

Condensed Exercise-Focused Physical Therapy for Adult Musculoskeletal Pain: A Systematic Review and Meta-analysis

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Abstract

Musculoskeletal disorders are the most common causes of disability across the globe and are also a significant contributor to pain, functional impairment, and the use of healthcare. Traditional physical therapy can be administered in several supervised sessions, but condensed physical therapy models with the focus on education and self-management, founded on exercise, have become a possible option. This meta-analysis and systematic review tried to prove the efficacy of single and multi-session exercise-oriented physical therapy cases in adults with musculoskeletal pain. Randomized controlled trials on the effects of condensed physical therapy interventions were identified by means of a systematic search of key electronic databases, such as PubMed, Scopus, Web of Science, and Cochrane Library. Qualified studies comprised of adult participants with musculoskeletal pain who had to receive single-session or brief forms of exercise-based physical therapy versus the traditional multi-session physical therapy. The synthesis was done by meta-analysis based on standardized mean differences and 95 percent confidence intervals of quantitative outcomes.

They included six randomized controlled trials (2,090 participants). The meta-analysis revealed that there were no clinically significant differences between condensed and multi-session exercise therapy on pain/functional outcome/ health-related quality of life at any point of follow-up. Multi-session interventions were found to have a small short-term gain in terms of pain reduction at six months, but were not long-term. In general, it seems that condensed exercise-based physical therapy interventions have similar clinical benefits to traditional multi-session therapy. These results indicate that simplified physical therapy models can provide an effective and affordable way of addressing musculoskeletal pain and maintaining sustainable healthcare provision.

Keywords: Musculoskeletal pain; physical therapy; exercise therapy; meta-analysis; systematic review; rehabilitation; pain management.

INTRODUCTION

Musculoskeletal disorders (MSKDs) represent a substantial global health burden, affecting approximately 1.71 billion individuals worldwide (Cieza et al., 2020). These conditions rank first in years lost to disability according to recent Global Burden of Disease reports (Vos et al., 2020), contributing to significant personal suffering, psychological distress, and economic costs through healthcare expenditures and workforce productivity losses (Björnsdóttir et al., 2014; Gaskin & Richard, 2012). The persistent nature of many musculoskeletal pain conditions creates chronic challenges for healthcare systems globally, particularly as aging populations increase the prevalence of degenerative musculoskeletal conditions.

Current approaches to musculoskeletal pain management often involve pharmacological interventions, imaging

procedures, and passive treatment modalities that may not adequately address the underlying causes or promote long-term self-management (Buchbinder et al., 2018). Traditional multi-session physical therapy programs, while commonly prescribed, face significant implementation challenges, including lengthy wait times, high costs, and limited accessibility, particularly for individuals from lower socioeconomic backgrounds who demonstrate a higher prevalence of musculoskeletal conditions (Todd et al., 2019). These systemic limitations have prompted critical examination of whether streamlined, resource-efficient physical therapy approaches could deliver comparable clinical outcomes while improving access and reducing healthcare inequities.

Recent paradigm shifts in musculoskeletal care emphasize patient education, exercise prescription, and self-

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management as foundational components of effective treatment (Lafrance et al., 2021; Lin et al., 2020). Several clinical trials have suggested that brief, education-focused interventions may yield outcomes similar to more intensive multi-session programs for specific musculoskeletal conditions (Darnall et al., 2021; Hopewell et al., 2021). This systematic review and meta-analysis were conducted to comprehensively evaluate the comparative effectiveness of single-session versus multiple-session exercise-focused physical therapy interventions across diverse musculoskeletal pain conditions in adults.

This systematic review and meta-analysis aimed to compare the effectiveness of single-session versus multiple-session exercise-focused physical therapy in adults with any musculoskeletal pain condition. The study assessed whether condensed physical therapy leads to clinically important differences in pain, function, and quality of life compared with traditional multiple-session programs. This review brings together evidence from randomized controlled trials to inform clinical practice guidelines and health policy regarding optimal models for delivering physical therapy services for musculoskeletal pain.

METHODS

2.1 Research Design and Framework

The present study was a systematic review and meta-analysis study whose synthesis method was based on mixed-method research to determine the effectiveness of condensed exercise-based physical therapy programs in adults with musculoskeletal pain. To achieve transparent reporting and reproducibility of the report, the review was conducted in accordance with the reporting standards of the Preferred Reporting Items of Systematic Reviews and Meta-Analyses (PRISMA). The research question and the eligibility criteria were designed based on the PICO Framework, and the target population was adults experiencing musculoskeletal pain. The intervention was condensed/single-session exercise-based physical therapy, the comparator turned out to be either multi-session-based physical therapy or standard care, and the outcome was the level of pain, physically related quality of life, or physical function. Randomized controlled trials were synthesized to provide quantitative results, which were analyzed by implementing meta-analysis, and the interpretation of the characteristics of the interventions and the context in which they were followed was qualitative.

2.2 Search Strategy and Selection Criteria

A comprehensive literature search was conducted following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021). Five electronic databases (AMED, CINAHL Complete, SPORTDiscus, MEDLINE, Physiotherapy Evidence Database) and one clinical trial registry (Cochrane Register of Clinical Trials) were searched from inception to September 12, 2022. The search strategy incorporated terms related to: (1) provider ("Physical Therapy," "Physiotherapy"), (2) condition ("Pain," "Hip," "Knee," "Shoulder," "Spine," "Musculoskeletal"), (3) study design ("RCT," "Randomized Controlled Trial"), and (4) intervention ("Single," "One-to-one," "Advice," "Exercise," "Education").

Search strategies were tailored to the syntax and indexing of each database. The researcher looked through the references of relevant systematic reviews and trials to identify further research. Documentation for the complete search strategy for each database is in appendix. Using Rayyan web application, two independent reviewers screened titles and abstracts, with review of the full text of possibly eligible articles. A third reviewer was consulted to resolve the discrepancies.

