techniques to their lumbar spine and pelvis. A PT conducted the treatment sessions, performing treatments to address a patient’s specific deficits. No exercises were prescribed.</p> <p>Participants were asked to attend up to 12 sessions in an 8-wk treatment period.</p>	<p>(continued)</p>

Table 1 (continued)

Study design	Rasmussen-Barr et al ⁷	Aure et al ⁸	Goldby et al ⁹	Ferreira et al ¹⁰
Outcome measures	<p>Pain: Measured using a visual analog scale (VAS). The authors used a 10-cm line for the VAS; 0 = <i>no pain</i> and 10 = <i>unbearable pain</i>.</p> <p>Health Assessment: A VAS was used to measure general health. Subjects would mark along a 10-cm line: 0 = <i>best health imaginable</i> and 10 = <i>worst health imaginable</i>.</p> <p>Functional Disability: The authors used 2 scores: the Oswestry Low Back-Pain Questionnaire (OSW) and the Disability Rating Index (DRI).</p> <p>Measures were recorded at baseline, 6 wk, 3 mo, and 1 y.</p>	<p>Range of Motion (ROM): Modified Schober test to measure spine ROM.</p> <p>Pain: Measured using a 10-cm VAS; 0 = <i>no pain</i> and 100 = <i>worst pain</i>. Pain was recorded at 3 time points: at the present, worst pain, worst during last 14 d, and mean during last 14 d.</p> <p>Functional Disability: Measured using the OSW.</p> <p>General Health: Dartmouth COOP function charts.</p> <p>Return to Work: Patient report.</p> <p>All outcomes of interest were measured 5 times during the study: before treatment, after 8 wk of treatment, and 4 wk, 6 mo, and 12 mo after treatment ceased.</p>	<p>Pain: Measured with a 0-100 numerical rating scale.</p> <p>Functional Disability: Measured with the modified Oswestry Disability Index and the low-back outcome score.</p> <p>General Health: Measured with the Nottingham Health Profile.</p> <p>Outcome measures were recorded at baseline and 3, 6, 12, and 24 mo after treatment.</p>	<p>Patient's Perceived Improvement: Patient-specific functional scale that measures perceived disability with 3 tasks at baseline and at subsequent testing sessions. The global perceived effect measured perception of improvement compared with when the pain first started.</p> <p>Pain: Measured using a VAS. The authors used a 10-cm line: 0 = <i>no pain</i> and 10 = <i>worst pain possible</i>.</p> <p>Functional Disability: Roland Morris Disability Questionnaire.</p> <p>Measurements were recorded at baseline, 8 wk, 6 mo, and 1 y. A blinded PT performed all outcome measures.</p>

(continued)

Table 1 (continued)

Study design	Rasmussen-Barr et al ⁷	Aure et al ⁶	Goldby et al ⁸	Ferreira et al ⁹
Main findings	<p>ST Group: Patients in the ST group experienced a significant improvement after treatment and maintained these gains at subsequent testing points (pain <.001, OSW <.001, DRI <.001, health <.05).</p> <p>The ST group's functional scores were also significantly better than those in the MT group ($P < .05$).</p>	<p>There were significant improvements for the MT and ET groups on the VAS and OSW after the last treatment session, although greater improvement was observed in the MT group ($P < .01$). The mean decrease on the VAS was 33 mm for MT and 17 mm for ET. The effect size for pain was 3.37 at the end of the 8-wk treatment period, which is statistically significant; any number of 2 or more is generally accepted as indicating significance.⁷ The effect size for pain was 3.5 one y after the last treatment session, which is statistically significant. Because of a lack of raw data, we were unable to determine how many subjects from each group met the minimal clinically important difference (MCID). However, the mean decrease for MT on the VAS was greater than 31 mm at the first follow-up period (after 8 wk of treatment) and at the 12-mo follow-up. Also of note, at the 12-mo follow-up there were no clinically significant changes between MT and ET based on the mean change scores for VAS.</p>	<p>Both the SS and MT groups experienced significant reductions in pain between baseline and each testing point ($P < .001$). There were fewer patients in the SS group experiencing symptoms ($P < .009$) than in the MT group at 6 mo.</p> <p>The SS experienced significant reduction (from baseline to 12 mo) on the modified Oswestry Disability Index ($P = .0098$) compared with the MT and education groups. The SS demonstrated greater improvements in quality of life on the Nottingham Health Profile than the MT and education groups; however, the between-groups differences were not significant. The SS group did demonstrate significant improvements on the Nottingham subsection of sleep ($P = .025$).</p>	<p>In the short term (8-wk testing point), the MT and MCE groups demonstrated better outcomes than the GE group.</p> <p>At 8 wk, the MCE group had significantly better outcomes for function ($P = .004$) and global perception ($P < .001$).</p> <p>At 8 wk the MT group had significantly better outcomes for function ($P = .016$) and global perception ($P = .004$) than the GE group.</p> <p>There were no significant differences between the MT and MCE groups.</p> <p>At 6 and 12 mo there were no significant differences between groups.</p>

