

Effect of physical therapy timing on patient-reported outcomes for individuals with acute low back pain: A systematic review with meta analysis of randomized controlled trials

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Abstract

Objective: The purpose of this systematic review with meta-analysis was to investigate the effect of early physical therapy (PT) for the management of acute low back pain (LBP) on patient-reported outcomes of pain and disability, compared to delayed PT or non-PT care.

Literature Survey: Randomized controlled trials in three electronic databases (MEDLINE, CINAHL, Embase) were searched from inception to June 12, 2020, and updated on September 23, 2021.

Methodology: Eligible participants were individuals with acute low back pain. The intervention was early PT compared to delayed PT or non-PT care. Primary outcomes included the patient-reported outcomes of pain and disability. The following information was extracted from included articles: demographic data, sample size, selection criteria, PT interventions, and pain and disability outcomes. Data were extracted following Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Methodological quality was assessed using the Physiotherapy Evidence Database (PEDro) Scale. Random effects models were used for the meta-analysis.

Synthesis: Seven of 391 articles met the eligibility criteria and were included in the meta-analysis. Random effects meta-analysis comparing early PT to non-PT care for acute LBP indicated a significant reduction in pain (standard mean difference [SMD] = 0.43, 95% confidence interval [CI]: -0.69 to -0.17) and disability (SMD = 0.36, 95% CI: -0.57 to -0.16) in the short term. Early PT compared to delayed PT did not result in improvement in short-term pain (SMD = -0.24, 95% CI: -0.52 to 0.04) or disability (SMD = 0.28, 95% CI: -0.56 to 0.01), or long-term pain (SMD = 0.21, 95% CI: -0.15 to 0.57) or disability (SMD = 0.14, 95% CI: -0.15 to 0.42).

Conclusions: This systematic review and meta-analysis suggest early PT versus non-PT care is associated with statistically significant reductions in short-term pain and disability (up to 6 weeks) with small effect sizes. The results indicate a nonsignificant trend favoring a small benefit of early PT over delayed PT for outcomes at short-term follow-up but no effect at long-term follow-up (6 months or greater).

INTRODUCTION

Low back pain (LBP) is a highly prevalent and costly musculoskeletal condition worldwide. It is the most common type of pain and 25% of U.S. adults have had an episode within the last 3 months.¹ LBP is associated with high health care use, medical expenditure, and reduced quality of life. LBP is also associated with high levels of pain, disability, and years lived with disability.^{2–4} In 2008, indirect costs associated with the management of LBP in the United States were estimated to be \$7.4 billion⁵ with direct costs estimated at \$34.2 million with 75% associated with medical treatment for pain.⁶ Further, health care costs for individuals with chronic LBP are double that of individuals with acute LBP.⁷ It is estimated that 75% of direct health services expenditures can be attributed to 25% of the back pain population.⁸

When considering the impact of physical therapy (PT) on patient outcomes, one must consider that PT represents a profession with heterogeneous treatment approaches and LBP is a heterogeneous condition. LBP studies are frequently hampered by a lack of subgrouping and consequently low effect sizes from various treatments.⁹ Nonetheless, LBP treatment guidelines include recommendations to initiate nonpharmacologic treatments commonly delivered in a PT practice such as pain education, advice to remain active, spinal manipulation, exercise, and in some cases, cognitive behavioral therapy and interdisciplinary rehabilitation.^{10–12} Recent studies support a more stratified approach to LBP care.^{13–15} Regarding PT interventions specifically, randomized controlled trials (RCTs) support a classification-based approach, which improves patient-reported outcomes through subgrouping patients by physical therapist evaluation and subsequently matching each subgroup with a more specific PT intervention.^{16,17}

Timing of the initiation of PT is another variable potentially affecting patient outcomes but is not included in medical treatment guidelines for LBP. Some studies have reported that patient outcomes are better when PT is accessed earlier as compared to non-PT initial management.^{18–21} However, drawing firm conclusions from these individual trials is challenging due to variable time points of entry, interventions used, outcomes captured, and follow-up periods. In a value assessment, the timing variable is an important one to study with respect to patient outcomes since it has already been shown that early entry to PT can reduce downstream health care use and costs.²² The purpose of this systematic review with meta-analysis is to better determine if early access to PT for the treatment of acute LBP is associated with improved patient-reported outcome measures, including pain and disability, compared to delayed PT or non-PT care.

METHODOLOGY

Searches and inclusion criteria

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed in the development of this systematic review.²³ The review was prospectively registered with the International Prospective Register of Systematic Reviews (PROSPERO) (CRD42020158144). A comprehensive literature search was conducted with assistance from a medical librarian in MEDLINE, CINAHL, and Embase databases from inception to June 12, 2020, and updated on September 23, 2021. A meta-analysis was performed when there were more than two studies to pool data on reported outcome measures for pain and/or disability. Details on the search strategy can be found in Appendix S1.