2.3 Eligibility Criteria

The eligibility criteria for studies were as follows: (1) adults (18 years) with musculoskeletal pain conditions enrolled; (2) randomized controlled trials; (3) at least one outcome of interest (pain, function, quality of life) reported; (4) one face-to-face physical therapy session compared to multiple physical therapy sessions; (5) published in full (not conference abstracts); (6) published in English. The individual in-person session utilized a variety of intervention elements (education, exercise prescription, manual therapy) delivered in one contact. Interventions delivered over two or more supervised sessions, such as exercise, manual therapy, education, or other physical therapy modalities. The researcher did not include studies involving pediatric populations, non-musculoskeletal conditions, or those with no extractable outcome data.

2.4 Data Extraction and Management

One reviewer undertook the data extraction while the other two reviewers verified. Extracted information includes study characteristics (author, year, country, design), participant characteristics (sample size, age, sex, diagnosis, duration of symptoms), intervention characteristics (form

of one-off, duration, frequency, comparator), outcome measures, and outcome results at specified time points. After the intervention, standard outcome assessment time points were 3, 6, and 12 months. In instances where studies reported different time points, the nearest available data were used. For example, 4 months of data for the 3-month analysis, etc.

2.5 Risk of Bias and Quality Assessment

Methodological quality of included studies was assessed using the Cochrane Risk of Bias tool 2.0 (Sterne et

al., 2019), evaluating five domains: randomization process, deviations from intended interventions, missing outcome data, outcome measurement, and selective reporting. Each domain was rated as “low risk,” “some concerns,” or “high risk.” Two reviewers independently assessed each study, with disagreements resolved through consensus discussion. Additionally, Physical therapy Evidence Database (PEDro) (Maher et al., 2003) scores were extracted or calculated for each included trial to provide complementary quality assessment. A visual demonstration of the risk bias analysis is given in Figure 1.

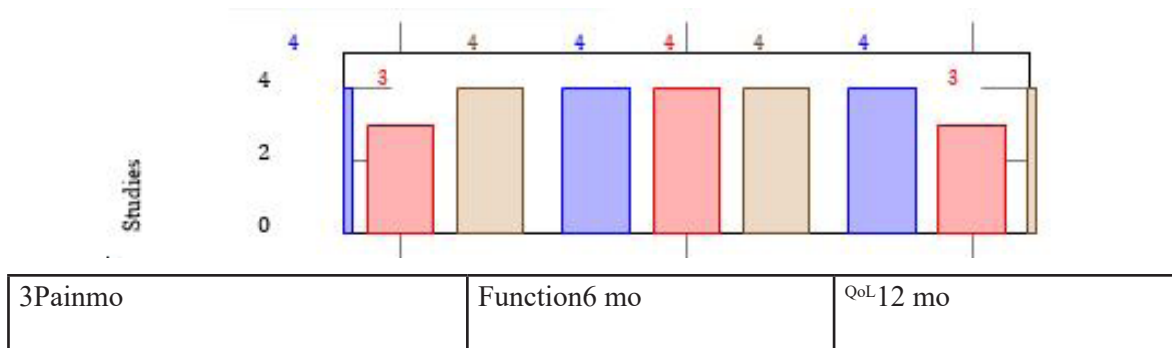


Figure 1 Studies included in meta-analyses across follow-up durations for pain, function, and QoL.

2.6 Data Synthesis and Analysis

For continuous outcomes measured with different scales, standardized mean differences (SMD) with 95% confidence intervals were calculated using random-effects models in Review Manager 5.4. For outcomes measured with identical scales, mean differences (MD) with 95% CIs were calculated. The meta-analysis used to serve as a random-effects model to address the variability (both clinical and methodological) between studies. Effect sizes were interpreted using Cohen’s conventions: trivial (<0.2), small (0.2-0.49), moderate (0.5-0.79), and large (0.8) (Cohen, 1988; Keskin, 2013). Statistical heterogeneity was assessed using I^2 statistics, with values $>40\%$ indicating substantial heterogeneity. A figure of 25, 50, and 75 was referred to as the low, moderate, and high heterogeneity values, respectively. Where quantitative pooling was inappropriate, findings were summarized narratively. In certain instances, where applicable, statistical techniques like the regression test of Egger were taken into account further to analyze possible bias in the study’s effect dispersion.

2.7 Mixed-Methods Integration

Along with quantitative synthesis, the mixed-method approach was employed in order to derive

contextual peculiarities of the interventions included. This methodology allowed combining both numerical results of a meta-analysis and descriptive data about intervention delivery, exercise prescription, the elements of patient education, and aspects of implementation reported in diverse studies. Combining quantitative and qualitative data made it possible to have a broader overview of how condensed physical therapy interventions are organized and implemented in clinical practice.

2.8 Certainty of Evidence

The overall certainty of evidence for each outcome was evaluated using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach (Guyatt et al., 2011). Evidence was rated as high, moderate, low, or very low based on study limitations, inconsistency, indirectness, imprecision, and publication bias. Two reviewers independently conducted GRADE assessments, with disagreements resolved through discussion.

