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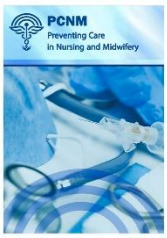

Original Article

Efficacy of a Mindful Compassion Intervention on Reducing Pain Catastrophizing and Rumination in Women with Mobility Disability: A Randomized Controlled Trial

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Abstract

Background: Living with mobility disabilities can be associated with psychological and social challenges. Certain interventions have been found to assist individuals with disabilities in coping with issues related to pain and rumination.

Objectives: This study aimed to evaluate the effectiveness of mindful compassion in reducing pain catastrophizing and rumination among women with mobility disabilities.

Methods: This quasi-experimental study employed a pre-test–post-test design with a control group. Thirty women with mobility disabilities at Kahrizak Charity Center, Iran (2024), were voluntarily recruited and randomly assigned to intervention and control groups. The intervention consisted of 12 weekly 90-minute mindful compassion sessions. Data (RRS, PCS) were analyzed using multivariate and univariate covariance analyses in SPSS-24.

Results: The results showed that mindful compassion significantly decreased pain catastrophizing among women with mobility disabilities ($p < 0.01$). Additionally, mindful compassion was found to significantly decrease rumination in these women ($p < 0.01$).

Conclusion: Mindful compassion proves to be an effective intervention for reducing both psychological and physical challenges in women with mobility disabilities. This intervention may be considered a valuable therapeutic approach in conjunction with other medical and rehabilitation treatments.

Implications for Nursing and Midwifery Preventive Care

- The findings highlight the importance of integrating mindfulness- and compassion-based interventions into preventive nursing and midwifery care for women with mobility disabilities.
- By addressing maladaptive cognitive patterns such as pain catastrophizing and rumination, these interventions may improve emotional regulation, rehabilitation adherence, and overall quality of life.

Introduction

Disabilities, defined as physical or mental conditions that limit an individual's ability to perform everyday tasks, affect approximately 15% of the global population, with mobility impairments being the most common form [1,2]. In Iran, over 1.35 million people have been identified as living with disabilities, and international surveys indicate that women experience disabilities at rates approximately 60% higher than men [3,4]. Physical disabilities often involve long-term reductions in bodily functions, leading to constraints in movement, stamina, and general physical abilities [5,6]. Such impairments not only hinder day-to-day functioning but can also affect participation in education, employment, social activities, and other fundamental aspects of life, with broader implications for self-confidence, life satisfaction, and overall well-being [7–11].

Individuals with mobility disabilities frequently experience a range of secondary health and psychological conditions. Factors such as low self-efficacy, depression, internalized stigma, low self-esteem, and chronic pain can profoundly reduce quality of life [7,8,12]. Psychological distress in this population is closely linked to maladaptive cognitive patterns, including pain catastrophizing—the tendency to exaggerate or focus excessively on the negative aspects of pain—and rumination [13,14], which involves repetitive attention to distress and its consequences [15–20]. These cognitive tendencies can exacerbate perceptions of pain, lower frustration tolerance, and contribute to negative emotional states, creating a cyclical pattern that impairs both physical and mental functioning [17–19].

While numerous interventions have targeted physical rehabilitation in individuals with disabilities, there is growing recognition of the importance of psychological strategies to enhance coping, resilience, and quality of life. Mindfulness-based therapies have been increasingly employed to support individuals in accepting limitations, regulating emotions, and reducing psychological distress [21–25].

Mindfulness can improve attention to the present moment, decrease stress reactivity, and promote adaptive emotional responses, making it particularly relevant for individuals facing chronic pain or physical limitations.

Within this framework, mindful compassion emerges as a structured approach, combining mindfulness practices with the cultivation of self-kindness, recognition of shared human experience, and nonjudgmental awareness of emotions. Its three core components—self-kindness versus self-criticism, common humanity versus isolation, and mindful awareness versus over-identification—provide individuals with tools to respond to difficulties with care and acceptance rather than harsh self-judgment or over-identification with distress [26–28].