Inclusion criteria for studies in this review were as follows: (1) study designs were peer-reviewed RCTs; (2) study participants were at least 18 years old; (3) study participants had a newly diagnosed episode of LBP within the last 6 months prior to initial presentation; (4) the experimental group received early access to PT; (5) the comparison group received either delayed PT or non-PT care; and (6) studies assessed patient-reported outcomes including pain and/or disability. Exclusion criteria included the following: (1) study participants with an episode of back pain that was chronic or chronicity was not explicitly stated; (2) study participants with a prior history of lumbar surgery, red flag symptoms, or neurologic symptoms; (3) study investigated only a single PT intervention (which is not reflective of clinical practice); (4) study included interventions from other disciplines in addition to PT; and (5) study designs including case reports, editorial or qualitative studies, systematic review, non-peer reviewed, or abstract format only.

Selection of trials

Retrieved references were exported to an Endnote file and duplicates were removed. Endnote files were uploaded into Covidence,²⁴ an online software designed for screening and reviewing of studies for systematic review. Titles and abstracts were screened independently by two of three authors (C.C., D.A., A.M.), and a fourth author (D.C.) settled discrepancies. Full-text articles were similarly screened and discrepancies were resolved.

Data extraction

Two reviewers (C.C and D.A.) independently extracted the data and a third reviewer (J.F.) reviewed the

information to ensure accuracy and agreement. Further, the third reviewer (J.F.) reviewed to correct data when there was disagreement. The information was organized in a table that included study design, participants, timing, PT-based interventions, definitions of early PT and comparison groups, and patient-reported outcome measures measuring the domains of pain and disability.

Operational definitions of acute LBP, early PT, delayed PT and non-PT care

Acute LBP was defined <12 weeks of symptoms. Similar to a previous analysis comparing early PT and delayed PT, this study defined early PT as any PT initiated within 30 days of the index visit for LBP.²² The term “index date” is used throughout the article to describe the date of the first visit for LBP, not the patient’s recollection of the onset of their first symptoms. Delayed PT was defined as the onset of PT after at least 30 days from the index visit for LBP. Non-PT care was defined as LBP treatment by a provider other than a physical therapist. If a physical therapist provided generic education only without a specific or individualized PT intervention, then this education was still considered non-PT care for the purpose of this study. The term usual care can vary in definition across trials despite its use as a common comparator in intervention trials for individuals with LBP.²⁵ In the present study, “no care” or “usual care” were also included as non-PT care after ensuring that PT was not provided as part of “usual care.”

Methodological quality assessment

Methodological quality was assessed using the PEDro Scale. The PEDro Scale is a valid and reliable tool developed specifically for RCTs investigating PT management.^{26,27} The tool includes 11 items and is scored out of 10. The first item, study eligibility, is not used in the total score. The higher the score the higher the quality of study and less risk of bias. PEDro scores are scored among trained members of PEDro. These scores are available to the consumer. This tool was selected over the Cochrane Risk of Bias tool because it is specific to PT trials.²⁸

Statistical analysis

A meta-analysis was performed to compare pain and/or disability outcomes between early PT and delayed PT and early PT and non-PT care when adequate study homogeneity was identified. For the purpose of the meta-analysis, effects on pain or disability evaluated at

short-term follow-up (which we refer to here as “short-term pain” and “short-term disability”) were estimated by outcomes assessed at 6 weeks post randomization or less. Similarly, effects on pain or disability evaluated at long-term follow-up (which we refer to as “long-term pain” and “long-term disability”) were estimated by outcomes assessed at 6 months or greater. Comparisons were made for short- and long-term effects. Data for pain and disability scores were pooled for meta-analysis using RevMan 5 version 5.4.1. A random-effects model was used for all meta-analyses due to the population variance across studies.²⁹ Due to differences in the outcomes used across studies, standard mean differences (SMD) with 95% confidence intervals (CIs) were calculated. Study heterogeneity was represented by the I^2 statistics. Heterogeneity scores were interpreted as high (>75%), moderate (50%–75%), and low (25%–50%).³⁰ Effect sizes were interpreted as large if greater than 0.8, moderate if between 0.5 and 0.8, and small if between 0.2 and 0.5.³¹

Deviations from the protocol

The original plan was to use the Cochrane Risk of Bias tool; however, the research team used the Physiotherapy Evidence Database (PEDro) methodological quality assessment tool. Further, the original study plan was to include prospective and retrospective cohort studies; however, the determination was made to include only RCTs so that a meta-analysis inclusive of all trials could be reported.

RESULTS

Study selection

The initial search strategy resulted in 391 records, from which seven full texts were assessed. Seven trials were included in the meta-analysis based on the homogeneity of study design and outcome measures used. Figure 1 details the flow of the study selection process.

Study characteristics

The extracted data from all studies are included in Table 1. All seven studies were RCTs^{18,19,21,32–35} with one being a pilot RCT or feasibility study.¹⁸ These RCTs had sample sizes ranging from 40 to 220 participants.