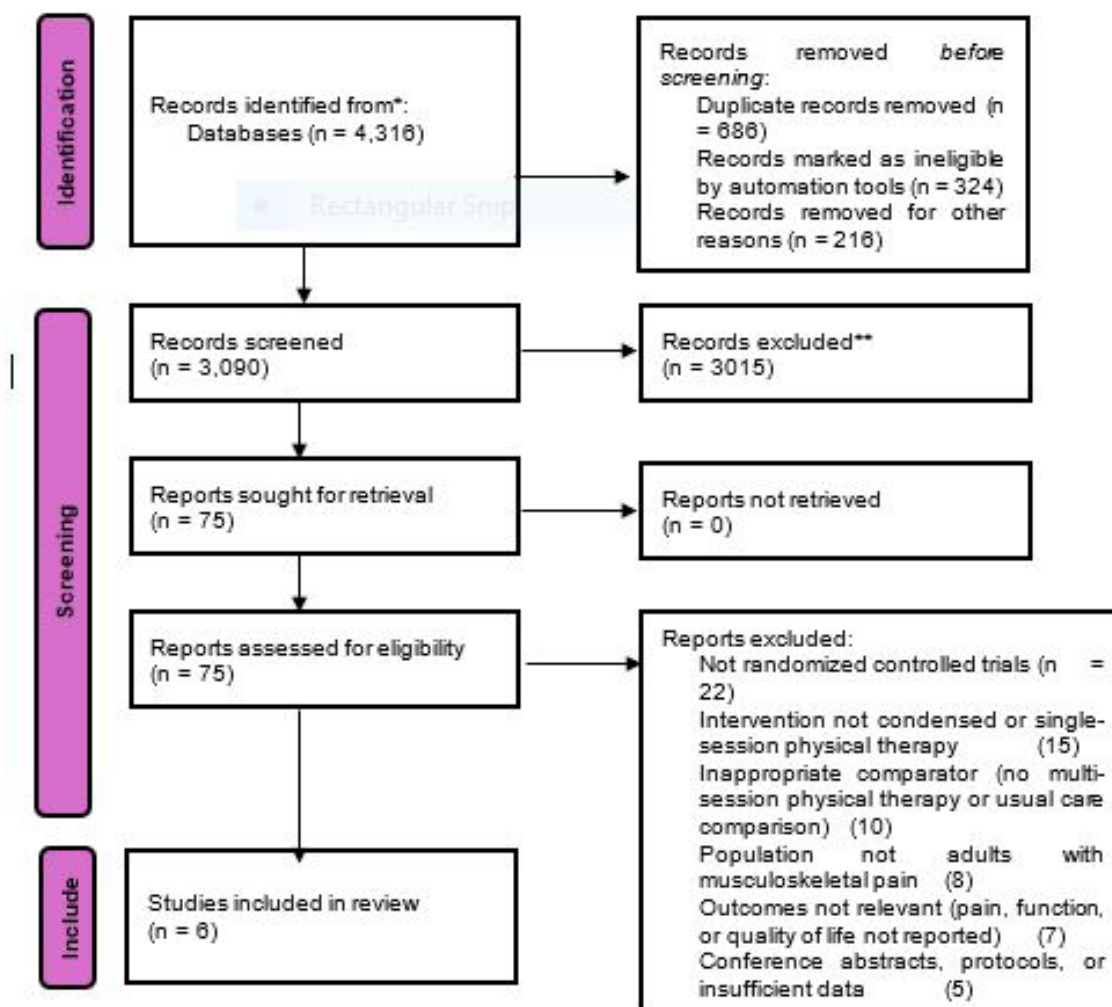
RESULTS

3.1 Study Selection

Prisma diagram shown in Figure 2 states literature search identified 4,316 records across all databases. After

removal of duplicates, 3,090 unique records remained for title and abstract screening. Following initial screening, 75 articles were assessed for full-text eligibility. Of these, six randomized controlled trials met the predefined inclusion criteria and were included in the systematic review and

meta-analysis, comprising a total of 2,090 participants (Barker et al., 2019; Callaghan & Oldham, 1995; Hamilton et al., 2020; Hopewell et al., 2021; Lamb et al., 2013; Michaleff et al., 2014). The study selection process is presented in the PRISMA flow diagram (Figure 2).



3.2 Study Characteristics

The six included studies evaluated physical therapy interventions across several musculoskeletal conditions, including osteoporotic vertebral fracture (n = 1), knee osteoarthritis (n = 2), shoulder pain (n = 1), and neck pain (n = 2). Sample sizes ranged from 27 to 708 participants, with a combined sample of 2,090 adults, including 686 men and 1,404 women. Single-session interventions typically involved a brief physical therapy consultation focusing on patient education, pain management strategies, activity modification, and prescription of a home exercise program. Included studies evaluated diverse musculoskeletal conditions: osteoporotic vertebral fracture (n=1), knee

osteoarthritis (n=2), shoulder pain (n=1), and neck pain (n=2). Table 1 shows sample sizes ranged from 27 to 708 participants, with total enrollment of 2,090 adults (686 men, 1,404 women). Single-session interventions typically included education about the condition, pain management strategies, activity modification advice, and often a prescribed home exercise program. Multi-session interventions varied from 6 to 20 sessions and included supervised exercise, manual therapy, electrophysical modalities, and additional education components.

3.3 Risk of Bias Assessment

According to the Cochrane Risk of Bias Tool (RoB

Table 1 Shows a Summary of the Included Studies

Characteristic	Description
Number of included studies	6 randomized controlled trials
Total participants	2,090
Sample size range	27 – 708 participants
Conditions studied	Vertebral fracture, knee osteoarthritis, shoulder pain, neck pain
Single-session intervention	Education, advice, and home exercise prescription
Multi-session intervention	6–20 supervised physical therapy sessions

Table 2 Characteristics of included randomized controlled trials

Study	Cond.	Single sess.	Multi sess.	n	FU (mo)	PEDro
Barker et al. (2019)	OVF	Edu (60 m)	Man. th./ex. (≤ 6)	613	12	8
Callaghan et al. (1995)	Knee OA	Edu + HEP	Ex./TENS (8)	27	1	4
Hamilton et al. (2020)	Knee OA	Edu + HEP	Sup. ex. (6)	339	6	7
Hopewell et al. (2021)	Shoulder pain	Edu + HEP	Prog. ex. (≤ 6)	708	12	6
Lamb et al. (2013)	Acute neck	Edu (30 m)	Ex./man./edu (≤ 6)	599	12	7
Michaleff et al. (2014)	Chronic neck	Edu + HEP	Comp. ex. (20)	170	12	8