Although mindfulness-based and compassion-focused interventions have been shown to improve psychological outcomes in general populations, few studies have specifically examined the integrated effects of mindful compassion on pain catastrophizing and rumination among women with mobility disabilities—a population particularly vulnerable to chronic pain and psychological distress. Mindful compassion interventions, emphasizing self-kindness, common humanity, and mindful awareness, have demonstrated reductions in anxiety and rumination, yet evidence remains limited for this demographic.

Addressing this gap, the present study investigates how mindful compassion can reduce pain catastrophizing and rumination in women with mobility disabilities, offering insights for preventive nursing and midwifery care aimed at improving mental well-being and quality of life.

Objectives

This study aimed to offer new insights by examining the effects of mindful compassion on pain catastrophizing and rumination in women with mobility disabilities.

Methods

Study Design

This quasi-experimental study employed a pre-test–post-test design with a control group.

Participants

This quasi-experimental study employed a pre-test–post-test design with a control group. The research population consisted of women with mobility disabilities residing full-time at the Kahrizak Charity Center in Alborz Province, Iran, in 2024. Among the total 170 residents with mobility disabilities at the center, 30 women were selected using voluntary and convenience sampling and assigned to intervention (n = 15) and control (n = 15) groups through permuted block randomization (Diagram 1). All study procedures were conducted in accordance with STROBE guidelines.

Sampling Methods

The sample size was calculated based on Fleiss et al.'s formula [29], with parameters explicitly defined as $\alpha = 0.05$, $\beta = 0.10$ (corresponding to 90% power), P0 = 0.8, P1 = 0.70, and r = 0.7. Using these parameters, the estimated sample size per group was 15, resulting in a total of 30 participants. This calculation was performed to detect a statistically meaningful difference in the primary outcomes while accounting for the expected medium = 0.5 effect size and study constraints. Regarding study timing, the intervention was conducted over 12 weeks, with pre-test and post-test assessments. No long-term follow-up was performed, which is acknowledged as a limitation of the study.

The relatively small sample size is justified by the limited population of women with mobility disabilities residing at the center and the exploratory nature of this quasi-experimental study. Despite the small sample, random assignment and standardized intervention protocols were employed to maximize internal validity and ensure reliable assessment of the effects of mindful compassion on pain catastrophizing and rumination.

The inclusion criteria were: (1) an age range of 30 to 55 years, (2) no diagnosis of cognitive impairment or mental/psychological disabilities, as determined by the center's physician and psychiatrist, and (3) no hearing or visual impairments. The exclusion criteria were: (1) missing more than two intervention sessions, (2) concurrent participation in other psychological or educational interventions, and (3) the failure to complete the questionnaire in the pre-test or post-test phases.

Interventions

The content of the intervention program was developed based on the book Mindful Compassion [34] and was implemented accordingly. Table 1 provides a summary of the intervention program content.

Comparison

In accordance with ethical guidelines, a sample of 30 women with mobility disabilities residing at the Kahrizak Charity Center in Alborz Province was selected from a total population of 170 based on specific inclusion criteria, which included age, type of disability, and absence of severe comorbid conditions. Participants were randomly assigned to either the intervention group (n = 15) or the control group (n = 15). The intervention group participated in a structured mindful compassion program comprising 12 weekly sessions, each lasting 90 minutes. Pre-test and post-test assessments were conducted using the Ruminative Response Scale (RRS) and the Pain Catastrophizing Scale (PCS).

To minimize the influence of potential confounding variables such as duration of disability, pain intensity, family support, and medication use, these factors were recorded at baseline, and eligibility criteria ensured relative homogeneity across participants. Random assignment to groups further helped to balance these characteristics between the intervention and control groups. The control group continued to receive standard care services, including physical therapy, occupational therapy, exercise programs, and educational pamphlets on dietary guidance throughout the study to uphold ethical standards. After the intervention concluded, members of the control group were offered six sessions of mindful compassion training.

Regarding generalizability, this study specifically focused on women with mobility disabilities. While mindful compassion interventions may hold promise for other disability types, the current findings are directly applicable only to women with mobility limitations. The intervention was delivered by a

rehabilitation counselor (MSc) at the Kahrizak Disabled Charity Center.

