

Effectiveness of Structured Exercise Therapy in the Management of Chronic Low Back Pain: A Randomised Controlled Trial

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ABSTRACT

Chronic low back pain is a leading cause of disability worldwide, and exercise therapy is a recommended first-line physiotherapy intervention. This paper reports a randomised controlled trial evaluating the effectiveness of a structured exercise therapy programme in the management of chronic low back pain. One hundred and twenty patients with chronic non-specific low back pain were randomised to a twelve-week structured exercise therapy programme or to usual care, and pain and disability were assessed at baseline, six and twelve weeks. The exercise group showed significantly greater reductions in pain and disability and higher global improvement than the usual-care group, with progressive benefit over the programme. The programme was safe and well tolerated. These findings indicate that structured exercise therapy is effective in reducing pain and disability in chronic low back pain, supporting its use as a core musculoskeletal physiotherapy intervention. The single-centre design and twelve-week horizon indicate the need for multicentre studies with longer follow-up.

KEYWORDS: *Low Back Pain, Exercise Therapy, Musculoskeletal Physiotherapy, Disability, Pain, Rehabilitation, Randomised Controlled Trial, Function*

INTRODUCTION

Its impact extends beyond the individual to substantial costs from healthcare use and lost productivity, making effective management a public health priority [1].

Low back pain is one of the most common musculoskeletal complaints and a leading cause of

disability worldwide, imposing a substantial burden on individuals, health systems and economies [1]. While most acute episodes resolve, a significant proportion of patients develop chronic low back pain, defined as pain persisting for twelve weeks or longer, which is associated with marked disability, reduced quality of life and high healthcare use [1], [2]. Most chronic low back pain is non-specific, without an identifiable structural cause, and its management is primarily conservative.

Its strong evidence base, low risk and capacity to promote self-management make exercise a particularly attractive first-line option [2], [3].

Physiotherapy is central to the conservative management of chronic low back pain, and exercise therapy is among the most strongly recommended interventions in clinical guidelines [2], [3]. Exercise therapy encompasses a range of approaches, including general aerobic exercise, strengthening, motor control and stretching, aimed at improving function, reducing pain and addressing the deconditioning and movement impairments associated with chronic pain. It is widely regarded as a first-line treatment, reflecting both its evidence base and its favourable safety profile [3].

The rationale for exercise therapy in chronic low back pain is multifactorial, encompassing improvements in strength, endurance, mobility and motor control, as well as effects on pain processing, confidence and activity [2], [3]. By promoting active engagement and physical activity, exercise also counters the fear-avoidance and inactivity that can perpetuate chronic pain and disability. Structured, supervised programmes aim to deliver these benefits in a progressive and individualised manner.

Although exercise therapy is widely recommended, continued evaluation of structured programmes against usual care, using validated outcomes, remains valuable for informing practice. The problem addressed in this study is the need for controlled evidence on the effectiveness of a structured exercise therapy programme in chronic low back pain. Accordingly, this randomised controlled trial compares structured exercise therapy with usual care, assessing pain and disability over twelve weeks, with the aim of informing musculoskeletal physiotherapy practice.

LITERATURE REVIEW

Chronic low back pain has been the subject of extensive research, and a substantial body of evidence supports exercise therapy as an effective intervention [2], [3]. Systematic reviews and clinical guidelines consistently recommend exercise for chronic low back pain, reporting benefits for pain and function compared with minimal or usual care, while noting that no single type of exercise is clearly superior [3]. This has established exercise as a cornerstone of conservative management.

A range of exercise approaches has been studied, including general and aerobic exercise, strengthening, motor control or stabilisation exercise, and approaches such as Pilates and yoga [2], [3]. Evidence suggests that the benefits of exercise are relatively consistent across types, supporting individualised selection based on patient preference, ability and clinical presentation. Supervised and structured programmes, and those incorporating progression and adherence support, are associated with better outcomes, and the integration of exercise with education and self-management is widely advocated [3], [4].

The mechanisms underlying the benefits of exercise are multifaceted, including improvements in physical capacity, effects on pain modulation and reductions in fear-avoidance and inactivity [2], [3]. Validated outcome measures, including pain scales and disability questionnaires such as the Oswestry Disability Index, enable the assessment of these benefits [5]. While the overall evidence for exercise is strong, controlled trials evaluating structured programmes against usual care with validated outcomes continue to add value, particularly in informing routine practice, which is the focus of the present study.

The visual analogue scale and the Oswestry Disability Index are well-established, validated measures that capture the two dimensions most relevant to chronic low back pain, namely pain intensity and the impact of pain on function [5]. Using both allows the effect of treatment to be assessed in terms that matter to patients, since reductions in pain do not always translate directly into improved function, and vice versa.