Methodological quality

Methodological quality was variable across studies with scores ranging from 4 to 8 with a maximum possible

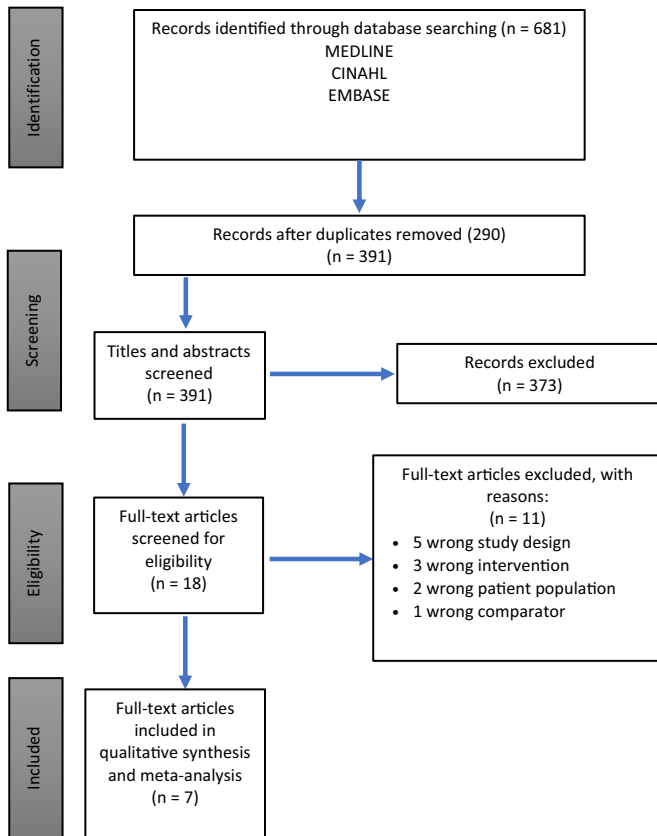


FIGURE 1 Flow diagram showing study selection.

score of 10 (Table 2). The most problematic domains were the blinding of patients and assessors. Blinding of participants and assessors is often difficult in clinical trials where the timing of the intervention is being studied.

Summary of the evidence

Description of PT

PT interventions included education (staying active and avoiding bed rest), exercise and exercise progression (including range of motion, spinal stabilization/strengthening and extension-biased exercise if indicated), and manual therapy (including thrust and non-thrust manipulation techniques). Four studies included PT interventions that were pragmatic, in other words, individualized to each patient.^{18,19,21,35} One study had a prescriptive approach with all patients receiving the same intervention across the early PT participants.³³ Two studies included a more prescriptive approach to intervention initially, followed by a pragmatic approach after a specified time period or number of visits.^{32,34} The number of PT visits ranged from one to eight visits across studies. Detailed descriptions of interventions used in each study can be found in Table 1.

Definitions of early PT, delayed PT, and non-PT care

Six studies reported on the results of early PT initiated within 48–72 hours of the index date of the first visit for LBP.^{19,21,32–35} One study defined early PT ranging from the primary index date to within 14 days of the index visit date.¹⁸ Although our operational definition of early PT for study inclusion allowed PT to be initiated up to 30 days following the index visit for LBP, all studies included in this analysis initiated early PT within 14 days of the index visit and most did so within 72 hours.

Three studies compared early PT to delayed PT; time windows of initiation of delayed PT were variable due to differing study designs and ranged from 4 to 6 weeks after the index visit date.^{18,21,35} Early PT intervention and delayed PT interventions were the same in each of the groups across the studies. However, one study included a component of advice on the index visit prior to initiation of a delayed PT hold time of 6 weeks.³⁵

Four studies compared early PT to non-PT care.^{19,32–34} Descriptions of non-PT care, often referred to as usual care in the studies, varied among the four studies. One study included a 20-minute education session on self-management and psychosocial resilience for both groups (PT and non-PT care groups) at the primary index date.³² Two studies comparing early PT to non-PT care included the use of the “Back Book”³⁶ and an education session including reassurance of a favorable prognosis and advice to be active, implemented on the index visit for both groups.^{19,33} One study provided nonspecific back massage and standard back advice to the non-PT care group over the same number of visits as the early-PT group.³⁴

Pain

Patient-reported outcome measures used to measure pain varied among studies. Two studies used the visual analog scale (VAS)^{18,35} and five studies used the numeric pain rating scale (NPRS).^{19,32,33} In addition to the VAS, Wand and colleagues³⁵ used the usual pain intensity and the Modified Somatic Perception Questionnaire (MSPQ). The Borg category scale for ratings of perceived pain and the Orebro musculoskeletal pain screening questionnaire were both used by the same study.²¹ The study by Gillan et al.³⁴ did not use pain as a primary or secondary outcome measure.

Pain: Early PT versus delayed PT

Three studies investigated early PT versus delayed PT for short- and long-term pain.^{18,21,35} Reddington et al.

