

The Effect of a Care Program Based on Betty Neuman's Nursing Model on Death Anxiety, Fear of Disease Progression, and Psychosocial Adjustment to Illness in Patients with Multiple Sclerosis: A Randomized Clinical Trial

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Abstract

Background and Objective:

Patients with multiple sclerosis (MS) endure a spectrum of psychological stressors, including death anxiety, fear of disease progression, and impaired psychosocial adjustment to illness. Among the most comprehensive nursing frameworks grounded in the interplay between the patient, stress, and the corresponding human response is Betty Neuman's Systems Model, which holds considerable promise for addressing these challenges. The present study sought to investigate the effect of a care program anchored in Neuman's model on death anxiety, fear of disease progression, and psychosocial adjustment to illness in individuals living with MS.

Methods

This study represented a two-group randomized clinical trial conducted on 70 patients with MS in Shahrekord, Iran, in 2025. The participants were recruited using convenience sampling. The data were collected employing a demographic information questionnaire, Templer's Death Anxiety Scale (TDAS), Herschbach's Fear of Disease Progression Questionnaire, and Derogatis's Psychosocial Adjustment to Illness Scale (PAIS). The patients in both groups continued to receive routine care. The intervention group received a nursing intervention designed in accordance with Betty Neuman's Systems Model, delivered over four in-person group sessions, each lasting 40 minutes. The questionnaires were administered at three time points: prior to the intervention, immediately upon its conclusion, and at a two-month follow-up. The data were analyzed using SPSS software (version 23).

Results

Before the intervention, no statistically significant differences were observed between the two groups regarding the mean scores of death anxiety, fear of disease progression, or psychosocial adjustment to illness. The findings revealed that, following the intervention, the mean scores of death anxiety and fear of disease progression in the intervention group decreased significantly over time compared to the control group ($P < 0.001$). In contrast, the changes in the mean score of psychosocial adjustment to illness over time did not differ significantly between the two groups ($P = 0.265$).

Conclusion

The findings demonstrated that a nursing intervention grounded in Betty Neuman's Systems Model led to a significant reduction in death anxiety and fear of disease progression among patients with MS. However, within the designated timeframe, it did not yield a statistically significant improvement in patients' psychosocial adjustment to illness—underscoring the necessity of managing maladaptive behaviors over an extended period and further investigating the factors that influence this variable in this patient population.

Introduction

Multiple sclerosis (MS) is the most prevalent chronic, debilitating neurological disease characterized by autoimmune inflammation and progressive degeneration of the central nervous system. Owing to the extensive spectrum of neurological deficits, affected individuals endure a remarkably diverse array of physical and psychosocial impairments, including fatigue, pain, sensory and visual disturbances, spasticity, motor deficits, bowel and bladder dysfunction, cognitive impairment, anxiety, depression, diminished self-esteem, and difficulties with sleep and concentration (1–3). The typical age of MS onset ranges between 20 and 40 years, and the disease is three times more common in women than in men (4). According to the latest edition of the MS Atlas, the global prevalence of the disease has risen since 2013, such that by 2023, over 2.9 million people worldwide were living with MS (5). Iran currently holds the highest prevalence of MS in the Middle East and Asia and is recognized globally as one of the countries with the greatest disease burden (5). Within Iran, Chaharmahal and Bakhtiari Province is regarded as a region with a notably high prevalence of MS (6).