RESEARCH GAP

Although exercise therapy for chronic low back pain is well supported overall, controlled evaluations of structured, progressive programmes against usual care in routine-practice

settings, using validated pain and disability outcomes over a defined course, remain valuable, particularly given variation in how exercise is delivered. Much of the literature pools heterogeneous interventions or compares exercise types rather than evaluating a structured programme against usual care. This study addresses that gap through a randomised controlled trial comparing a twelve-week structured exercise programme with usual care.

OBJECTIVES

The objectives of the study were as follows:

- To compare pain reduction between structured exercise therapy and usual care in chronic low back pain.
- To compare disability outcomes between the two groups.
- To evaluate global improvement and the trajectory of benefit over the programme.
- To inform the use of structured exercise therapy in musculoskeletal physiotherapy practice.

METHODOLOGY

Study Design and Participants

A randomised controlled trial was conducted in adults with chronic non-specific low back pain of at least twelve weeks' duration. Patients with specific spinal pathology, recent surgery or contraindications to exercise were excluded. Of 142 patients screened, 120 were randomised in equal numbers to structured exercise therapy or usual care with informed consent. The study followed accepted ethical standards. Baseline characteristics are summarised in Table 1, and the study flow is shown in Figure 1.

Interventions

The exercise group undertook a twelve-week structured, supervised and progressive programme combining aerobic exercise, strengthening and motor control exercise, individualised to the patient and supported by education and a home programme [2], [3]. The usual-care group received standard advice, including reassurance and encouragement to remain active, and analgesia as required, without the structured programme. The intervention components are summarised in Table 2.

Outcome Measures

Pain was assessed using a visual analogue scale, and disability using the Oswestry Disability

Index, at baseline, six weeks and twelve weeks [5]. Global improvement was assessed at twelve weeks. Assessments were performed by raters blinded to group allocation.

Statistical Analysis

Pain and disability outcomes were compared between groups, and the trajectory of pain over the programme was examined. Results are presented in Table 3, with the pain trajectory shown in Figure 2 and improvement outcomes in Figure 3.

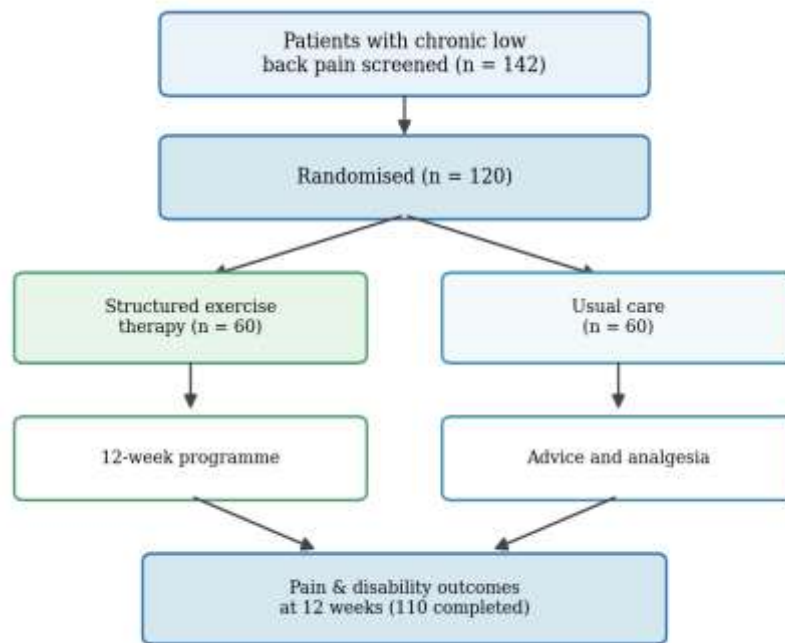


Figure 1: Flow of Participants through Randomization, Intervention and Assessment.

Table 1: Baseline characteristics of participants (n = 120).

Characteristic	Value	Notes
Mean age (years)	44.6 ± 11.2	Range 25-65
Female / Male	66 / 54	55% female
Mean duration (months)	18.4 ± 9.1	
Mean baseline VAS	6.8 ± 1.3	0-10 scale
Mean baseline ODI	38.2 ± 10.4	0-100 scale

Table 2: Components of the Structured Exercise Therapy Programme.

Component	Description
Aerobic exercise	Progressive low-impact aerobic training
Strengthening	Trunk and lower-limb strengthening
Motor control	Stabilisation and movement control exercise
Education	Advice, reassurance and activity guidance
Home programme	Supported independent exercise

RESULTS AND FINDINGS

Of 120 randomised patients, 110 (92%) completed the twelve-week programme and assessments. The exercise group showed greater reductions in pain than the usual-care group, as shown in Figure 2.