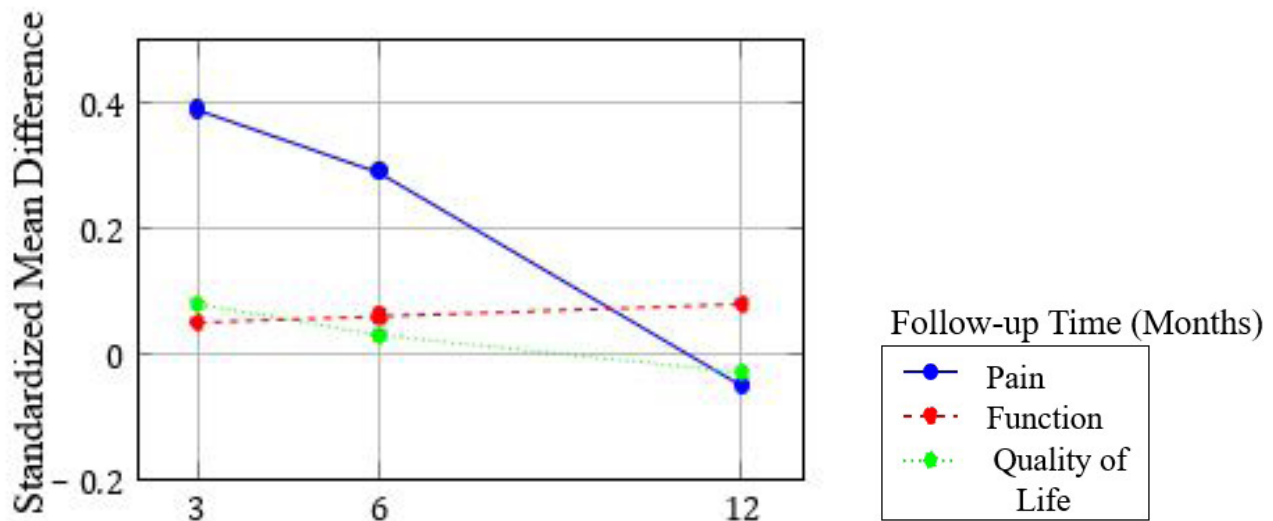


Figure 3 : Standardized mean differences between single and multiple physical therapy sessions across follow-up periods for pain, function, and quality of life outcomes. Positive values favor multiple sessions.

2) developed by the Cochrane Collaboration, all included studies were rated as having “some concerns” regarding overall risk of bias. Common methodological limitations included the lack of participant and therapist blinding, which is typical in physical therapy trials, and potential bias related to outcome measurement.

Despite these limitations, Table 3 shows several

methodological strengths were observed. Most studies demonstrated a low risk of bias related to deviations from intended interventions and missing outcome data. Quality assessment using the PEDro Scale indicated moderate to high methodological quality, with scores ranging from 4 to 8 out of 10, and two studies achieving scores of 8/10 (Table 2 and Figure 3).

Table 3 Risk of Bias Assessment (Cochrane RoB 2.0)

Study	D1	D2	D3	D4	D5	Overall
Barker et al. (2019)	Low	Low	Low	Low	Some	Some
Callaghan et al. (1995)	Some	Some	Low	Low	Some	Some
Hamilton et al. (2020)	Low	Some	Low	Low	Some	Some
Hopewell et al. (2021)	Low	Low	Low	Low	Some	Some
Lamb et al. (2013)	Low	Low	Low	Low	Some	Some
Michaleff et al. (2014)	Low	Low	Low	Low	Some	Some

D1: Randomization; D2: Deviations; D3: Missing data; D4: Outcome measurement; D5: Selective reporting

3.4 Pain Outcomes

Meta-analysis of pain outcomes (low certainty evidence) revealed a statistically significant but small difference favoring multi-session interventions at 6 months (3 studies, n=1,035; SMD: 0.29, 95% CI: 0.05 to 0.53; p=0.02). No significant between-group differences were observed at 3 months (4 studies, n=1,312; SMD: 0.39, 95% CI: -0.11 to 0.89; p=0.13) or 12 months (4 studies, n=1,266; SMD: -0.05, 95% CI: -0.49 to 0.39; p=0.82). The Callaghan et al. trial (Callaghan & Oldham, 1995), included only in qualitative synthesis, reported no significant pain differences at 4 weeks between single-session education with home exercise and multi-session supervised exercise or TENS for knee osteoarthritis.

3.5 Function and Disability Outcomes

Low certainty evidence from meta-analyses showed no significant differences in function/disability outcomes at any time point: 3 months (4 studies, n=1,583; SMD: 0.05, 95% CI: -0.11 to 0.21; p=0.56), 6 months (4 studies, n=1,538; SMD: 0.06, 95% CI: -0.12 to 0.23; p=0.53), and 12 months (4 studies, n=1,528; SMD: 0.08, 95% CI: -0.08 to 0.25; p=0.30). Confidence intervals for all function outcomes remained below thresholds for moderate effect sizes, suggesting clinically insignificant differences between intervention approaches.

3.6 Quality of Life Outcomes

Meta-analyses revealed no significant between-group differences in health-related quality of life at 3 months (4 studies, n=1,779; SMD: 0.08, 95% CI: -0.02 to 0.17; p=0.12), 6 months (3 studies, n=1,206; SMD: 0.03, 95% CI: -0.08 to 0.14; p=0.59), and 12 months (4 studies, n=1,729; SMD: -0.03, 95% CI: 0.12 to 0.07; p=0.58). Effect sizes were consistently trivial to small, with confidence intervals not encompassing clinically

meaningful differences.

3.7 Heterogeneity and Certainty of Evidence

Statistical heterogeneity varied across outcomes and time points, with I² values ranging from 0% to 94%. Substantial heterogeneity (I² > 40%) was observed for pain outcomes at 3 and 12 months, possibly due to clinical diversity in included populations and interventions. Using GRADE criteria, the overall certainty of evidence was rated as low for all outcomes due to risk of bias concerns, inconsistency in some analyses, and imprecision of effect estimates. No evidence of publication bias was detected through visual inspection of funnel plots, though the small number of studies limits definitive assessment.