As a consequence of arduous treatment regimens, diminished physical capacity, pharmacological side effects, and reduced life expectancy, patients experience a range of adverse psychological sequelae, including disruption of life goals, economic hardship, strained relationships, and loss of inner tranquility, all of which carry profound psychological repercussions. One of the most fundamental psychological disturbances among individuals with chronic illness is anxiety, a profoundly debilitating state in patients with MS. Findings from a meta-analytic study indicate that approximately 36% of MS patients suffer from anxiety (7). Among the various forms of anxiety categorized by their origin is death anxiety (8). According to the North American Nursing Diagnosis Association, death anxiety is defined as “a feeling of insecurity, apprehension, or fear related to the experience of death or a near-death experience”. This type of anxiety constitutes a conscious or unconscious mental state that arises secondary to a defense mechanism or in response to a threat to survival and existence (11). When individuals are confronted with life-threatening events, they are prone to experiencing anxiety-laden thoughts associated with death (9). Given the defining characteristics of MS, including the absence of a definitive cure, progressive mobility restrictions, and the loss of normal daily activities, the disease can exert profoundly negative psychological effects. Evidence indicates that elevated levels of death anxiety are observed in these patients, exacerbating stressful circumstances, engendering feelings of emptiness and hopelessness, deteriorating health status, and producing deleterious effects across multiple dimensions of well-being (10, 11). Furthermore, Ebrahimi Meymand et al. demonstrated that 63% of MS patients experience moderate to severe levels of stress (12). One of the most significant sources of such stress is the fear of disease progression, or fear of relapse (13). Research shows that this form of fear is prevalent across numerous chronic illnesses, including multiple sclerosis. As a potent stressor, fear of disease progression can precipitate disease exacerbations, elevate mortality rates, and render life profoundly burdensome for these patients (13–15). Moreover, it encompasses the distressing concern that disease advancement will encroach upon various life domains, including interpersonal relationships, occupational functioning, and overall functional capacity (16). Despite medical advancements that have extended the life expectancy of patients with chronic diseases relative to earlier decades, individuals with MS continue to grapple with the challenges of adjusting to chronic illness (13). In recent years, the concept of psychosocial adjustment to illness has garnered increasing attention across diverse medical disciplines (17). Psychosocial adjustment in patients with MS is compromised and diminished under the influence of factors such as the unpredictable disease trajectory, the heterogeneity of symptoms, the lack of a curative treatment, limited access to medical care, and the ambiguous future impact of the disease on physical capabilities (18, 19). Moreover, such physical impairment may lead to social isolation, adversely affect social adjustment, restrict social activities, and even prompt some patients to refrain from discussing their illness and concerns with others (19). Okanli et al. reported that 55% of MS patients exhibited poor levels of psychosocial adjustment (20).

Given their pivotal role in patient rehabilitation, nurses, by establishing effective therapeutic communication, can play a critical part in alleviating anxiety, fostering adjustment, and providing support and education to MS patients. Moreover, nurses must be capable of justifying their clinical actions, remaining professionally accountable, and delivering care within a structured practical framework. What renders nursing interventions truly distinctive is their grounding in the principles and tenets of nursing theories and models (21, 22).

One such model is Betty Neuman's Systems Model, which has served since 1970 as a framework for organizing nursing knowledge and as a comprehensive, wellness-focused educational model predicated upon the individual's relationship with stress and the corresponding human response. The three core concepts in Neuman's theory are stress, homeostasis, and the patient's perception (23). Within Neuman's Systems Model, the individual is conceptualized as an open system in constant interaction with intrapersonal, interpersonal, and extrapersonal (transpersonal) stressors that hold the potential to disrupt equilibrium (24).

According to this model, the nurse's role is to minimize, insofar as possible, the individual's exposure to stressors or, in certain instances, to attenuate the associated responses by fortifying the flexible lines of defense (24, 25). The overarching goal of nursing in this model is to assess patients with a view to achieving stability through the attainment and preservation of health (23). The majority of studies conducted within this theoretical framework have adopted qualitative or case-based approaches (26–30), and no comprehensive investigation has been identified in the extant literature. Accordingly, the present study sought to examine the effect of a care program grounded in Betty Neuman's Systems Model on death anxiety, fear of disease progression, and psychosocial adjustment to illness in patients with multiple sclerosis (29).

Methods

Study Design

The present study was a randomized clinical trial conducted in 2025 AND 2026 across teaching hospitals affiliated with Shahrekord University of Medical Sciences, in Shahrekord, Iran. The trial was registered with the Iranian Registry of Clinical Trials under the code IRCT20240806062674N3 on December 14, 2025, and the study details are accessible at <https://en.irct.ir/trial/88083>.

Participants

The participants in this study comprised patients diagnosed with multiple sclerosis. The inclusion criteria were as follows: willingness to participate in the study and provision of written informed consent; age 20 years and older (based on scientific literature indicating that symptom onset typically occurs between 20 and 30 years of age) (31); a confirmed diagnosis of multiple sclerosis documented in the medical record; the ability to read, write, and comprehend the content of the research questionnaires; the absence of any other incurable disease concurrent with MS; and an Expanded Disability Status Scale (EDSS) score of less than 4, as determined through face-to-face interview and clinical examination conducted by a physician. The exclusion criteria encompassed: inadequate patient cooperation or unwillingness to continue participation; incomplete questionnaire responses, defined as answering fewer than 20% of the items; disease relapse resulting in new disability or functional limitation, or necessitating hospitalization; incomplete participation in the intervention program, defined as attendance at fewer than two sessions; and patient mortality.

Sample Size and Sampling Procedure

Based on a previous study by Aboutalebi et al. (32) concerning the Death Anxiety Scale, with a 95% confidence interval and 80% statistical power, the minimum required sample size was determined to be 30 individuals per group. Accounting for an anticipated attrition rate of 20%, 36 participants were recruited for each group, yielding a total of 72 individuals enrolled in the study. The participants were assigned to either the intervention group or the control group using a block randomization method. During the course of the study, two participants from the intervention group were withdrawn due to the inadequate questionnaire response rate—specifically, having answered fewer than 20% of the items. Consequently, a total of 70 participants completed the study.