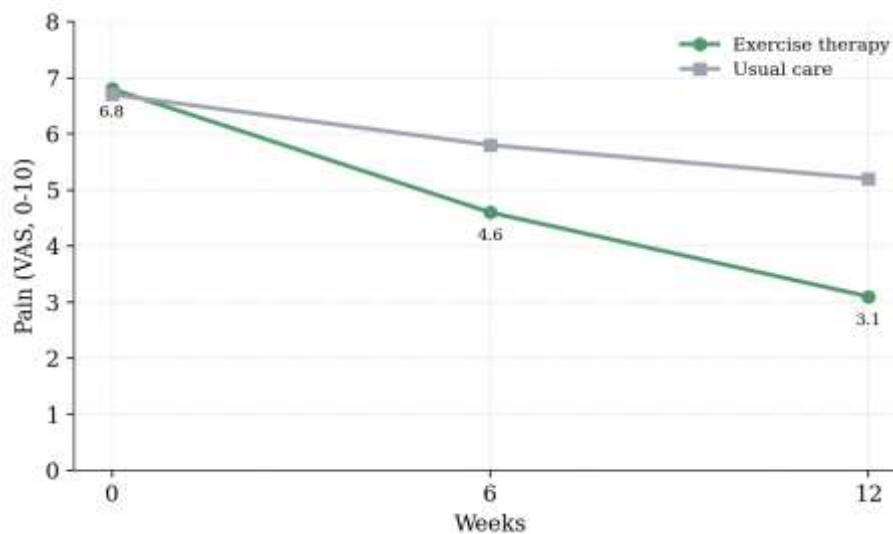


Figure 2: Pain (Visual Analogue Scale) Over the Twelve-Week Programme by Group

By contrast, the modest improvement in the usual-care group is consistent with the natural course and the limited effect of advice and analgesia alone in chronic low back pain [2], [3].

Mean pain scores decreased progressively in the exercise group across the twelve weeks, with a substantially greater reduction than in the usual-care group, in which pain improved only modestly. The progressive trajectory in the exercise group is consistent with the cumulative

effect of structured, progressive exercise on pain and physical capacity [2], [3]. The divergence between groups was evident by six weeks and increased to twelve weeks.

The higher proportion of patients reporting global improvement indicates that the benefits were not only statistically evident but also perceptible and meaningful to patients themselves [3], [5].

Disability and global improvement also favoured the exercise group (Figure 3). The reduction in Oswestry Disability Index scores was significantly greater in the exercise group than in the usual-care group, and a higher proportion of patients reported global improvement. These differences indicate that structured exercise therapy produced clinically meaningful benefits in function as well as pain, consistent with its established role in chronic low back pain [3], [5]. The improvement in disability is particularly important given the impact of chronic low back pain on daily function.

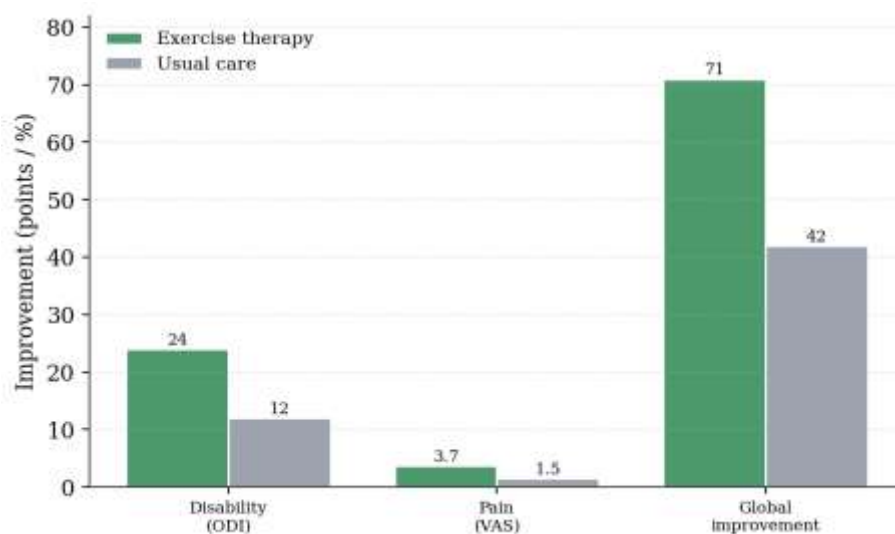


Figure 3: Disability, Pain and Global Improvement at Twelve Weeks by Group

The good adherence observed is itself a positive finding, since the benefits of exercise depend on consistent participation, and a programme that patients are willing and able to follow is more likely to succeed in practice [2], [3].