Table 1. Structure and Content of the Mindful Compassion Intervention Program

Session	Core Topic	Key Objectives and Practices
1	Introduction to Mindfulness & Compassion	Psychoeducation on concepts; Introduction to mindful breathing; Setting group intentions.
2	Cultivating Self-Kindness	Recognizing self-criticism; Practicing self-compassionate language; Loving-kindness meditation for the self.
3	Common Humanity vs. Isolation	Understanding shared human experience; Exercises to connect with others' struggles; Group discussion on feelings of isolation.
4	Mindful Awareness of Pain & Distress	Learning to observe physical and emotional pain without over-identification; Body scan meditation focused on non-judgmental awareness.
5	Integrating Compassion in Daily Life	Developing a personal practice; Identifying triggers for catastrophizing and using compassion as a response; Creating an action plan.
6	Consolidation and Forward Path	Reviewing skills and insights; Discussing strategies for maintaining practice; Closure and future planning.

Outcomes

The study measured changes in rumination and pain catastrophizing to evaluate the program's effect. Pre-test and post-test assessments were conducted using the Ruminative Response Scale (RRS) and the Pain Catastrophizing Scale (PCS).

Data Collection

This study utilized two psychometric instruments: the Ruminative Response Scale (RRS) and the Pain Catastrophizing Scale (PCS).

Ruminative Response Scale (RRS)

The RRS was originally developed by Nolen-Hoeksema and Morrow [30] to assess individuals' tendencies to engage in rumination.

This instrument comprises 22 items, each rated on a 4-point Likert scale ranging from 1 (rarely) to 4 (almost always). The total score, obtained by summing the responses to all items, ranges from 22 to 88, with higher scores reflecting greater levels of rumination [31]. Previous research has reported mean scores of 42.0 for women and 39.6 for men on this scale [32].

In the present study, the internal consistency of the RRS when administered to women with mobility disabilities was evaluated, yielding a Cronbach's alpha coefficient of 0.87.

Pain Catastrophizing Scale (PCS)

Developed by Sullivan et al. [33], the PCS measures the degree to which individuals catastrophize about their pain experiences. The scale consists of 13 items, each scored on a 5-point Likert scale ranging from 0 (not at all) to 4 (all the time). The PCS yields a total score (ranging from 0 to 52) and three subscale scores: Rumination, Magnification, and Helplessness [34]. While there is no specific cutoff score, higher scores indicate more severe pain catastrophizing. Previous studies have reported strong internal consistency for the PCS, with Cronbach's alpha coefficients ranging from 0.87 to 0.93 for the total scale; 0.85–0.91 for Rumination; 0.66–0.75 for Magnification; and 0.78–0.87 for Helplessness [35]. In the current study, the PCS demonstrated acceptable reliability, with Cronbach's alpha coefficients of 0.81 for Rumination, 0.71 for Magnification, 0.70 for Helplessness, and 0.82 for the total score.

Statistical Methods

Data were summarized using descriptive statistics including means and standard deviations. For inferential statistics, univariate analysis of covariance (ANCOVA) was employed. Several statistical assumptions were tested prior to analysis:

The Kolmogorov-Smirnov test assessed normality of score distributions; Levene's test evaluated homogeneity of variances for dependent variables across groups; and Box's M test checked the equality of covariance matrices. Additionally, multivariate tests including Pillai's trace, Wilks' lambda, Hotelling's trace, and Roy's largest root were used to determine the significance of differences. All analyses were conducted using SPSS version 24, with the significance level set at $p < 0.05$.