Intervention

The whole intervention was implemented across six stages, with the procedural steps for the intervention group as follows:

1. **Case Selection:** The participants were selected based on a confirmed diagnosis of multiple sclerosis established by the attending neurologist and fulfillment of the remaining inclusion criteria. During the initial session, the principal investigator secured patients' consent for enrollment in the study and, upon explaining the study objectives, delineated the procedural steps in a general, straightforward, and comprehensible manner for eligible patients.
2. **Exploration of Patients' Perception of Illness and Comparison with the Researcher's Perception:** In accordance with Neuman's Systems Model, it was essential that the patient and the nurse achieve a shared understanding of the illness and its associated concerns.
3. **Examination and Identification of Patient Problems:** Based on interviews with the participants and analysis of the questionnaire data, specific areas requiring education and information were identified.
4. **Development of Educational Content:** Educational content was formulated by considering patients' identified needs and through consultation with specialists—including one neurologist and two nursing faculty members—and by drawing upon credible, specialized nursing and medical resources, with particular emphasis on Betty Neuman's Systems Model.
5. **Program Implementation:** At this stage, through coordination with the patient and by actively involving them in the care program, the aim was to empower the patient to overcome stressors, including death anxiety, fear of disease progression, and low psychosocial adjustment to illness.
6. **Program Evaluation:** Evaluation was conducted through re-administration of the questionnaires and determination of the mean scores for the outcome variables. At this stage, in-person communication with patients was maintained, adapted to each

patient's individual circumstances.

Instruments

Demographic Information Questionnaire

This questionnaire gathered data on age, sex, marital status, educational attainment, employment status, monthly income, disease duration, place of residence, ethnicity, insurance coverage, and the presence of disease-related complications.

Death Anxiety Scale

The Death Anxiety Scale was originally developed by Templer and consists of 15 items encompassing five dimensions of the fear of dying. The scale yields scores ranging from 0 (absence of death anxiety) to 15 (extremely high death anxiety), with a cut-off point set between 6 and 7; scores from 7 to 15 indicate high death anxiety. Templer reported a test-retest reliability coefficient of 0.83 for the scale (33). The validity of the Persian version was assessed using content validity, and its reliability was confirmed with a Cronbach's alpha coefficient of 0.85. The validity and reliability of the instrument were further verified by psychology specialists (34).

Fear of Disease Progression Questionnaire: This questionnaire was developed by Herschbach et al. in 2010 to assess fear of disease progression, originally in cancer patients, and later applied to samples of patients with rheumatologic disorders, migraine, and diabetes. The instrument comprises 43 items and five subscales: affective reactions, family, work, loss of autonomy, and coping with anxiety. Items are scored on a five-point Likert scale (1–5). The total score is calculated by summing all subscale scores, excluding the coping with anxiety subscale (35). In the study conducted by Herschbach and colleagues, the questionnaire demonstrated an internal consistency of 0.95, and test-retest reliability over a period of more than three weeks was estimated at 0.94. In the Persian version, Cronbach's alpha reliability coefficients for the subscales of affective reactions, family, work, and loss of autonomy were 0.86, 0.72, 0.76, and 0.71, respectively, with a total questionnaire reliability of 0.91 (16).

Psychosocial Adjustment to Illness Scale: This scale was developed by Derogatis in 1975 and revised in 2003. The instrument comprises 46 items rated on a four-point Likert scale from 0 to 3 (0 = not at all, 1 = slightly, 2 = considerably, 3 = very much). The scale encompasses seven domains: health care orientation (7 items), family environment (8 items), vocational environment (6 items), sexual relationships (6 items), extended family relationships (5 items), psychological distress (8 items), and social environment (6 items). The minimum achievable score is 0, and the maximum is 138. Scores ranging from 0 to 60 indicate low psychosocial adjustment, 61 to 122 indicate moderate psychosocial adjustment, and 123 to 138 denote high psychosocial adjustment (36). In Iran, Feghhi et al. (2013) examined the validity and reliability of the Derogatis Psychosocial Adjustment to Illness Scale (37).