TABLE 1 Study characteristics

Early PT versus delayed PT		Intervention		Outcomes		Results	
Participants		Intervention		Outcomes		Results	
Study design	Sample size; mean age (Y) and SD	Participant eligibility	Early	Delayed	Outcome measure follow-up	Pain	Disability
Nordeman et al. ³⁰ Prospective RCT	n = 60 33.4	18–65 years old with subacute LBP (3–12 weeks from onset) localized to the low back with or without LE symptoms	PT within 2 days PT treatment was individualized based on history and physical examination; 1 visit	PT after 4 weeks PT treatment was individualized based on history and physical examination; 1 visit	BRPP (pain) RMDQ (disability) Baseline Discharge 6 months	No significant difference in pain from baseline to discharge was found between groups. Early PT was associated with significantly greater reduction in pain, compared to delayed PT at 6 months.	No significant difference in disability from baseline to discharge was found between groups. No significant difference in disability from baseline to 6 months was found between groups.
Reddington et al. ²⁷ Pilot RCT	n = 80 47 (13.5)	>18 years old with unilateral lumbar radicular pain and/or nerve root symptoms	PT within 2 weeks Individualized, goal-oriented PT based on interview, PROMs and clinical assessment; 6 visits over 8 weeks	PT after 6 weeks Individualized, goal-oriented PT based on interview, PROMs and clinical assessment; 6 visits over 8 weeks	VAS (pain) ODI (disability) Baseline 6 weeks 12 weeks 26 weeks	Early PT was associated with decreased pain up to 6 weeks. When the delayed PT group began their PT at 6 weeks, the rate of recovery assimilated and by 12 weeks, both groups had similar pain levels.	Early PT was associated with improved disability up to 6 weeks. When the delayed PT group began their PT at 6 weeks, the rate of recovery assimilated and by 12 weeks, both groups had similar function.
Wand et al. ³⁵ Prospective RCT	n = 94 35 (8.5)	20–55 years old with acute LBP <6 weeks referred to physical therapy	PT within same day Advice on staying active and “Back Book.” Pragmatic, evidence-based approach including manual therapy (low velocity mobilization and high velocity manipulation), rehabilitation exercises including ROM and strength, advice on staying active and	PT after 6 weeks Advice on staying active and “Back Book.” on index date. Pragmatic, evidence-based approach including manual therapy (low velocity mobilization and high velocity manipulation), rehabilitation exercises including ROM and strength, advice on	VAS (pain) RMDQ (disability) Baseline 3 months 6 months	Early PT was not associated with significant improvements in pain at 6 weeks. After 3 and 6 months, pain was not significantly different between groups.	Early PT was associated with significant improvements in disability at 6 weeks. After 3 and 6 months, disability was not significantly different between groups.

(Continues)

TABLE 1 (Continued)

Early PT versus delayed PT		Intervention		Outcomes		Results	
Study design	Participants and SD	Participant eligibility	Early	Delayed	Outcome measure follow-up	Pain	Disability
Fritz et al. ¹⁶ Prospective RCT	n = 220 37.4 (10.3)	18–60 years old with no LBP treatment in the past 6 months, ODI score ≥ 20 , symptoms duration < 16 days, and no symptoms distal to the knee in the past 72 h	PT within 72 h Received education about the favorable prognosis of LBP and a copy of the “Back Book.” PT included prescriptive approach including spinal manipulation, spinal ROM exercises, trunk strengthening and exercise progression; 4 visits over 3 weeks.	No PT Received education about the favorable prognosis of LBP and a copy of the “Back Book.”	NPRS (pain) ODI (disability) Baseline 4 weeks 3 months 1 year	Early PT was not associated with a significant improvement in pain intensity at 4 weeks, 3 months, and 1 year.	Early PT was associated with a significant improvement in disability at 4 weeks and 3 months, but not 1 year.
Fritz et al. ²⁸ Prospective RCT	n = 220 39 (11.2)	18–60 years old with sciatica, ODI score ≥ 20 , symptoms present 90 days or less, and symptoms distal to the knee in the past 72 h	PT within 72 h Received education about the favorable prognosis of LBP and a copy of the “Back Book.” PT included pragmatic approach including manual therapy (mobilization and high velocity manipulation) and exercise including instruction in HEP; 6–8 visits over 4 weeks.	No PT Received education about the favorable prognosis of LBP and a copy of the “Back Book.”	NPRS (pain) ODI (disability) Baseline 4 weeks 3 months 1 year	Early PT resulted in significantly greater improvements in pain intensity at 4 weeks, 6 months, and 1 year.	Early PT resulted in significantly greater improvements in disability, at 4 weeks, 6 months, and 1 year.
Gillan et al. ³⁴ Prospective RCT	n = 40 29–58	Back pain less than 12 weeks in duration and with a presence of a lateral shift	PT within 1 week McKenzie management; standard protocol (prescriptive); 2–3 visits/week for 1 week then at PT discretion (pragmatic).	No PT No physical intervention except for nonspecific back massage and standard back advice; 2–3 visits/week for 1 week then at PT discretion.	ODI (disability) Baseline (day 1) 28 days 90 days	NA	No significant between group differences in disability at any time point.
Rhon et al. ³² Prospective RCT	n = 119 27.2 (6.5)	18–60 years old military service members with LBP < 90 days in duration and ODI > 20	PT within 72 h 20-min educational session focusing on evidence based self-	No PT 20-min educational session focusing on evidence based self-	NPRS (pain) ODI (disability) Baseline 4 weeks	There was no difference in the NPRS at any of the time points.	Early PT was associated with significantly lower levels of disability

TABLE 1 (Continued)