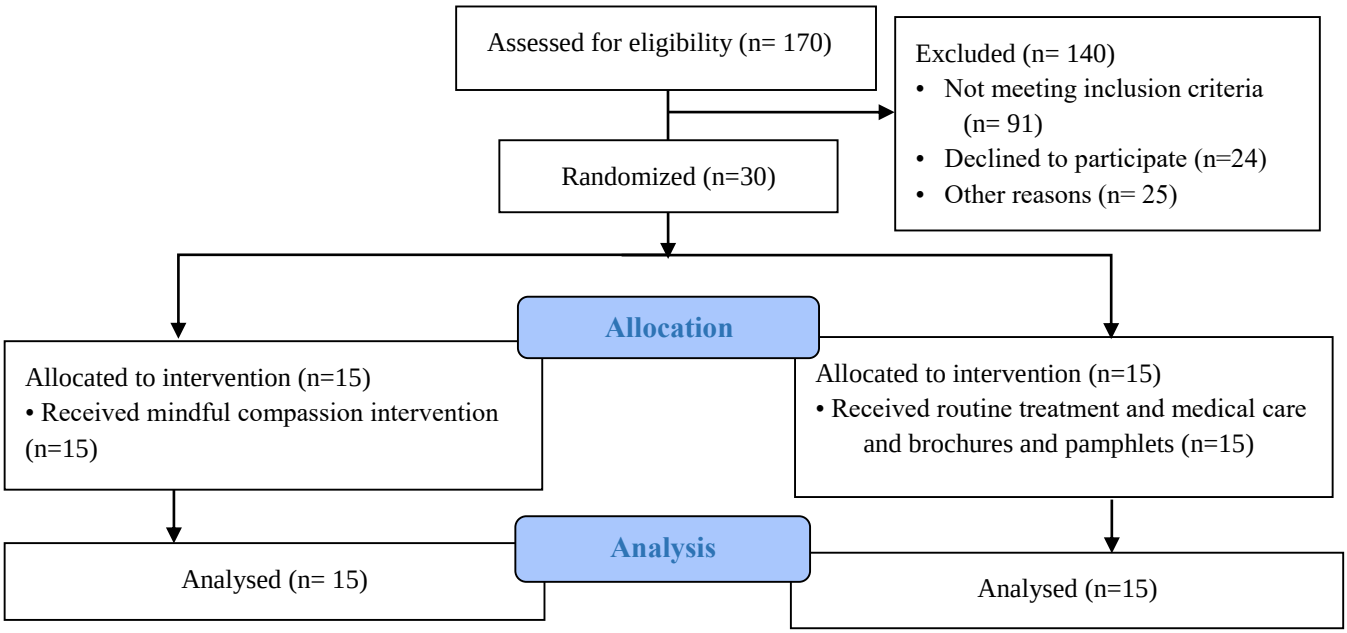

Figure 1. Flow Diagram of Study Selection and Data Collection Process

Result

The demographic characteristics of participants, including age distribution, educational level, and marital status, are presented in Table 2.

Table 2. Demographic Characteristics of Participants (N = 30)

Characteristic	Category	n	%
Age Group	30-35	8	26.7
	36-40	10	33.3
	41-45	7	23.3
	46-50	5	16.7
Education Level	Below Diploma	12	40.0
	Diploma	11	36.7
	Associate Degree	4	13.3
	Bachelor's or Higher	3	10.0
Marital Status	Single	9	30.0
	Married	14	46.7
	Divorced/Widowed	7	23.3

The data in Table 3 indicate that while the control group exhibited minimal changes in post-test scores for both pain catastrophizing and rumination, the intervention group demonstrated substantial reductions in both variables following the intervention.

Analysis of covariance (ANCOVA) was conducted to compare group means while controlling for pre-test scores. Prior to running ANCOVA, the necessary assumptions were verified. Levene's test for homogeneity of variances and Box's M test for homogeneity of covariance matrices were both non-significant ($p > 0.05$), confirming that the assumptions were met. The ANCOVA results are presented in Table 4.