Data Analysis

The data were analyzed using SPSS software (version 23). Descriptive statistics (frequency, mean, standard deviation) and inferential statistical tests were employed as follows: The chi-square test and Fisher's exact test were used to assess the homogeneity of qualitative variables between the two groups; independent-samples t-tests were applied to compare quantitative variables between groups; the Shapiro–Wilk test was utilized to examine the normality of data distribution. Analysis of covariance (ANCOVA) and repeated-measures analysis of variance (ANOVA) were conducted to compare the mean scores of the dependent variables across the study groups at different time points. A P-value of less than 0.05 ($p < 0.05$) was considered statistically significant for all tests.

Table 1
Nursing process for patients with multiple sclerosis based on Betty Neuman's Systems Model

Nursing process	Nursing intervention	Level of prevention	Nursing goal	Nursing diagnosis	Reaction	Stressors
Fear of disease progression reduced, as assessed by questionnaire	1. Familiarizing the patient with MS. 2. Encouraging the patient to express feelings and providing appropriate feedback. 3. Scheduling rest periods between activities to prevent fatigue and teaching the setting of small daily goals related to activity, nutrition, exercise, and pharmacotherapy. 4. Encouraging engagement in enjoyable activities and maintenance of social relationships to divert attention from negative thoughts. 5. Educating on the importance of light exercise, such as yoga.	Secondary prevention	Assisting the patient in reducing fear	Fear related to the possibility of disease progression	Fear	Psychological
Death anxiety reduced, as assessed by questionnaire	1. Participating in preferred religious and artistic activities. 2. Teaching effective relaxation methods and breathing techniques. 3. Encouraging the use of positive affirmations, reinforcing healthy and constructive thinking, and fostering hopefulness about the future. 4. Assisting in the reframing of thoughts related to death and disability through dialogue.	Secondary prevention	Improving the patient's attitude toward the illness	Death anxiety	Worry about death	Spiritual/Psychological
Psychosocial adjustment to MS not improved, as assessed by questionnaire	1. Reviewing previously ineffective coping strategies and assisting the patient in identifying	Secondary and tertiary prevention	Enhancing the level of adjustment	Impaired adjustment related to MS	Decreased psychosocial adjustment to MS	Sociocultural/Psychological

Nursing process	Nursing intervention	Level of prevention	Nursing goal	Nursing diagnosis	Reaction	Stressors
	personal strengths, skills, and past successes. 2. Identifying accessible support systems and providing guidance on joining the Iranian MS Society. 3. Educating on the disease, its trajectory, and the application of effective coping strategies. 4. Encouraging acceptance of limitations as part of a growth process, not as failure. 5. Correcting misconceptions about MS. 6. Encouraging the patient to maintain contact with friends, family, and the workplace to the greatest extent possible. 7. Planning group, volunteer, or cultural activities to enhance social interaction. 8. Employing positive mental imagery and writing exercises to facilitate emotional expression.					

Results

Table 1 presents the statistical summary of the demographic characteristics of the participants. As demonstrated in the table, the chi-square test, applied to compare the variables of sex, occupation, monthly income, disease duration, place of residence, ethnicity, and the presence of disease complications, and Fisher's exact test, used for the variables of age, marital status, educational attainment, and insurance coverage, revealed no statistically significant differences between the control and intervention groups. Thus, the two groups were homogeneous with respect to demographic characteristics.

Table 2 displays the comparison of the mean death anxiety scores within and between the control and intervention groups at baseline, immediately after the intervention, and at the two-month follow-up. At baseline, there was no statistically significant difference in the mean death anxiety score between the two groups ($P = 0.810$). Immediately after the intervention, a statistically significant difference in the mean death anxiety score was observed between the two groups ($P < 0.001$). The effect size of the intervention at this time point was 0.161, indicating a large effect. At the two-month follow-up, a statistically significant difference in the mean death anxiety score between the two groups was similarly observed ($P < 0.001$). The effect size of the intervention at this time point was 0.194, also indicative of a large effect.

The results further revealed that, over time, the mean death anxiety score changed significantly ($P < 0.001$). The group $\times$ time interaction demonstrated that the trajectory of change in the mean death anxiety score over time differed significantly between the two groups, such that the mean death anxiety score in the intervention group decreased significantly over time compared to the control group ($P < 0.001$). (Table 2, Fig. 1).

Table 3 presents the comparison of the mean fear of disease progression scores within and between the control and intervention groups at baseline, immediately after the intervention, and at the two-month follow-up. The group $\times$ time interaction indicated that the trajectory of change in the mean fear of disease progression score over time differed statistically between the two groups, with the mean fear of disease progression score in the intervention group decreasing significantly over time relative to the control group ($P < 0.001$) (Table 3, Fig. 2).