Early PT versus delayed PT			
Participants	Intervention	Outcomes	Results
<p>Sample size; mean age (Y) and SD</p> <p>Participant eligibility</p>	<p>Early</p> <p>management of LBP. TBC^a approach including manual therapy, exercise, or an extension-based program. After 2 weeks of a TBC approach PTs could follow a pragmatic approach; patients were treated up to 8 visits.</p>	<p>Delayed</p> <p>based self-management of LBP.</p> <p>Outcome measure follow-up</p> <p>3 months 1 year</p>	<p>Pain</p> <p>Pain</p> <p>Disability</p> <p>at 4 weeks, but not 1 year.</p>

Abbreviations: BRPP, Borg category scale for ratings of perceived pain; HEP, home exercise program; LE, lower extremity; LBP, low back pain; NPRS, numeric pain rating scale; ODI, Oswestry disability index; PROMs, patient-reported outcome measures; PT, physical therapy; PTs, physical therapists; RCT, randomized control trial; RMDQ, Roland and Morris disability questionnaire; ROM, range of motion; TBC, treatment-based classification; VAS, visual analog scale.

^aThe TBC approach attempts to match a patient with an appropriate treatment based on their clinical presentation and relevant impairments based on examination findings.

demonstrated significant reductions in pain between groups (measured by the VAS) at 6 weeks.¹⁸ Nordeman et al.²¹ did not report differences in pain at patient discharge; however, the authors did report a significant difference in pain between the early and delayed PT groups at 6 months favoring early PT. Similarly, Wand et al.³⁵ demonstrated between-group differences in pain at 6 months as measured by the MSPQ. When results of RCTs were pooled, no effect was found for short-term pain (SMD = -0.24, 95% CI: -0.52 to 0.04) or long-term pain (SMD = 0.21, 95% CI: -0.15 to 0.57), (Figure 2A, B).

Pain: Early PT versus non-PT care

Three studies investigated early PT versus non-PT care for short- and long-term pain.^{19,32,33} The study by Rhon et al.³² did not show a difference on the NPRS at all time points (4 weeks, 3 months, 1 year). Two studies by Fritz et al. found significant between-group differences in pain as measured by the NPRS at 4 weeks,^{19,33} 3 months,³³ 6 months, and 1 year.¹⁹ When results were pooled, a small effect (SMD = 0.43, 95% CI: -0.69 to -0.17) was found favoring early PT for short-term pain. No effect was found for long-term pain (SMD = 0.15, 95% CI: -0.40 to 0.09), (Figure 3A, B).

Disability

Measures of disability across studies included the Oswestry Disability Index (ODI) and the Roland and Morris disability questionnaire (RMDQ). Five studies used the ODI^{18,19,32-34} and two studies used the RMDQ to measure disability.^{21,35}

Disability: Early PT versus delayed PT

Three studies investigated early PT versus delayed PT for short- and long-term disability.^{18,21,35} The study by Reddington et al.¹⁸ demonstrated improvement in the ODI in the early PT group up to 6 weeks; however, both groups had similar outcomes by 12 weeks. Similar findings were reported by Wand et al.³⁵ with improvement in disability as measured by the RMDQ (compared to the delayed PT group) at 6 weeks, but with no significant differences between groups at 3 and 6 months. Nordeman et al.²¹ measured disability with the RMDQ and reported no significant differences between groups at discharge and at 6-month follow-up. When results were pooled, no effect was found for short-term disability (SMD = 0.28, 95% CI: -0.56 to 0.01) or long-term disability (SMD = 0.14, 95% CI: -0.15 to 0.42), (Figure 2C, D).

TABLE 2 Methodological Quality

Study	Physiotherapy Evidence Database (PEDro)											Total score/10 (Eligibility does not contribute to total score)
	1	2	3	4	5	6	7	8	9	10	11	
Fritz et al. ¹⁶	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Fritz et al. ²⁸	Y	Y	Y	Y	N	N	Y	Y	N	Y	Y	7
Gillan et al. ³⁴	Y	Y	N	Y	N	N	Y	N	N	Y	N	4
Nordeman et al. ³⁰	Y	Y	Y	N	N	N	N	Y	Y	Y	Y	6
Reddington et al. ²⁷	Y	Y	N	Y	N	N	N	Y	N	Y	Y	5
Rhon et al. ³²	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	7
Wand et al. ³⁵	Y	Y	Y	Y	N	N	Y	N	Y	Y	Y	7

Note: PEDro items indicated whether the study clearly described the following topics: 1. Eligibility was specified. 2. Participants were randomly allocated. 3. Allocation was concealed. 4. Groups were similar at baseline. 5. Participants were blinded. 6. Therapists were blinded. 7. Assessors were blinded. 8. Measures of one key outcome were obtained from more than 85% of the initial allocated group. 9. All participants were available and received treatment or control as allocated or, if not the case, were analyzed by "intention to treat." 10. Results of between-group statistical comparisons are reported for at least one key outcome. 11. Study provides both point measures and measures of variability for at least one key outcome.

Disability: Early PT versus non-PT care

Three studies investigated early PT versus non-PT care for short- and long-term disability.^{19,32,33} Three prospective RCTs demonstrated significant between-group differences on the ODI at 4 weeks^{19,32,33} with significant improvement in disability and function between groups at 3 months³³ and 6 months.¹⁹ One study demonstrated significant effects on disability at 1 year favoring early PT.¹⁹ Rhon et al.³² did not demonstrate between-group changes at 1 year; however, there was a significant improvement from baseline to 1 year within groups on the ODI. Gillan et al.³⁴ also reported improvement within groups, as measured by the ODI; however, there were no significant differences between groups at 28- and 90-day follow-up. Pooled results demonstrated a small effect (SMD = 0.36, 95% CI: -0.57 to -0.16) that favored early PT for short-term disability. No effect was found for long-term disability (SMD = 0.19, 95% CI: -0.39 to 0.02), (Figure 3C, D).