DISCUSSION

This meta-analysis and systematic review of six randomized controlled trials (n = 2,090) did not reveal any clinical significance of differences between single-session and multi-session exercise-based physical therapy in adults with musculoskeletal pain. Multi-session care had a slight statistical benefit in reducing pain at six months, which was, however, not maintained. In the literature, there was a high degree of similarity between pain and functional outcomes and quality of life hence condensed physical therapy can be given with similar clinical effects to specific musculoskeletal conditions. Results are in line with the emerging literature favors streamlined and self-management-based models of musculoskeletal care (Lin et al., 2020; Zaglauer et al., 2025). Several implementation studies and clinical trials have reported that education-based interventions with well-structured home exercise programs could lead to an outcome similar to that of more intensive physical therapy programs (Saunders et al., 2022). As an illustration, the stratified care trial by Jonathan C. Hill and colleagues have shown that focused education and

self-management assistance can be effective in enhancing the results and decrease the healthcare expenditures in a musculoskeletal pain patient (Hill et al., 2011; Speerin et al., 2020). Correspondingly, the model of self-management outlined by Nadine E. Foster focuses on patient education, alteration of activities and exercise at home as the key elements of a successful process of rehabilitation (Darnall et al., 2021; Foster et al., 2023). The musculoskeletal rehabilitation research evidence also suggests that the treatment intensity is not necessarily associated with better outcomes. Clinical studies comparing physical therapy with exercise physical therapy in the treatment of knee osteoarthritis and shoulder pain have demonstrated that structured home exercise program could meet similar effects in pain and functioning in comparison with supervised physical therapy that was applied over a number of sessions (Deslauriers et al., 2016; Fari et al., 2026). These results are in line with those of the current review as multi-session interventions with a slight short-term benefit in terms of pain reduction were found with no difference at later points of follow-up. The findings also are in line with the international clinical guideline's recommendation on musculoskeletal disorders. The modern recommendations focus on active treatment methods, patient education, and support of self-management instead of the use of repeated passive therapy sessions (Deslauriers et al., 2016; Rhon et al., 2025). As an illustration, it is found that guideline recommendations on low back pain emphasize that brief education and exercise guidance can be valuable in the

provision of clinical significance even in the absence of long-term supervised treatment in accordance with the recommendations (Stevenson et al., 2024). To this end, the research on health systems has also suggested that low-intensity or first contact forms of physical therapy can prove beneficial. Research on the consultation pathways of early physical therapy has shown that patient outcomes can be improved and that diagnostic imaging, opioid prescriptions and specialist referral can increase (Cieza et al., 2020; Foster et al., 2023; Hopewell et al., 2021). These results indicate that compressed physical therapy programs might serve as an effective first management tool with more intensive treatment programs being reserved to complex or persistent symptomatic patients. Nonetheless, past studies also indicate that condensed interventions effectiveness can be determined by proper patient selection and design of interventions. There are trials which have indicated that patients who are chronically ill or have a very bearable disability can receive more intense and closely monitored rehabilitation programs (Darnall et al., 2021; Jongen et al., 2017). This observation can be one of the reasons that could contribute to the modest pain reduction benefit that was noted with multi-session interventions at six months in the current analysis. However, the lack of sustained differences in stipulated long-term outcomes evidences the perception that in most patients with musculoskeletal pain, short-term administered physical therapy treatments will be adequate to produce similar clinical outcomes but to decrease the treatment load (Figure 4).

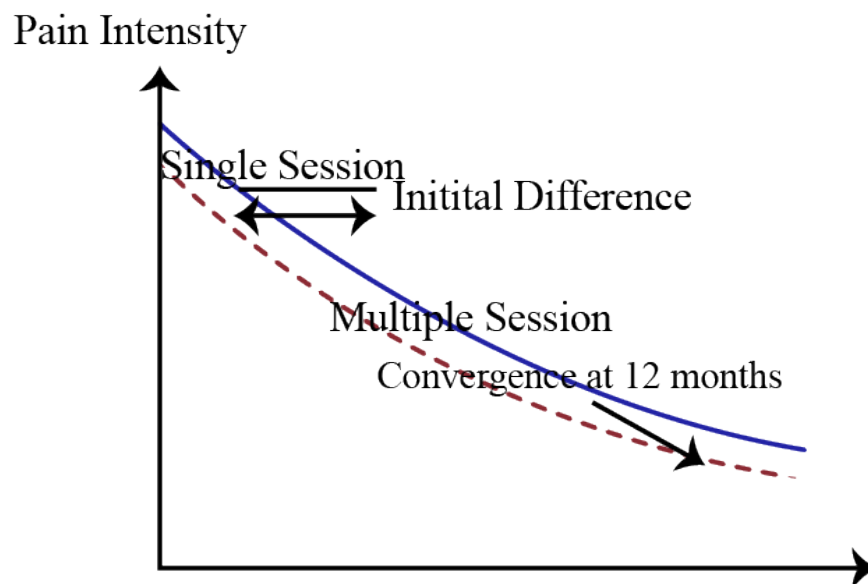


Figure 4 Conceptual representation of pain trajectory differences between single and multiple physical therapy sessions, showing initial advantage for multiple sessions with convergence over time.

The results are aligned with the view in that the approach of condensed physical therapy consultations focusing on education, prescription of exercises and self-management forms the best first-line approach to musculoskeletal pain management. These models have the potential to enhance the availability of physical therapy care through shortening waiting times and lowering the prices of treatments but the models do not compromise the clinical care. Its implementation must be patient-centered and need to take into consideration clinical complexity, comorbidities, and personal preferences. Multi-session physical therapy could be suitable to the patients who are to be strictly monitored, have complex rehabilitation, or are to have gradual exercise modifications. Similar results in the comparison of condensed and multi session physical therapy processes can turn out to represent the core position of patient education and self-management as completely important in musculoskeletal care. Patient self-efficacy can be improved through educational interventions, which in turn can contribute to participation in the exercise programs and decrease the need of a patient to be supervised by a therapist on a regular basis (Hartvigsen et al., 2018). Besides this, numerous musculoskeletal disorders show fluctuating symptom courses and spontaneous recovery courses of nature which can minimize the detectable distinctions among interventional severity levels across the time scale (Deslauriers et al., 2016; Gross et al., 2012). There are a number of limitations that ought to be held. Included trials were very few and the heterogeneity of musculoskeletal conditions and intervention protocols could be a limitation to generalization. The concerns of risks of bias and differences in treatment elements also decreased some certainty of evidence based on the GRADE Approach. Also, the vast majority of the studies omitted the prevalent conditions, including low back pain, eliminating the ability to generalize the results.