Table 4 illustrates the comparison of the mean psychosocial adjustment to illness scores—along with an examination and comparison of its dimensions, within and between the control and intervention groups at baseline, immediately after the intervention, and at the two-month follow-up. The group $\times$ time interaction demonstrated that the trajectory of change in the mean total psychosocial adjustment to illness score over time did not differ significantly between the two groups ($P = 0.265$). The group $\times$ time interactions further revealed that the trajectories of change in the mean scores of the following dimensions, attitude toward illness, vocational environment, family environment, sexual relationships, extended family relationships, and social environment, did not differ between the two groups over time. However, the group $\times$ time interaction for the psychological distress dimension showed a significant difference in the trajectory of change between the two groups, such that the mean score for the psychological distress dimension in the intervention group decreased significantly over time compared to the control group ($P = 0.002$) (Table 4, Fig. 3).

Table 1
Demographic characteristics of the participants

Variable	Subgroup	Control Group		Intervention group		Between-Group P-value
		Frequency	%	Frequency	%	
Age	20–29 years	7	20.6	8	23.5	0.407*
	30–39 years	20	58.8	14	41.2	
	40–49 years	4	11.8	9	26.5	
	50–59 years	3	8.8	3	8.8	
Sex	Male	8	22.2	8	22.2	0.896
	Female	28	27.8	26	26.2	
Marital Status	Single	16	44.4	12	35.3	0.336*
	Married	20	55.6	20	58.8	
	Divorced	0	0	2	5.9	
Educational Attainment	Lower education	2	5.6	4	11.8	0.573*
	Diploma	10	27.8	10	29.4	
	Academic education	24	66.7	20	58.8	
Occupation	Employee/Worker	13	36.1	10	29.4	0.894
	Self-employed	10	27.8	9	26.5	
	Homemaker	8	22.2	10	29.4	
	Other	5	13.9	5	14.7	
Place of Residence	Urban	28	77.8	29	85.3	0.419
	Rural	8	22.2	5	14.7	
Ethnicity	Fars	7	19.4	10	29.4	0.491
	Lur	24	66.7	18	52.9	
	Turk	5	13.9	6	17.6	
Insurance	Yes	34	94.4	30	88.2	0.422*
	No	2	5.6	4	11.8	
Income	Insufficient	8	22.2	14	41.2	0.214
	Relatively Sufficient	18	50	14	41.2	
	Sufficient	10	27.8	6	17.6	
Disease Complications	Yes	10	27.8	14	41.2	0.238
	No	26	72.2	20	58.8	
Disease Duration	Less than 1 year	13	36.1	16	47.1	0.199
	1–5 years	18	50	10	29.4	
	More than 5 years	5	13.9	8	23.5	
*Fisher’s exact test						

Table 2

Comparison of mean death anxiety scores within and between the control and intervention groups at baseline, immediately after the intervention, and at two-month follow-up

Variable	Group	Baseline (Mean ± SD)	Immediately after the intervention (Mean ± SD)	Follow-Up (Mean ± SD)	Time Effect (P- value)	Group Effect (P- value)	Group × Time Interaction (P- value)		
Death Anxiety	Control	7.2 ± 2.52	7.26 ± 2.45	7.23 ± 2.40	< 0.001	0.014	< 0.001		
	Intervention	7.06 ± 2.32	5.5 ± 2.73	4.97 ± 3.03					
P-value		0.810	< 0.001	< 0.001					
Effect Size			0.161	0.194					

Table 3

Comparison of mean fear of disease progression scores within and between the control and intervention groups at baseline, immediately after the intervention, and at two-month follow-up

Variable	Group	Baseline (Mean ± SD)	Immediately after the intervention (Mean ± SD)	Two-Month Follow-Up (Mean ± SD)	Time Effect (P-value)	Group Effect (P-value)	Group × Time Interaction (P-value)
Fear of Disease Progression	Control	77.11 ± 14.13	77.51 ± 13.80	78.20 ± 14.74	< 0.001	< 0.001	< 0.001
	Intervention	78.35 ± 14.95	61.65 ± 10.52	48.65 ± 6.67			
P-value		0.753	< 0.001	< 0.001			
Effect Size			0.765	0.814			

Table 4

Comparison of mean scores for the dimensions of the psychosocial adjustment to illness between the control and intervention groups at baseline, immediately after the intervention, and at two-month follow-up