DISCUSSION

The purpose of this systematic review with meta-analysis was to determine if early access to PT for the treatment of acute LBP is associated with improved patient-reported outcomes including pain and disability compared to either non-PT care or delayed PT. We identified seven prospective RCTs^{18,19,21,32-35} evaluating early PT versus delayed PT or non-PT care in individuals with acute LBP and all seven trials were included for meta-analysis. Our results indicate a nonsignificant trend favoring a small benefit of early PT over delayed PT for outcomes at short-term follow-up, but no effect at long-term follow-up. Early PT versus non-PT care is associated with statistically significant reductions in

short-term pain and disability (up to 6 weeks) with small effect sizes. No effect was found for pain or disability at longer follow-up time points.

The following sections aim to better explain these findings, interpret the findings in the context of a value equation, and highlight clinical implications, limitations, and future directions for research.

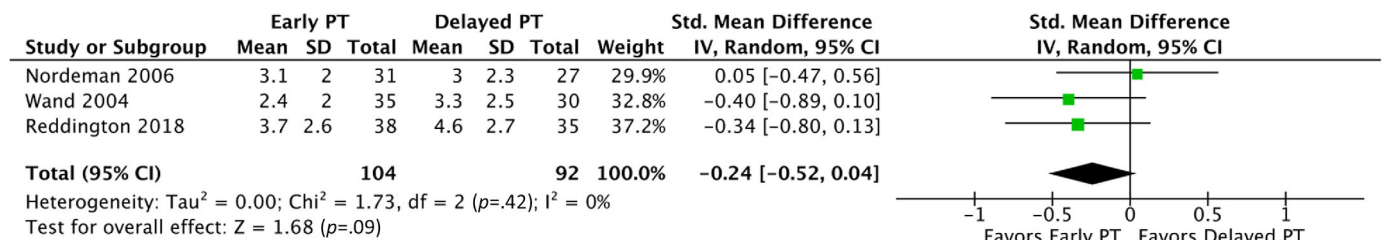
Early PT versus delayed PT

This meta-analysis shows that early PT after an episode of acute LBP resulted in a nonsignificant trend towards a reduction in pain and disability compared to delayed PT in the short term, but no long-term effects were seen.^{18,21,35} The individual studies included in this analysis did demonstrate significant improvements in pain (between groups) up to 6 weeks¹⁸ and disability up to 6 weeks^{18,35} but the effects were small and it is possible that rates of recovery were similar between groups by the long term.^{18,35} One study reported decreased pain in the early PT group compared to delayed PT at 6 months; however, the effects were small and the description of the intervention was limited.²¹ Additionally, interventions between early PT and delayed PT groups were pragmatic and variable, potentially washing out any significant effect. Continued efforts toward appropriate patient subgrouping and matched treatment protocols in prospective studies will improve future investigations of early versus delayed PT.^{16,37}

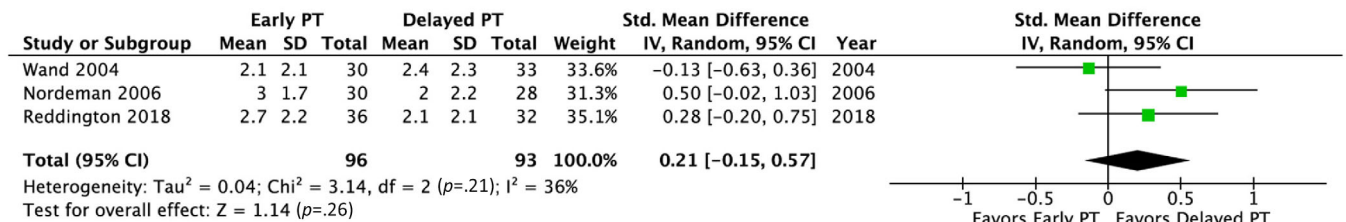
Early PT versus non-PT care

Compared to non-PT care, early PT led to short-term improvements in pain and disability but showed no difference long term. Exactly what components of PT led to early improvements is not clear from this analysis.