Overall, structured exercise therapy was associated with significantly greater reductions in pain and disability and higher global improvement than usual care. The programme was safe and

well tolerated, with good adherence and no serious adverse events. Aggregate outcomes are summarised in Table 3.

Table 3: Pain and Disability Outcomes by Group.

Outcome	Exercise	Usual care	Difference
VAS reduction	3.7	1.5	+2.2
ODI reduction	24	12	+12
Global improvement	71%	42%	+29
Adherence	88%	-	

DISCUSSION

This randomised controlled trial found that a structured, progressive exercise therapy programme produced significantly greater reductions in pain and disability and higher global improvement than usual care in patients with chronic low back pain. These findings support the role of structured exercise therapy as a core musculoskeletal physiotherapy intervention and are consistent with the strong evidence and guideline recommendations favouring exercise in chronic low back pain [2], [3].

The progressive reduction in pain over the programme, and the widening difference from usual care, are clinically informative. They suggest that the benefits of exercise accrue with continued, progressive training rather than appearing immediately, underlining the importance of an adequate course of structured exercise [2], [3]. The combination of aerobic, strengthening and motor control exercise, individualised and supported by education and a home programme, reflects contemporary best practice and likely contributed to the favourable outcomes by addressing the multiple physical and behavioural factors involved in chronic low back pain.

Restoring the ability to perform everyday activities is often what patients value most, and improvements in disability are therefore central to meaningful recovery [1], [5].

The improvement in disability is of particular significance, as reducing disability and restoring function are central goals in chronic low back pain, which is defined as much by its impact on

activity as by pain itself [1], [5]. The higher global improvement in the exercise group indicates that the benefits were meaningful to patients. By promoting active engagement and physical activity, structured exercise also addresses the fear-avoidance and inactivity that perpetuate chronic pain, supporting longer-term self-management. The clinical significance lies in demonstrating that a structured programme delivers worthwhile benefits over usual care in routine practice.

The combination of supervised sessions with a home programme is likely to have contributed to the favourable outcomes, since it increased the total volume of exercise and supported the development of independent self-management [2], [3]. Embedding exercise within the patient's daily routine in this way is an important means of sustaining benefit beyond the supervised period.

The progressive and individualised nature of the programme allowed exercise to be adapted to each patient's capacity and response, which is consistent with evidence that tailored, appropriately dosed exercise is more effective than generic prescription [2], [3].

Certain limitations should be acknowledged. The single-centre design limits generalisability, and although outcome assessors were blinded, patients and treating therapists could not be blinded, allowing potential expectation effects. The twelve-week horizon does not establish whether the benefits are maintained over the longer term, which is an important consideration in a chronic, often recurrent condition. These considerations indicate the need for multicentre trials with longer follow-up, but the findings provide robust short-term evidence supporting structured exercise therapy.

LIMITATIONS

This study has several limitations. The single-centre design limits generalisability to other settings and populations. Although outcome assessors were blinded, patients and treating therapists could not be blinded to the intervention, allowing potential performance and expectation effects. The twelve-week follow-up does not establish whether the benefits are maintained over the longer term, which is important in a chronic and frequently recurrent condition. The study focused on non-specific chronic low back pain and may not apply to specific spinal pathology, and pain and disability were the primary outcomes, with broader

quality-of-life measures not the main focus.

FUTURE SCOPE

Future research should include multicentre randomised controlled trials with longer-term follow-up to confirm the durability of the benefits of structured exercise therapy in chronic low back pain and to evaluate its effects on recurrence and quality of life. Studies comparing exercise types and identifying which patients respond best would help individualise treatment, and research into strategies to support long-term adherence and physical activity is particularly important given the chronic nature of the condition. Investigation of exercise combined with education and psychological approaches, and of home- and technology-supported delivery, would further inform comprehensive musculoskeletal physiotherapy management of chronic low back pain.

CONCLUSION

These results add to the substantial body of evidence supporting exercise as a first-line treatment and reinforce the value of delivering it as a structured, progressive and individualised programme [2], [3].

In this randomised controlled trial, a structured, progressive exercise therapy programme produced significantly greater reductions in pain and disability and higher global improvement than usual care in patients with chronic low back pain, with progressive benefit over the twelve-week programme. The findings support the use of structured exercise therapy as a core, first-line musculoskeletal physiotherapy intervention for chronic low back pain. While the single-centre design and twelve-week horizon warrant cautious interpretation, the clear benefits observed support structured exercise, and multicentre trials with longer-term follow-up are needed to confirm the durability of these outcomes and to optimise programme delivery.

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