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Effectiveness of Mindfulness-Based Stress Reduction and Cognitive Behavioural Therapy on Pain and Functional Limitation In Patients with Chronic Low Back Pain

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Abstract:
Background: Chronic low back pain (CLBP) is a musculoskeletal condition associated with pain and functional limitation. Mindfulness-Based Stress Reduction (MBSR) and Cognitive Behavioural Therapy (CBT) are non-pharmacological approaches used in chronic pain management. Objective: To compare the effectiveness of MBSR and CBT on pain intensity and functional limitation in patients with CLBP. Methods: A comparative pre-test and post-test study was conducted among 50 patients with CLBP aged 24–50 years at Revathi Medical Centre, Tiruppur. Participants were divided equally into two groups of 25. Group A received MBSR and Group B received CBT for 60 minutes per session, three sessions per week, for 16 weeks. Pain intensity was assessed using the McGill Pain Questionnaire (MPQ), and functional limitation was assessed using the Oswestry Disability Index (ODI). Paired t-tests were used for within-group comparisons and independent t-tests for between-group comparisons. Statistical significance was set at $p \leq 0.05$. Results: In Group A, the mean MPQ score decreased from 50.00 ± 5.93 to 36.88 ± 5.00, while Group B decreased from 49.24 ± 6.23 to 42.32 ± 5.78. The ODI score decreased from 50.62 ± 9.82 to 35.16 ± 9.48 in Group A and from 50.80 ± 10.22 to 42.80 ± 9.63 in Group B. Both groups demonstrated statistically significant pre- to post-intervention improvements, with greater reductions observed in Group A. Conclusion: Both MBSR and CBT were associated with improvements in pain and functional limitation in patients with CLBP. Greater reductions in outcome scores were observed following MBSR in this sample.

Keywords: Chronic low back pain; Cognitive behavioural therapy; Mindfulness; Pain; Functional limitation; Oswestry Disability Index.

INTRODUCTION

Low back pain is a common musculoskeletal condition that can substantially affect physical functioning, participation and quality of life. Non-specific chronic low back pain is generally characterized by pain that persists or recurs for more than three months without being reliably attributed to an underlying disease or structural lesion. Persistent low back pain is influenced by physical, psychological and behavioural factors, supporting the need for a multidimensional approach to management [1,2]. Chronic low back pain is not solely a consequence of tissue-related pathology. Psychological factors such as anxiety, emotional distress, maladaptive beliefs and pain-related coping behaviours can contribute to the persistence and severity of symptoms. Consequently, contemporary management increasingly incorporates non-pharmacological interventions addressing both physical and psychosocial aspects of chronic pain [2-4].

Mindfulness-Based Stress Reduction is a structured mind-body intervention that develops present-moment awareness and non-judgmental acceptance of thoughts, emotions and physical sensations. Mindfulness-based approaches may help individuals change their responses to pain rather than focusing exclusively on eliminating the pain experience. Previous clinical research has demonstrated beneficial effects of mindfulness-based interventions on pain and functional outcomes in people with chronic low back pain [3,4]. Cognitive Behavioural Therapy is a psychological intervention that focuses on identifying and modifying maladaptive thoughts, beliefs and behaviours. In chronic pain management, CBT commonly incorporates pain education, cognitive restructuring, behavioural activation, relaxation strategies, goal setting, problem solving and coping skills. Evidence supports CBT as a psychosocial intervention for chronic pain and chronic low back pain [5].

A randomized clinical trial comparing MBSR and CBT in adults with chronic low back pain demonstrated improvement in pain-related outcomes and functional limitations with both interventions [4]. Systematic review evidence has also suggested that mindfulness-based interventions may provide beneficial effects on pain and physical functioning in individuals with low back pain [4]. The McGill Pain Questionnaire is a multidimensional pain assessment instrument designed to characterize sensory, affective and evaluative aspects of pain. It has been widely used in pain research and clinical practice [6]. The Oswestry Disability Index is a condition-specific patient-reported measure commonly used to assess disability and functional limitation associated with low back pain [7]. Although both mindfulness-based and cognitive behavioural approaches have demonstrated benefits in chronic pain management, comparison of their effects in a physiotherapy-based clinical setting remains relevant. Therefore, the present study was undertaken to compare the effectiveness of MBSR and CBT on pain and functional limitation in patients with chronic low back pain [3,4].

Aim

To compare the effectiveness of Mindfulness-Based Stress Reduction and Cognitive Behavioural Therapy on pain and functional limitation in patients with chronic low back pain.