FUTURE RESEARCH DIRECTIONS

Future Research Directions Research gaps in the existing evidence regarding the effectiveness of condensed interventions of physical therapy on musculoskeletal pain should be filled in subsequent research. Cost-effectiveness is one of the aspects that should be evaluated. Although condensed physical therapy models can save time and therapy sessions of therapists, strong supporting evidence of the economy is not abundant. In trials of the future, formal health economic analyses should be done, which will include the direct costs (e.g. the time of clinicians,

facility use) and indirect costs (e.g. loss of productivity and healthcare utilization). Economic performance in terms of quality-adjusted life year (QALYs) and disability-adjusted life year (DALYs) would be potentially useful to policy makers and healthcare models in the same regard, as regards efficient rehabilitation care models. The next area of importance is the patient experience and treatment acceptability. The benefits of condensed physical therapy interventions cannot be fully portrayed by clinical efficacy only. Investigation of patient-reported experience measures (PROMs) and patient satisfaction, treatment preference, and perceived utility should also be incorporated into the future study because brief physical therapy consultation is valuable. Mixed-methods research incorporating quantitative outcomes alongside qualitative investigation of patient perspective potentially might assist in discovering impediments and means through which self-management following single-session approaches will be effective. More studies should also be conducted to establish optimal elements and models of delivering condensed physical therapy interventions. Future studies are needed to determine the contribution of various factors- to include, prescription of exercises, patient education and behavioral strategies of self-management towards the effectiveness of a treatment regimen. Various strategies in delivery such as in-person consultations, telehealth-based physical therapy, and hybrid frameworks could be compared, and they have received more focus in new research in the rehabilitation domain in recent years. Besides this, the possibility of ancillary follow-up calls or booster sessions need to be discussed to define the possibility of the minimal background support to enhance adherence and long-term results. Lastly, there should be research on translation to clinical practice and implementation. Even in effective cases, simple models of physical therapy can have obstacles associated with training clinicians, organization design, and care channels. They can carry out implementation research to determine the strategies of assisting in introduction of streamlined physical therapy models in regular health care systems. Possible strategies may include clinician education programs, clinical decision-support tools, and audit-feedback mechanisms that will enable uptake. Pragmatic trials and extended observational studies should also be used to assess the effects of compressed physical therapy strategies regarding the impact on healthcare utilization, treatment accessibility, and patient outcomes in the real world.

CONCLUSION

This meta-analysis and systematic review report that condensed exercise-based physical therapy interventions are a clinical option capable of producing clinical outcomes just as good as traditional multi-session physical therapy in adults with musculoskeletal pain. In the sampled randomized controlled trials, there were no clinically significant differences in intervention models of pain, physical function or health-related quality of life at any of the follow-ups. Despite the small short-term difference in pain reduction at six months, which was also small, multi-session interventions showed no difference in pain reduction at other assessment intervals. In general, the results would indicate that the physical therapy consultation system for brief periods, well organized, and with suitable exercise instructions could provide the viable alternative to more serious treatment regimens to a variety of patients with musculoskeletal disorders. Clinically and health systematically, these findings endorse the possibility of simplified physical therapy models that enhance efficient access and efficiency for musculoskeletal care. Compression of interventions to focus on patient education, self-management, and programmed home exercises can be used to overcome the recurrent issues in rehabilitation such as insufficient clinical capacity, protracted waiting time, and soaring health expenses. With the appropriate application, such models can enable the healthcare systems to provide practical care and efficiently utilize the existing resources.

Nevertheless, patient-centered and context-sensitive treatment decisions should also be made. The choice of physical therapy methods should be determined by factors like patient preferences, clinical complexity, comorbidities, and community medical services. Multi-session physical therapy can continue to have added therapeutic value to persons whose presentations are more complex or persons who need closer attention.

The existing evidence base is still restricted by the fact that few trials are available, some studies are heterogeneous in their intervention, and some are methodologically flawed. Further investigations into the economic assessment, study of patient satisfaction and acceptability, finding the best intervention elements, and research to implement the effective physical therapy models into usual clinical behavior should be the emphasis of future research to facilitate the adoption of effective models of physical therapy into day-to-day clinical activities. It will be necessary to reinforce evidence in these spheres to inform

policy and support making sustainable rehabilitation plans. Developing evidence-based cost-effective physical therapy solutions can bring more sustainable, equitable, and accessible care to musculoskeletal conditions, and eventually lead to a better long-term outcome in individuals with such ultimately prevalent issues.

Disclosure Statement

Conflict of Interest

The authors declare that there are no conflicts of interest related to this study.

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This research received no external funding from public, commercial, or not-for-profit organizations.

Ethical Approval

Ethical approval was not required for this study because it is a systematic review and meta-analysis based on previously published data.

Informed Consent

Not applicable, as the study did not involve primary data collection from human participants.

Data Availability

All data analyzed in this study are derived from publicly available published studies, and relevant information is included within the article and its supplementary materials.

Author Contributions

All authors contributed to the study design, literature review, data interpretation, and manuscript preparation, and approved the final version of the manuscript.