Table 3. Descriptive Statistics for Pain Catastrophizing and Rumination Scores Before and After the Intervention

Group	Variable	Pretest M (SD)	Posttest M (SD)	Paired Differences (t-test)
Control	Pain Catastrophizing	31.13 (6.52)	30.93 (4.49)	t = 0.40, $p = 0.91$
	Rumination	41.40 (11.15)	43.73 (10.14)	t = 0.29, $p = 0.47$
Intervention	Pain Catastrophizing	27.73 (6.48)	21.27 (6.12)	t = 5.90, $p \leq 0.001$
	Rumination	49.73 (10.14)	37.48 (11.44)	t = 4.90, $p \leq 0.001$

Table 4. Results of Multivariate Analysis of Covariance for Pain Catastrophizing and Rumination by Group

Effect	Test	Value	F	Effect df	Error df	*p*	η^2	Power
Group	Pillai's Trace	0.315	5.753	2	25	0.009	0.315	0.823
	Wilks' Lambda	0.685	5.753	2	25	0.009	0.315	0.823
	Hotelling's Trace	0.460	5.753	2	25	0.009	0.315	0.823
	Roy's Largest Root	0.460	5.753	2	25	0.009	0.315	0.823

Note. All analyses control for pre-test scores. η^2 = eta squared (effect size).

The multivariate test statistics (Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root) yielded a significance value of $p = 0.009$, indicating statistically significant differences between the intervention and control groups on the combined dependent variables of pain catastrophizing and rumination during the post-intervention phase. These results demonstrate that the mindful compassion intervention was effective in reducing both pain catastrophizing and rumination among women with mobility disabilities.

The ANCOVA results presented in Table 5 indicate a statistically significant difference in pain catastrophizing scores between the intervention and control groups after accounting for pre-test scores, with F = 3.830, $p = 0.034$, and a medium effect size ($\eta^2 = 0.221$). For rumination scores, the analysis revealed a stronger significant effect, with F = 14.013, $p = 0.001$, and a large effect size ($\eta^2 = 0.509$). Given the substantial reduction in mean scores observed in the intervention group during the post-test assessment, these findings support the conclusion that the mindful compassion intervention was effective in reducing both pain catastrophizing and rumination among women with mobility disabilities.

Table 5. Analysis of Covariance Results for Pain Catastrophizing and Rumination by Group

Variable	Source	Sum of Squares	df	Mean Square	F	*p*	η^2	Power
Pain Catastrophizing	Between Groups	231.754	2	115.877	3.830	0.034	0.221	0.645
	Error	816.946	27	30.257				
	Total	21485	30					
Rumination	Between Groups	1537.884	2	768.942	14.013	0.001	0.509	0.996
	Error	1481.583	27	54.873				
	Total	3019.467	30					

Note. η^2 = eta squared (effect size). All analyses control for pre-test scores.

Discussion

The findings of this study indicate that mindful compassion interventions significantly reduce pain catastrophizing among women with mobility disabilities. Mindfulness practices cultivate self-compassion, which serves as a mediator in alleviating stress within mindfulness-based stress reduction (MBSR) programs and contributes to relapse prevention in mindfulness-based cognitive therapy (MBCT) for depression [34]. Essentially, enhancing self-compassion enables individuals facing stress or depressive symptoms to manage

these conditions more effectively. Additionally, mindfulness practices increase awareness of bodily sensations and emotions, facilitating deeper understanding of pain and recognition of pain catastrophizing patterns, which may ultimately contribute to reduced perceived pain intensity. Previous research has demonstrated that teaching self-compassion improves mental health outcomes [35] and promotes self-regulation [36]. Mindfulness is further associated with decreased impulsivity and improved emotional regulation, allowing individuals to maintain awareness and live consciously, thereby enhancing their sense of personal and environmental control. This capacity for self-regulation develops through non-judgmental acceptance of distressing thoughts and emotions, a central component of mindfulness practice [24].

Evidence suggests that mindfulness and compassion-based approaches alleviate stress and anxiety, factors known to intensify pain perception. By reducing these psychological stressors, mindfulness interventions may help mitigate chronic pain and encourage greater self-acceptance among patients. Mindfulness has proven particularly beneficial for individuals with musculoskeletal and chronic pain conditions [37,38]. By fostering non-judgmental awareness and self-reflection, mindfulness contributes to improved cognitive functioning and well-being in individuals with disabilities, thereby promoting autonomy and facilitating rehabilitation [39]. Supporting this, research on yoga interventions for patients with pain and mobility limitations has shown reductions in anxiety and pain catastrophizing alongside increased self-compassion [40]. Given the multidimensional nature of pain, implementing mindful compassion strategies can help decrease both pain experience and rumination, ultimately improving patients' quality of life. MBSR has been specifically demonstrated to effectively manage nonspecific chronic pain [41].