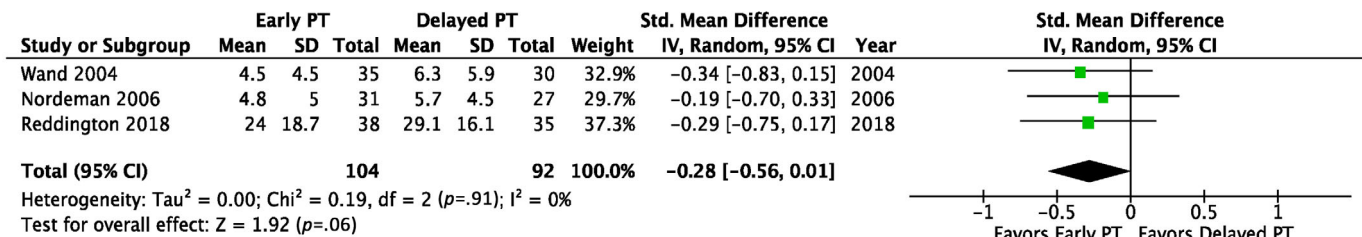
(A) Short-Term Pain



(B) Long-Term Pain



(C) Short-Term Disability



(D) Long-Term Disability

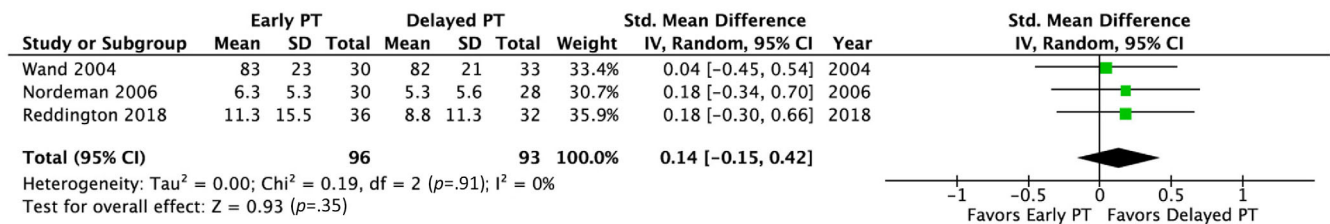


FIGURE 2 Early physical therapy versus delayed physical therapy. CI, confidence interval; PT, physical therapy; Std., standard.

PT interventions were performed and the number of visits varied across studies. Guideline-adherent early PT for LBP traditionally emphasizes acute pain management through manual therapy with postural corrections, pain education, and reassurance³⁸ which may have less effect on patient-reported outcomes in the long term. Alternatively, certain patient subgroups, such as those with sciatica, may see longer-lasting improvement with early PT than others.¹⁹

The lack of significant long-term differences in the current analysis may also be explained by the early education and advice to stay active dispensed to both groups in the included studies.^{19,32–34} Some subgroups of individuals with LBP benefit from just one session of education and advice about medication, work, and activity.^{14,15,33} Patient stratification using screening

tools may be helpful in directing the intensity of PT care provided to patients with acute LBP.^{13–15} An additional consideration is the lack of an active comparator group when using a non-PT control, as well as the difficulty in blinding patients. This can potentially lead to short-term benefits but the effects of treatment would likely diminish over time.

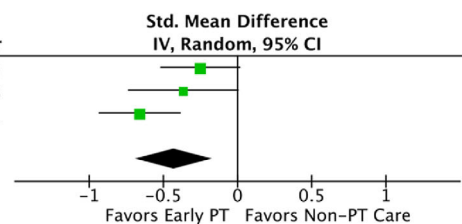
Clinical implications

This review suggests that early PT when compared to non-PT care may lead to a greater reduction in pain and disability up to 6 weeks following initiation of care; however, the effects between groups was small. With respect to pain and disability scores, early PT does not

(A) Short-Term Pain

Study or Subgroup	Early PT			Non-PT Care			Weight	Std. Mean Difference IV, Random, 95% CI	Year
	Mean	SD	Total	Mean	SD	Total			
Fritz 2015	1.7	1.5727	108	2.1	1.6022	112	36.7%	-0.25 [-0.52, 0.01]	2015
Rhon 2018	3.21	2.32	56	4.06	2.3	59	27.1%	-0.37 [-0.73, 0.00]	2018
Fritz 2021	-2.4	2.1167	110	-1	2.1167	110	36.1%	-0.66 [-0.93, -0.39]	2021
Total (95% CI)			274			281	100.0%	-0.43 [-0.69, -0.17]	

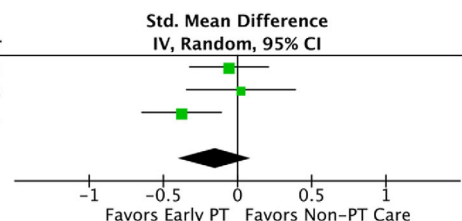
Heterogeneity: Tau² = 0.03; Chi² = 4.60, df = 2 (p=.10); I² = 57%
Test for overall effect: Z = 3.22 (p=.001)



(B) Long-Term Pain

Study or Subgroup	Early PT			Non-PT Care			Weight	Std. Mean Difference IV, Random, 95% CI	Year
	Mean	SD	Total	Mean	SD	Total			
Fritz 2015	1.3	1.8872	108	1.4	1.6022	112	36.9%	-0.06 [-0.32, 0.21]	2015
Rhon 2018	3.74	2.54	56	3.68	2.69	59	26.4%	0.02 [-0.34, 0.39]	2018
Fritz 2021	-2.3	2.1167	110	-1.5	2.1167	110	36.7%	-0.38 [-0.64, -0.11]	2021
Total (95% CI)			274			281	100.0%	-0.15 [-0.40, 0.09]	