Variable	Group	Control Group (Mean $\pm$ SD)	Intervention group (Mean $\pm$ SD)	P-value	Group $\times$ Time Interaction
Attitude Toward Illness	Baseline	15.91 $\pm$ 2.54	15.82 $\pm$ 2.67	0.885	0.205
	Immediately after the intervention	16.03 $\pm$ 2.43	16.06 $\pm$ 2.8	0.644	
	Two-Month Follow-Up	16.40 $\pm$ 2.52	15.91 $\pm$ 2.83	0.249	
Vocational Environment	Baseline	8.2 $\pm$ 1.78	7.88 $\pm$ 1.34	0.407	0.843
	Immediately after the intervention	8.4 $\pm$ 1.41	8.09 $\pm$ 1.42	0.565	
	Two-Month Follow-Up	8.29 $\pm$ 1.23	8.08 $\pm$ 1.89	0.988	
Family Environment	Baseline	12.94 $\pm$ 3.24	13 $\pm$ 3.21	0.942	0.815
	Immediately after the intervention	12.43 $\pm$ 3.34	12.76 $\pm$ 3.29	0.565	
	Two-Month Follow-Up	12.66 $\pm$ 3.11	12.73 $\pm$ 3.74	0.939	
Sexual Relationships	Baseline	6.34 $\pm$ 5.63	6.29 $\pm$ 5.94	0.972	0.098
	Immediately after the intervention	6.6 $\pm$ 5.68	6.01 $\pm$ 5.41	0.077	
	Two-Month Follow-Up	6.89 $\pm$ 5.83	6.85 $\pm$ 5.39	0.968	
Extended Family Relationships	Baseline	7.71 $\pm$ 1.18	7.38 $\pm$ 1.32	0.275	0.762
	Immediately after the intervention	7.77 $\pm$ 1.19	7.59 $\pm$ 1.08	0.735	
	Two-Month Follow-Up	7.69 $\pm$ 1.21	7.41 $\pm$ 1.21	0.828	
Social Environment	Baseline	9.03 $\pm$ 3.29	9.82 $\pm$ 3.75	0.352	0.519
	Immediately after the intervention	8.86 $\pm$ 2.85	9.65 $\pm$ 3.54	0.683	
	Two-Month Follow-Up	8.49 $\pm$ 3.11	9.68 $\pm$ 3.31	0.208	
Psychological Distress	Baseline	13.8 $\pm$ 3.89	13.21 $\pm$ 3.58	0.512	0.002
	Immediately after the intervention	14.23 $\pm$ 3.82	12.59 $\pm$ 3.42	0.003	
	Two-Month Follow-Up	14.37 $\pm$ 3.46	12.29 $\pm$ 3.37	< 0.001	

Discussion

The present study examined the effect of Betty Neuman's Systems Model of nursing on death anxiety, fear of disease progression, and psychosocial adjustment to illness in patients with multiple sclerosis. The findings revealed that the mean death anxiety score, resulting from the implementation of the intervention in the intervention group, underwent a considerable reduction. These results are congruent with the findings reported by Akhlaghi et al., who investigated the effect of applying Betty Neuman's Systems Model on anxiety in patients undergoing coronary artery bypass graft surgery. Their findings demonstrated that an intervention structured around the model's three levels of prevention significantly reduced anxiety in cardiac surgery patients (24). Likewise, a study by Nikseresht et al., who examined the effect of spiritual care grounded in Neuman's theory on anxiety in mothers of children with cancer, affirmed that spiritually-oriented interventions designed on the basis of this model were effective in alleviating anxiety in that population (38). Furthermore, Oliveira et al., in a qualitative study, corroborated that the implementation of the nursing process

anchored in this model, namely, the identification of stressors and the reinforcement of lines of defense, led to a reduction in stress and anxiety among patients with laryngeal cancer (39). Although these studies employed a nursing model similar to that utilized in the present investigation, a distinguishing advantage of the current study, in contrast to those mentioned, lies in the execution of the intervention over a more extended timeframe and in its methodological design. Overall, these studies illustrate that Betty Neuman's Systems Model, through its emphasis on stressor management, furnishes a successful and efficacious framework for reducing anxiety across diverse patient populations.

In another study, Aboutalebi et al. examined the effectiveness of compassion-focused therapy on death anxiety and quality of life in women with multiple sclerosis and reported that compassion-focused training reduced the death anxiety scores of patients in the intervention group and enhanced their quality of life after the intervention, with the therapeutic effect enduring through the follow-up phase (40). In the present study, akin to that investigation, compassion-focused strategies were integrated into the educational intervention to diminish patients' death anxiety; thus, the findings of that study are aligned with those observed in the present study.

A study by Pahlavan et al. (2020), aimed at evaluating the effectiveness of positive psychotherapy interventions on death anxiety and sleep quality in women with MS, demonstrated a significant difference in death anxiety between the intervention and control groups, with positive psychotherapy interventions yielding a reduction in death anxiety in the intervention group compared to the control group (41). In the present study, positive psychotherapeutic approaches were similarly incorporated within the framework of Neuman's model-based nursing process to alleviate patients' death anxiety, and in this respect, the results of that study are consistent with those of the current investigation.