(continued)

Table 1 (continued)

Study design	Rasmussen-Barr et al ⁷	Aure et al ⁶	Goldby et al ⁸	Ferreira et al ⁹
Main findings (continued)		<p>The MT group experienced a mean decrease of 21% on the OSW. The ET group experienced a mean decrease of 9% on the OSW. The effect size for function was 4.92 immediately after the study, which is statistically significant. The effect size for function was 3.23 at the 1-yr follow-up, which is statistically significant. Because of a lack of raw data, we were unable to determine how many subjects from the MT group met the MCID. However, at the 12-mo follow-up, the mean decrease for the MT group on the OSW was greater than 11%. Also of note, at the 1-yr follow-up there were no clinically significant changes between the MT and ET groups based on the mean change scores. For the ET group only clinically significant changes were seen at the 12-mo follow-up based on the mean scores. Also of note, at the 1-y assessment there were no clinically significant changes between the MT and ET groups in disability.</p> <p>Based on data provided from the authors the number needed to treat (NNT) with MT is 2.32, with a 95% CI of 1.5–5.6. This number is <10, indicating significance.⁷</p> <p>An NNT of 2.32, rounded up to 3, suggests that only 3 people must be treated in order to prevent 1 from remaining sick-listed.</p>		

(continued)

Table 1 (continued)

Study design	Rasmussen-Barr et al ⁷	Aure et al ⁶	Goldby et al ⁸	Ferreira et al ⁹
Level of evidence	2b	2b	2b	2b
Validity score	PE德罗 6/11	PE德罗 8/11	PE德罗 10/11	PE德罗 9/11
Conclusion	Patients with CLBP who participated in an ST program demonstrated greater improvement on a functional test and a greater decrease in pain than those in the MT group, and those in the ST cohort required less follow-up care.	MT appears to significantly improve functioning and decrease pain in patients with CLBP. However, stabilization exercises still play an important role in the long-term treatment of CLBP. It is important for PTs to be knowledgeable in both types of treatments and be able to individualize their treatments to adapt to different patients and the underlying causes of their CLBP.	The SS approach was superior to MT or education. MT treatment is superior to education alone.	In the short term, the use of either MT or lumbar-stabilization exercises led to significantly better improvements in function and global perception outcomes than in a general exercise group.

CLBP, chronic low back pain; ST, stabilizing training; MT, manual therapy.

Stabilization exercises and manual therapy to the lumbar spine have documented efficacy, but future studies need to be conducted to determine whether 1 treatment approach is superior to the other. In addition, future research should attempt to identify homogeneous groups that are successfully treated with a particular approach. Identifying potential clinical prediction rules for treating patients with CLBP may improve the delivery of rehabilitation services for this population.

References

1. Flynn T, Fritz J, Whitman J, et al. A clinical prediction rule for classifying patients with low back pain who demonstrate short-term improvement with spinal manipulation. *Spine*. 2002;27:2835–2843.
2. Rasmussen-Barr E, Ang B, Arvidsson I, Nilsson-Wikmar L. Graded exercise for recurrent low-back pain: a randomized, controlled trial with 6-, 12-, and 36-month follow-ups. *Spine*. 2009;34:221–228.
3. Delitto A, Erhard RE, Bowling RW. A treatment-based classification approach to low back syndrome: identifying and staging patients for conservative treatment. *Phys Ther*. 1995;75: 470–485.
4. Hicks GE, Fritz JM, Delitto A, McGill SM. Preliminary development of a clinical prediction rule for determining which patients with low back pain will respond to a stabilization exercise program. *Arch Phys Med Rehabil*. 2005;86:1753–1762.
5. Centre for Evidence Based Medicine. Levels of Evidence. 2009. <http://www.cebm.net/index.aspx?o=1025>. Accessed December 1, 2009.
6. Aure OF, Nilsen JH, Vasseljen O. Manual therapy and exercise therapy in patients with chronic low back pain: a randomized, controlled trial with 1-year follow-up. *Spine*. 2003;28:525–531.
7. Rasmussen-Barr E, Nilsson-Wikmar L, Arvidsson I. Stabilizing training compared with manual treatment in sub-acute and chronic low-back pain. *Man Ther*. 2003;8:233–241.
8. Goldby LJ, Moore AP, Doust J, Trew ME. A randomized controlled trial investigating the efficiency of musculoskeletal physiotherapy on chronic low back disorder. *Spine*. 2006;31:1083–1093.
9. Ferreira ML, Ferreira PH, Latimer J, et al. Comparison of general exercise, motor control exercise and spinal manipulative therapy for chronic low back pain: a randomized trial. *Pain*. 2007;131:31–37.
10. Jewell DV. *Guide to Evidence-Based Physical Therapy Practice*. Sudbury, MA: Jones & Bartlett; 2008.