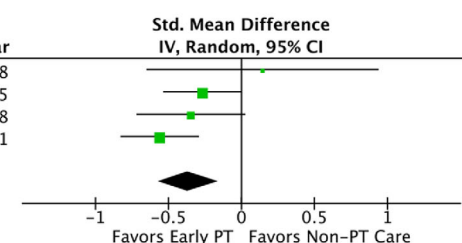
Heterogeneity: Tau² = 0.02; Chi² = 4.07, df = 2 (p=.13); I² = 51%
Test for overall effect: Z = 1.24 (p=.22)



(C) Short-Term Disability

Study or Subgroup	Early PT			Non-PT Care			Weight	Std. Mean Difference IV, Random, 95% CI	Year
	Mean	SD	Total	Mean	SD	Total			
Gillan 1998	19	15	11	17	12	14	6.2%	0.14 [-0.65, 0.94]	1998
Fritz 2015	11.1	12.5816	108	14.5	12.8177	112	35.4%	-0.27 [-0.53, -0.00]	2015
Rhon 2018	22.19	12.8	56	26.57	12.29	59	22.8%	-0.35 [-0.72, 0.02]	2018
Fritz 2021	-17	14.2877	110	-8.8	14.8735	119	35.6%	-0.56 [-0.82, -0.30]	2021
Total (95% CI)			285			304	100.0%	-0.36 [-0.57, -0.16]	

Heterogeneity: Tau² = 0.01; Chi² = 4.20, df = 3 (p=.24); I² = 29%
Test for overall effect: Z = 3.49 (p=.0005)



(D) Long-Term Disability

Study or Subgroup	Early PT			Non-PT Care			Weight	Std. Mean Difference IV, Random, 95% CI	Year
	Mean	SD	Total	Mean	SD	Total			
Fritz 2015	7	11.53	108	9	11.75	112	38.0%	-0.17 [-0.44, 0.09]	2015
Rhon 2018	24.26	16.91	56	23.46	17.74	59	24.4%	0.05 [-0.32, 0.41]	2018
Fritz 2021	-22.4	15.3461	110	-17	15.3461	110	37.7%	-0.35 [-0.62, -0.08]	2021
Total (95% CI)			274			281	100.0%	-0.19 [-0.39, 0.02]	

Heterogeneity: Tau² = 0.01; Chi² = 3.01, df = 2 (p=.22); I² = 34%
Test for overall effect: Z = 1.75 (p=.08)

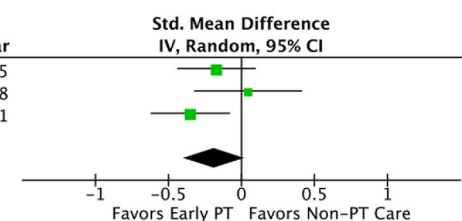


FIGURE 3 Early physical therapy versus non-physical therapy care. CI, confidence interval; PT, physical therapy; Std., standard.

appear to be superior to non-PT care or delayed PT care beyond 6 months.

Strengths and limitations

This systematic review has some strengths. Most notably the authorship team followed methodological standards for systematic reviews with meta-analysis. However, this review also has limitations. The small number of RCTs and the underpowering of studies included in the analysis affect their ability to detect change. LBP is not homogenous. The population variance across studies is another limitation. Inconsistency in the type of LBP and the population studied decreases the overall impact of the results. We used a random-effects model versus a fixed-effects model due

to the population variance, which will appropriately decrease the effect size. More studies with improved subgrouping of LBP populations may provide more clarity regarding the overall effect of early versus delayed PT. Another limitation is that two of the studies that demonstrated a significant finding favoring early PT are from the same authorship team.^{19,33} However, the samples are distinct and the methods are unique to the aim of each of those studies.

Further, the varying risk of bias scores may have affected fidelity of the results. To that point, blinding to early versus delayed or non-PT care in the context of an RCT is generally not possible, thus affecting risk of bias scores and introducing potential bias toward finding a beneficial effect of PT. The homogeneous nature of the data reporting allowed for pooling of data for meta-analytic procedures yet the heterogeneity of the

interventions (including a lack of a consistent definition of what constitutes PT) and the inclusion of interventions in study control groups is a significant limitation. The definition of “physical therapy” as an intervention was broad and included pragmatic and prescriptive approaches as well as a range of intervention approaches and techniques. Further, the number of visits included in “physical therapy” as an intervention ranged from one to eight visits, which is divergent. Another limitation was the component of patient education. The same education session was provided to both the intervention group and the control in early PT versus delayed PT (provided on index date)³⁵ and in early PT versus non-PT care^{19,32–34} making it difficult to determine the true impact of no care compared to PT care, which often includes a strong patient education component to compliment other interventions.³⁹ The combined effect of these limitations makes it very difficult to analyze and interpret results.

CONCLUSION

This systematic review and meta-analysis suggest a possible small beneficial effect of early PT versus non-PT care in the short term that is not seen in the long term. No effect was found when comparing early PT to delayed or non-PT care in the long term (beyond 6 months). Further study is necessary to determine if the structured education provided to both the intervention and control groups of the included studies reduced the between-group differences, or if certain patient subgroups would show a stronger treatment effect from early PT. Research efforts should continue to explore the optimal timing and types of acute LBP interventions that are most valuable for reducing recurrences and chronic LBP.


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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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