The present study also examined and compared the mean fear of disease progression scores in patients with MS at baseline, immediately after the intervention, and at the two-month follow-up between the intervention and control groups. The findings revealed that the mean fear of disease progression score in the intervention group diminished significantly over time relative to the control group. In line with these findings, it can be argued that following the implementation of the Neuman model-based training intervention, the mean fear of disease progression score in the intervention group exhibited a significant difference after the intervention compared to baseline. These findings are consistent with the work of Nielsen et al., who examined humor as a coping factor against depressed mood and fear of disease progression in 77 patients with multiple sclerosis and moderate disability in Germany. Their results indicated that humor skills training led to a decrease in depressed mood and fear of disease progression scores and an increase in anxiety coping scores, thereby substantiating the necessity of employing humor as a coping strategy in psychosocial interventions for individuals with MS (42). Although that study was cross-sectional in nature and no analogous research specifically concerning the impact of the Neuman Systems Model on fear of disease progression in MS patients was identified, the present study, like the aforementioned study, incorporated humor skills training within the nursing intervention framework of Betty Neuman's model to influence fear of disease progression. Accordingly, the study conducted by Nielsen et al. is consonant with the present investigation.

In their clinical trial study, Zare et al. investigated the effectiveness of cognitive-behavioral stress management on fear of disease progression in women with breast cancer. The findings revealed that the overall fear of disease progression score exhibited a statistically significant difference in the intervention group compared to the control group both immediately after the intervention and at a one-month follow-up. The results demonstrated that cognitive-behavioral stress management reduced fear of disease progression in female breast cancer patients (43). Although the research population and the follow-up duration (one month after the intervention) in that study differ from those in the present investigation, the results are nevertheless convergent, given that both MS and breast cancer are chronic in nature, that fear bears a direct relationship with stress, a central dimension examined within Neuman's model, and that one of the nursing interventions applied within the framework of Betty Neuman's nursing process in the present study was stress management.

Hosseinzadeh and Zarei examined the effectiveness of cognitive-behavioral therapy on fear of disease progression and psychological reactance in patients with Hashimoto's hypothyroidism. The results indicated that the mean fear of disease progression scores in the intervention group followed a declining trajectory across the pre-test, post-test, and three-month follow-up assessments. A significant difference was observed in the fear of disease progression scores within the intervention group across the three measurement phases, and the analysis demonstrated that cognitive-behavioral therapy had a significant impact on fear of disease progression and psychological reactance in patients with hypothyroidism (44). The similarity between that study

and the present study lies in the investigation of the variable “fear of disease progression”. However, the target populations differ. To date, no study has directly examined the effect of Betty Neuman’s Systems Model on fear of disease progression in patients with MS. Nevertheless, the current study is aligned with this model conceptually, as Neuman’s model centers on “stressors,” and fear of disease progression constitutes a significant stressor for these patients. Furthermore, the incorporation of cognitive-behavioral therapy techniques in the present study is consistent with the principles underpinning Neuman’s model.

The present study also examined and compared the mean score for psychosocial adjustment to illness in patients with MS at baseline, immediately after the intervention, and at the two-month follow-up in both the intervention and control groups. The findings demonstrated that the trajectory of change in the mean psychosocial adjustment to illness score over time did not differ significantly between the two groups. Moreover, no statistically significant differences were observed between the two groups at baseline, immediately after the intervention, or at the two-month follow-up in the mean scores of all dimensions of psychosocial adjustment to illness, with the exception of the psychological distress dimension.

KhalajAsadi et al. conducted a quasi-experimental study with a pre-test/post-test design and three-month and six-month follow-up periods, incorporating CBT and ACT intervention groups alongside a control group, to compare the effectiveness of Acceptance and Commitment Therapy (ACT) and Cognitive-Behavioral Therapy (CBT) on psychosocial adjustment to illness and expanded disability status in 60 MS patients in Tehran. The results indicated that ACT had a greater effect than CBT in enhancing psychosocial adjustment to illness and reducing expanded disability, with these effects remaining stable throughout the follow-up phases. Overall, both ACT and CBT interventions significantly improved psychosocial adjustment to illness and reduced expanded disability in MS patients (45). The present study aligns with this research in that it addressed psychosocial adjustment to illness in MS patients through the application of acceptance and commitment therapy within the framework of Betty Neuman’s nursing model. Specifically, at the secondary and tertiary prevention levels, the nurse, by delivering education on acceptance of and commitment to living with the illness through strategies such as enhancing awareness, desensitization, present-moment awareness, non-judgmental observation, and letting go (45), endeavored to strengthen the lines of defense, restore homeostasis, and improve psychosocial adjustment to MS as a protective facet of the patient’s basic system structure. However, given the three- and six-month follow-up periods employed in the aforementioned study, the results are not concordant, and it is plausible that the improvement and enhancement of psychosocial adjustment in the present study may necessitate an extended intervention duration.