References

- Barker, K. L., Newman, M., Stallard, N., Leal, J., Minns Lowe, C., Javaid, M. K., Noufaily, A., Adhikari, A., Hughes, T., Smith, D. J., Gandhi, V., Cooper, C., & Lamb, S. E. (2019). Exercise or manual physiotherapy compared with a single session of physiotherapy for osteoporotic vertebral fracture: three-arm PROVE RCT. *Health Technol Assess*, 23(44), 1-318. <https://doi.org/10.3310/hta23440>
- Björnsdóttir, S. V., Jónsson, S. H., & Valdimarsdóttir, U. A. (2014). Mental health indicators and quality of life among individuals with musculoskeletal chronic pain: a nationwide study in Iceland. *Scand J Rheumatol*, 43(5), 419-423. <https://doi.org/10.3109/03009742.2014.881549>
- Buchbinder, R., van Tulder, M., Öberg, B., Costa, L. M., Woolf, A., Schoene, M., & Croft, P. (2018). Low back pain: a call for action. *Lancet*, 391(10137), 2384-2388. [https://doi.org/10.1016/s0140-6736\(18\)30488-4](https://doi.org/10.1016/s0140-6736(18)30488-4)
- Callaghan, M., & Oldham, J. (1995). An evaluation of exercise regimes for patients with osteoarthritis of the knee: a single-blind randomized controlled trial. *Clinical Rehabilitation*, 9(3), 213-218. <https://doi.org/10.1177/026921559500900306>
- Cieza, A., Causey, K., Kamenov, K., Hanson, S. W., Chatterji, S., & Vos, T. (2020). Global estimates of the need for rehabilitation based on the Global Burden of Disease study 2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet*, 396(10267), 2006-2017. [https://doi.org/10.1016/S0140-6736\(20\)32340-0](https://doi.org/10.1016/S0140-6736(20)32340-0)
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (2 ed.). Routledge. <https://doi.org/10.4324/9780203771587>
- Darnall, B. D., Roy, A., Chen, A. L., Ziadni, M. S., Keane, R. T., You, D. S., Slater, K., Poupore-King, H., Mackey, I., Kao, M. C., Cook, K. F., Lorig, K., Zhang, D., Hong, J., Tian, L., & Mackey, S. C. (2021). Comparison of a Single-Session Pain Management Skills Intervention With a Single-Session Health Education Intervention and 8 Sessions of Cognitive Behavioral Therapy in Adults With Chronic Low Back Pain: A Randomized Clinical Trial. *JAMA Netw Open*, 4(8), e2113401. <https://doi.org/10.1001/jamanetworkopen.2021.13401>
- Deslauriers, S., Raymond, M.-H., Laliberté, M., Lavoie, A., Desmeules, F., Feldman, D., & Perreault, K. (2016). Access to publicly funded outpatient physiotherapy services in Quebec: waiting lists and management strategies. *Disability and Rehabilitation*, 39, 1-9. <https://doi.org/10.1080/09638288.2016.1238967>
- Fari, G., Quarta, F., Bressi, F., La Russa, R., Paolucci, T., & Bernetti, A. (2026). Effects of Exercise-Based Telerehabilitation for Knee Osteoarthritis: A Systematic Review and a Study Protocol. *Bioengineering*, 13(2), 136. <https://www.mdpi.com/2306-5354/13/2/136>
- Foster, N. E., Dunn, K. M., Protheroe, J., Hill, J. C., Lewis, M., Saunders, B., Jowett, S., Hennings, S., Campbell, P., Bromley, K., Bartlam, B., Babatunde, O., Wathall, S., Oppong, R., Kigozi, J., & Chudyk, A. (2023). Programme Grants for Applied Research. In Stratified primary care for adults with musculoskeletal pain: the STarT MSK research programme including RCTs. National Institute for Health and Care Research
- Copyright © 2023 Foster et al. <https://doi.org/10.3310/fbv4177>
- Gaskin, D. J., & Richard, P. (2012). The economic costs of pain in the United States. *J Pain*, 13(8), 715-724. <https://doi.org/10.1016/j.jpain.2012.03.009>
- Gross, A., Forget, M., St George, K., Fraser, M. M., Graham, N., Perry, L., Burnie, S. J., Goldsmith, C. H., Haines, T., & Brunarski, D. (2012). Patient education for neck pain. *Cochrane Database Syst Rev*, 2012(3), Cd005106. <https://doi.org/10.1002/14651858.CD005106.pub4>
- Guyatt, G., Oxman, A. D., Akl, E. A., Kunz, R., Vist, G., Brozek, J., Norris, S., Falck-Ytter, Y., Glasziou, P., DeBeer, H., Jaeschke, R., Rind, D., Meerpohl, J., Dahm, P., & Schünemann, H. J. (2011). GRADE guidelines: 1. Introduction-GRADE evidence profiles and summary of findings tables. *J Clin Epidemiol*, 64(4), 383-394. <https://doi.org/10.1016/j.jclinepi.2010.04.026>
- Hamilton, D. F., Beard, D. J., Barker, K. L., Macfarlane, G. J., Tuck, C. E., Stoddart, A., Wilton, T., Hutchinson, J. D., Murray, G. D., & Simpson, A. H. R. W. (2020). Targeting rehabilitation to improve outcomes after

total knee arthroplasty in patients at risk of poor outcomes: randomised controlled trial. *Bmj*, 371, m3576. <https://doi.org/10.1136/bmj.m3576>

Hartvigsen, J., Hancock, M. J., Kongsted, A., Louw, Q., Ferreira, M. L., Genevay, S., Hoy, D., Karppinen, J., Pransky, G., Sieper, J., Smeets, R. J., & Underwood, M. (2018). What low back pain is and why we need to pay attention. *Lancet*, 391(10137), 2356-2367. [https://doi.org/10.1016/s0140-6736\(18\)30480-x](https://doi.org/10.1016/s0140-6736(18)30480-x)

Hill, J. C., Whitehurst, D. G., Lewis, M., Bryan, S., Dunn, K. M., Foster, N. E., Konstantinou, K., Main, C. J., Mason, E., Somerville, S., Sowden, G., Vohora, K., & Hay, E. M. (2011). Comparison of stratified primary care management for low back pain with current best practice (STarT Back): a randomised controlled trial. *Lancet*, 378(9802), 1560-1571. [https://doi.org/10.1016/s0140-6736\(11\)60937-9](https://doi.org/10.1016/s0140-6736(11)60937-9)

Hopewell, S., Keene, D. J., Heine, P., Marian, I. R., Dritsaki, M., Cureton, L., Dutton, S. J., Dakin, H., Carr, A., Hamilton, W., Hansen, Z., Jaggi, A., Littlewood, C., Barker, K., Gray, A., & Lamb, S. E. (2021). Progressive exercise compared with best-practice advice, with or without corticosteroid injection, for rotator cuff disorders: the GRASP factorial RCT. *Health Technol Assess*, 25(48), 1-158. <https://doi.org/10.3310/hta25480>

Jongen, P., Ruimschotel, R., Museler-Kreijns, Y. M., Dragstra, T. M. C., Duyverman, L., Valkenburg-Vissers, J., Cornelissen, J., Lagrand, R., Donders, R., & Hartog, A. (2017). Improved health-related quality of life, participation, and autonomy in patients with treatment-resistant chronic pain after an intensive social cognitive intervention with the participation of support partners. *Journal of Pain Research*, 10, 2725-2738. <https://doi.org/10.2147/JPR.S137609>

Keskin, B. (2013). *Statistical Power Analysis*.