Objectives

1. To compare the effectiveness of Mindfulness-Based Stress Reduction and Cognitive Behavioural Therapy on pain intensity using the McGill Pain Questionnaire.
2. To compare the effectiveness of Mindfulness-Based Stress Reduction and Cognitive Behavioural Therapy on functional limitation using the Oswestry Disability Index.

MATERIALS AND METHODS

Ethical Committee Number:

The study was approved by the Institutional Ethics Committee (IEC-RIPT/DT/21/4514).

Study Design

A comparative pre-test and post-test study design was used to compare the effects of Mindfulness-Based Stress Reduction and Cognitive Behavioural Therapy.

Study Setting and Duration

The study was conducted in the outpatient department of Revathi Medical Centre, Tiruppur, Tamil Nadu, over a total study period of six months. The intervention period for each participant was 16 weeks.

Participants and Sample Size

A total of 50 patients with chronic low back pain aged 24–50 years were included. Participants were divided equally into two groups, with 25 participants in each group. Group A received Mindfulness-Based Stress Reduction and Group B received Cognitive Behavioural Therapy.

Sampling Method

Selective sampling was used to recruit eligible participants, as recorded in the study/dissertation materials.

Inclusion Criteria

- Age between 24 and 50 years.
- Currently receiving medical treatment such as physiotherapy or medication.
- History of non-specific chronic low back pain with pain persisting for at least 3 months.
- Male and female participants.
- Provided informed consent and were willing to participate in complementary pain-management interventions.

Exclusion Criteria

- History of spine surgery.
- Presence of another chronic disease.
- Age above 50 years.
- Pregnancy.
- Unwillingness to participate.
- Medical contraindication to exercise.

Outcome Measures

McGill Pain Questionnaire (MPQ)

Pain was assessed using the McGill Pain Questionnaire, a multidimensional instrument designed to assess qualitative and quantitative aspects of pain. The questionnaire includes sensory, affective and evaluative dimensions and has been used extensively in clinical pain research.

Oswestry Disability Index (ODI)

Functional limitation was assessed using the Oswestry Disability Index. The ODI is a condition-specific measure used to evaluate disability associated with low back pain and includes domains related to daily activities and functional performance.

Intervention

All participants underwent baseline assessment before the intervention. The intervention was delivered for 60 minutes per session, three sessions per week, for 16 weeks.

Group A – Mindfulness-Based Stress Reduction

- 10 minutes of mindful breathing.
- 10 minutes of body scan meditation.
- 15 minutes of mindful movement.
- 15 minutes of mindful walking meditation.
- 10 minutes of mindful daily practice.

Mindfulness practice emphasized purposeful attention to present-moment experiences without judgment. These techniques were used to improve awareness and acceptance of pain-related sensations and emotional responses.

Group B – Cognitive Behavioural Therapy

- Education.
- Cognitive restructuring.
- Behavioural activation.
- Relaxation and coping strategies.
- Goal setting.
- Problem-solving strategies.

CBT aims to modify maladaptive thoughts and behaviours associated with chronic pain and to develop more adaptive coping strategies.

Statistical Analysis

Pre- and post-intervention outcome scores were analysed using paired t-tests for within-group comparisons and independent t-tests for between-group comparisons. Statistical significance was set at $p \leq 0.05$.

RESULTS

A total of 50 patients with chronic low back pain participated in the study, with 25 participants in Group A and 25 participants in Group B. Group A received Mindfulness-Based Stress Reduction, whereas Group B received Cognitive Behavioural Therapy. Pain intensity and functional limitation were assessed before and after the intervention.

Pain Intensity

The mean McGill Pain Questionnaire score in Group A decreased from 50.00 ± 5.93 before intervention to 36.88 ± 5.00 after intervention. Group B demonstrated a reduction from 49.24 ± 6.23 to 42.32 ± 5.78. Within-group analysis demonstrated statistically significant improvement in both groups ($p = 0.001$). The post-intervention mean pain score was lower in Group A than in Group B, indicating a greater reduction in pain intensity following Mindfulness-Based Stress Reduction in the present sample. The between-group results are presented in Table 1.

Functional Limitation

The mean Oswestry Disability Index score in Group A decreased from 50.62 ± 9.82 to 35.16 ± 9.48 following intervention. In Group B, the mean ODI score decreased from 50.80 ± 10.22 to 42.80 ± 9.63. Both groups demonstrated statistically significant pre- to post-intervention improvement ($p = 0.001$). The lower post-intervention ODI score in Group A indicates a greater reduction in disability compared with Group B in the present study. The between-group results are presented in Table 2.

Table 1. Comparison of McGill Pain Questionnaire scores between Group A and Group B at pre-test and post-test.