The current study also revealed that mindful compassion significantly reduced rumination among women with mobility disabilities. Through mindful compassion practice, individuals learn to redirect attention from persistent negative thoughts toward more constructive and supportive perspectives [42]. This approach helps individuals observe thoughts as transient mental events rather than fixed truths, thereby decreasing the frequency and intensity of rumination. Consequently, individuals engaging in mindfulness practices often report reduced depressive symptoms due to their enhanced ability to approach thoughts non-judgmentally and foster greater self-compassion [43].

Individuals with higher self-compassion demonstrate greater propensity to engage proactively in self-care practices aimed at alleviating suffering. Such individuals tend to treat themselves kindly, prioritize emotional and physical health, and maintain balanced, non-judgmental interpersonal relationships. Mindful compassion encourages self-kindness during adversity, acceptance of personal imperfections, and adoption of supportive, compassionate responses toward oneself [44,45]. Furthermore, mindful compassion helps individuals shift from feelings of isolation and disconnection toward recognizing shared human experiences, thereby approaching emotions with acceptance rather than being overwhelmed by them. This emotional skillset enhances individuals' capacity to manage challenging emotions and thoughts [46,47]. Self-compassion also facilitates transformation of negative emotions into more adaptive responses, enabling individuals to cope with difficulties in constructive ways [28].

Given these findings, future research should explore the neurobiological mechanisms underlying mindful compassion using neuroimaging methods such as functional magnetic resonance imaging (fMRI) and electroencephalography (EEG). Such investigations could illuminate how neural changes contribute to pain and rumination reduction. Longitudinal research is recommended to examine the long-term effects of mindfulness-based compassion interventions on pain and rumination in women with mobility disabilities, determining whether observed benefits persist over time. Insights from these studies could inform training programs for therapists specializing in mindful compassion interventions and support development of peer support groups for women with mobility disabilities to share experiences and effective coping strategies.

Study limitations include the quasi-experimental design, convenience and voluntary sampling, small sample size, and focus on women residing at a single center, which may limit generalizability. The relatively small sample size particularly constrains broad application of the findings.

Based on these findings, we recommend considering mindful compassion as a complementary intervention in care settings for individuals with mobility disabilities. Its demonstrated effectiveness in reducing pain catastrophizing and rumination supports implementation to enhance psychological well-being, promote self-compassion, and improve overall quality of life. Implementation should be tailored to specific population needs and available resources in each care setting.

Conclusion

This study investigated the effectiveness of mindful compassion interventions in decreasing pain catastrophizing and rumination among women with mobility disabilities. The results indicate that mindful compassion, incorporating mindfulness-based practices, can effectively reduce stress and chronic pain in this population. These effects are achieved through cultivating greater self-compassion toward oneself and others. Furthermore, mindful compassion enhances awareness of bodily sensations and emotional experiences, contributing to reductions in pain perception, negative thought patterns, and rumination. By learning to observe and accept thoughts non-judgmentally, individuals become better equipped to disengage from maladaptive cognitive processes and break cycles of persistent negative thinking.

Ethics Consideration

The study protocol received approval from the Iranian National Committee for Ethics in Biomedical Research (https://ethics.research.ac.ir/IndexEn.php) with code: IR.IAU.SRB.REC.1403.091.

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Conflict of Interest

The authors declare no conflict of interest.

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Authors' Contributions

Khodabakhshi-Koolaee A, Nooshazari S, and Falsafinejad MR: Conducted research, data gathering, and analysis; Khodabakhshi-Koolaee A, Nooshazari S: Contributed to conceptualization; Khodabakhshi-Koolaee A, Falsafinejad MR: Designed the study and drafted the initial version; All authors: Provided final approval.

Artificial Intelligence Utilization

The authors utilized AI to assist with English language editing and ensure compliance with journal standards.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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