Lafrance, S., Santaguida, C., Perreault, K., Bath, B., Thavorn, K., Feldman, D., Hébert, L. J., Fernandes, J., & Desmeules, F. (2021). Single session compared with multiple sessions of education and exercise for older adults with spinal pain in an advanced practice physiotherapy model of care: protocol for a randomised controlled trial. *BMJ Open*, 11(9), e053004. <https://doi.org/10.1136/bmjopen-2021-053004>

[bmjopen-2021-053004](https://doi.org/10.1136/bmjopen-2021-053004)

Lamb, S. E., Gates, S., Williams, M. A., Williamson, E. M., Mt-Isa, S., Withers, E. J., Castelnuovo, E., Smith, J., Ashby, D., Cooke, M. W., Petrou, S., & Underwood, M. R. (2013). Emergency department treatments and physiotherapy for acute whiplash: a pragmatic, two-step, randomised controlled trial. *Lancet*, 381(9866), 546-556. [https://doi.org/10.1016/s0140-6736\(12\)61304-x](https://doi.org/10.1016/s0140-6736(12)61304-x)

Lin, I., Wiles, L., Waller, R., Goucke, R., Nagree, Y., Gibberd, M., Straker, L., Maher, C. G., & O'Sullivan, P. P. B. (2020). What does best practice care for musculoskeletal pain look like? Eleven consistent recommendations from high-quality clinical practice guidelines: systematic review. *Br J Sports Med*, 54(2), 79-86. <https://doi.org/10.1136/bjsports-2018-099878>

Maher, C. G., Sherrington, C., Herbert, R. D., Moseley, A. M., & Elkins, M. (2003). Reliability of the PEDro scale for rating quality of randomized controlled trials. *Phys Ther*, 83(8), 713-721.

Michaleff, Z. A., Maher, C. G., Lin, C. W., Rebeck, T., Jull, G., Latimer, J., Connelly, L., & Sterling, M. (2014). Comprehensive physiotherapy exercise programme or advice for chronic whiplash (PROMISE): a pragmatic randomised controlled trial. *Lancet*, 384(9938), 133-141. [https://doi.org/10.1016/s0140-6736\(14\)60457-8](https://doi.org/10.1016/s0140-6736(14)60457-8)

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., . . . Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *Bmj*, 372, n71. <https://doi.org/10.1136/bmj.n71>

Rhon, D. I., Horn, M. E., Lee, H. J., Morton-Oswald, S., & George, S. Z. (2025). Treatment variability for shoulder pain between physician and non-physician clinicians based on initial setting and specific shoulder diagnosis: a health system analysis. *BMC Health Serv Res*, 25(1), 1370. <https://doi.org/10.1186/s12913-025-13175-w>

Saunders, B., Chudyk, A., Protheroe, J., Cooper, V., Bartlam, B., Birkinshaw, H., Foster, N., & Hill, J.

(2022). Risk-based stratified primary care for common musculoskeletal pain presentations: qualitative findings from the STarT MSK cluster randomised controlled trial. Research Square. <https://doi.org/10.21203/rs.3.rs-1473984/v1>

Speerin, R., Needs, C., Chua, J., Woodhouse, L. J., Nordin, M., McGlasson, R., & Briggs, A. M. (2020). Implementing models of care for musculoskeletal conditions in health systems to support value-based care. *Best Pract Res Clin Rheumatol*, 34(5), 101548. <https://doi.org/10.1016/j.berh.2020.101548>

Sterne, J. A. C., Savović, J., Page, M. J., Elbers, R. G., Blencowe, N. S., Boutron, I., Cates, C. J., Cheng, H.-Y., Corbett, M. S., Eldridge, S. M., Emberson, J. R., Hernán, M. A., Hopewell, S., Hróbjartsson, A., Junqueira, D. R., Jüni, P., Kirkham, J. J., Lasserson, T., Li, T., . . . Higgins, J. P. T. (2019). RoB 2: a revised tool for assessing risk of bias in randomised trials. *Bmj*, 366, 14898. <https://doi.org/10.1136/bmj.14898>

Stevenson, K., Hadley-Barrows, T., Evans, N., Campbell, L., Southam, J., Chudyk, A., Ellington, D., Jeeves, B., Jenson, C., Kleberg, S., Birkinshaw, H., Mair, F., Dziedzic, K., Peat, G., Jordan, K. P., Yu, D., Bailey, J., Braybooke, A., Mallen, C. D., & Hill, J. C. (2024). The SelfSTarT intervention for low back pain patients presenting to first contact physiotherapists: A mixed methods service evaluation. *Musculoskeletal Care*, 22(1), e1876. <https://doi.org/https://doi.org/10.1002/msc.1876>

Todd, A., McNamara, C. L., Balaj, M., Huijts, T., Akhter, N., Thomson, K., Kasim, A., Eikemo, T. A., & Bambra, C. (2019). The European epidemic: Pain prevalence and socioeconomic inequalities in pain across 19 European countries. *European Journal of Pain*, 23(8), 1425-1436. <https://doi.org/https://doi.org/10.1002/ejp.1409>

Vos, T., Lim, S. S., Abbafati, C., Abbas, K. M., Abbasi, M., Abbasifard, M., Abbasi-Kangevari, M., Abbastabar, H., Abd-Allah, F., Abdelalim, A., Abdollahi, M., Abdollahpour, I., Abolhassani, H., Aboyans, V., Abrams, E. M., Abreu, L. G., Abrigo, M. R. M., Abu-Raddad, L. J., Abushouk, A. I., . . . Murray, C. J. L. (2020). Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis

for the Global Burden of Disease Study 2019. *The Lancet*, 396(10258), 1204-1222. [https://doi.org/10.1016/S0140-6736\(20\)30925-9](https://doi.org/10.1016/S0140-6736(20)30925-9)

Zaglauer, K., Kunsorg, A., Jakob, V., Görg, L., Oehlschlägel, A., Riedel, R., Marschall, U., Welsink, D., Schuhmacher, H., & Wittmann, M. (2025). Effect of a Multimodal Pain Therapy Concept Including Intensive Physiotherapy on the Perception of Pain and the Quality of Life of Patients With Chronic Back Pain: A Prospective Observational Multicenter Study Named “RütmuS”. *Pain Res Manag*, 2025, 6693678. <https://doi.org/10.1155/prm/6693678>