Test	Group A Mean ± SD	Group B Mean ± SD	t	df	p value
Pre-test	50.00 ± 5.93	49.24 ± 6.23	0.442	48	0.661
Post-test	36.88 ± 5.00	42.32 ± 5.78	−3.55	48	0.001

Table 2. Comparison of Oswestry Disability Index scores between Group A and Group B at pre-test and post-test.

Test	Group A Mean ± SD	Group B Mean ± SD	t	df	p value
Pre-test	50.62 ± 9.82	50.80 ± 10.22	0.191	48	0.849
Post-test	35.16 ± 9.48	42.80 ± 9.63	2.82	48	0.001

Table 3. Within-group comparison of McGill Pain Questionnaire scores from pre-test to post-test.

Group	Pre-test Mean ± SD	Post-test Mean ± SD	t	p value
Group A	50.00 ± 5.93	36.88 ± 5.00	30.55	0.001
Group B	49.24 ± 6.23	42.32 ± 5.78	27.17	0.001

Table 4. Within-group comparison of Oswestry Disability Index scores from pre-test to post-test.

Group	Pre-test Mean ± SD	Post-test Mean ± SD	t	p value
Group A	50.62 ± 9.82	35.16 ± 9.48	25.60	0.001
Group B	50.80 ± 10.22	42.80 ± 9.63	29.30	0.001

DISCUSSION

The present study compared Mindfulness-Based Stress Reduction and Cognitive Behavioural Therapy in patients with chronic low back pain. Both intervention groups demonstrated statistically significant reductions in pain intensity and functional limitation after the intervention period. However, the magnitude of improvement was greater in the Mindfulness-Based Stress Reduction group. The improvement observed following Mindfulness-Based Stress Reduction may be related to increased awareness and acceptance of pain-related sensations, reduced emotional reactivity and improved coping with discomfort. Mindfulness-based interventions may influence the psychological and behavioural dimensions of chronic pain rather than focusing exclusively on pain intensity.

The findings are consistent with previous research comparing MBSR and CBT in chronic low back pain. reported that both MBSR and CBT were beneficial approaches for adults with chronic low back pain, supporting the use of structured psychosocial interventions as components of non-pharmacological pain management. Cognitive Behavioural Therapy also produced significant improvement in the present study. CBT may reduce disability by addressing maladaptive pain-related thoughts, fear, avoidance behaviours and ineffective coping strategies. Previous evidence has established CBT as an important psychosocial treatment for chronic pain. The McGill Pain Questionnaire was selected because chronic pain is multidimensional and includes sensory and affective components. The observed reduction in MPQ scores in both groups suggests that both interventions were associated with improvement in the reported pain experience.

Functional limitation was evaluated using the Oswestry Disability Index. The reduction in ODI scores in both groups indicates improvement in self-reported disability. The greater reduction observed in Group A suggests that MBSR may have produced greater functional benefits in this sample; however, this finding should be interpreted cautiously because of the study's sample size and design limitations. Overall, the findings suggest that both MBSR and CBT may be useful non-pharmacological approaches for patients with chronic low back pain. In the present sample, the reductions in MPQ and ODI scores were greater in the MBSR group, while CBT also demonstrated improvement.

Limitations

- The sample size was relatively small, with only 50 participants.
- Participants were recruited from a single clinical setting, which may limit generalisability to other populations.
- The study included participants within a restricted age range of 24–50 years.
- Only pain intensity and functional limitation were evaluated, without assessment of psychological variables, quality of life or long-term outcomes.
- The study duration was six months, while the intervention period was 16 weeks. Long-term follow-up was not reported.

Recommendations

- Future studies should recruit larger and more diverse samples and should consider multicentre research designs.
- Longer follow-up periods may help determine whether improvements are maintained after completion of treatment.
- Future research may also evaluate psychological outcomes, quality of life, fear-avoidance, pain catastrophizing, self-efficacy and physical performance in addition to pain and disability.
- Further comparative studies should use clearly defined randomisation procedures where applicable and standardized intervention protocols to improve methodological quality and reproducibility.

CONCLUSION

Both Mindfulness-Based Stress Reduction and Cognitive Behavioural Therapy were associated with significant reductions in pain intensity and functional limitation among patients with chronic low back pain. In the present study, the Mindfulness-Based Stress Reduction group demonstrated greater reductions in McGill Pain Questionnaire and Oswestry Disability Index scores than the Cognitive Behavioural Therapy group. These findings suggest that MBSR may be a useful non-pharmacological approach for improving pain and functional outcomes in patients with chronic low back pain. However, larger and methodologically rigorous studies are required to confirm the comparative effectiveness of these interventions.

Conflict of Interest

The authors declare that there is no conflict of interest.

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