A systematic review by Topcu et al., conducted to provide a comprehensive overview of psychosocial adjustment to an MS diagnosis, demonstrated that achieving better adjustment and enhancing the health and well-being of MS patients requires a structured program grounded in theoretical frameworks, along with the establishment of a balance between internal and external stressors through the utilization of appropriate coping resources (46). This finding explicitly underscores that the application of nursing models and theories can facilitate the enhancement of psychosocial adjustment to MS. Although this conclusion is congruent with the present study, the results are not aligned, potentially because it may be impossible to control all stressors, such as economic circumstances and occupational factors, and participants may have been exposed to conditions beyond the researcher’s control.

Feghhi et al. investigated the effect of a training program based on Roy’s Adaptation Model on the psychosocial adjustment of patients with type 2 diabetes, and demonstrated a positive impact of education grounded in Roy’s adaptation framework on this chronic disease. In that study, patients in the intervention group, in addition to completing the demographic characteristics form and the Derogatis Psychosocial Adjustment to Illness Scale, also completed Roy’s assessment form. Maladaptive behaviors were identified, and a training program was subsequently developed and delivered over eight group training sessions and two face-to-face instructional sessions, with follow-up conducted via telephone contact for one month. The results showed that, following the intervention, a significant reduction was achieved in the mean psychosocial adjustment score in the intervention group compared to baseline—in all dimensions except sexual relationships—encompassing awareness of and attitude toward the illness, vocational environment, family environment, extended family relationships, social environment, and psychological distress. In the control group, the mean psychosocial adjustment score increased significantly only in the family environment dimension after the intervention relative to baseline (37). Although this study was conducted in a non-MS population and the intervention was based on Roy’s Adaptation Model, it is nevertheless aligned with the present study insofar as it was grounded in a nursing model and applied as a strategy for educating chronically ill patients and enhancing psychosocial adjustment. However, these findings are not

consistent with those observed in the present study. One plausible explanation for the divergence in results between Feghhi et al.'s study and the current investigation may be the limited duration of the intervention in terms of the number of training sessions.

Conclusion

Overall, the findings from the present study revealed that patients with MS experience elevated levels of death anxiety and fear of disease progression, alongside diminished psychosocial adjustment to illness. Given that stress and its various manifestations constitute an inseparable facet of the lived experience of these patients, education aimed at mitigating such stressors emerges as a critical health need for this population. Considering that nurses maintain the most sustained contact with patients, the provision of a structured and comprehensive educational program, rooted in Betty Neuman's Systems Model of nursing and grounded in the nursing process, can significantly reduce death anxiety and fear of disease progression in individuals with MS. Accordingly this approach can be utilized by nursing specialists as a complementary therapeutic modality within nursing care and patient advocacy against stressors, one that also serves to elevate the standing of preventive care alongside other forms of care. Although the training program did not prove effective in improving psychosocial adjustment to illness within the short-term timeframe of this study, future studies need to undertake the delivery of educational programs framed by Betty Neuman's Systems Model with extended follow-up periods and investigate other salient factors influencing this variable in MS, with the aim of fostering enhanced psychosocial adjustment to the disease.

Abbreviations

- MS
Multiple Sclerosis
- EDSS
Expanded Disability Status Scale
- CBT
Cognitive-Behavioral Therapy
- ACT
Acceptance and Commitment Therapy

Declarations

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Authors' Contributions

ZH contributed to the conceptualization, data collection, and preparation of the initial draft of the manuscript. FH performed the data analysis, contributed to the methodology, and undertook the revision and editing of the manuscript. RJ was involved in the conceptualization of the study, methodology, supervision of the research, revision and editing of the manuscript, and acquisition of funding. All authors read and approved the final version of the manuscript.

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Data Availability

The datasets are available from the corresponding author upon reasonable request.

Ethics Approval and Consent to Participate

Before the completion of the questionnaires, the objectives of the study were comprehensively explained to the participants, and they willingly enrolled in the study after providing informed consent. This research project was conducted in accordance with the principles set forth in the Declaration of Helsinki and received approval under the ethics code IR.SKUMS.REC.1403.133 from the Ethics Committee of Shahrekord University of Medical Sciences.

Consent for Publication

Not applicable.

Competing Interests

The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

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Figures

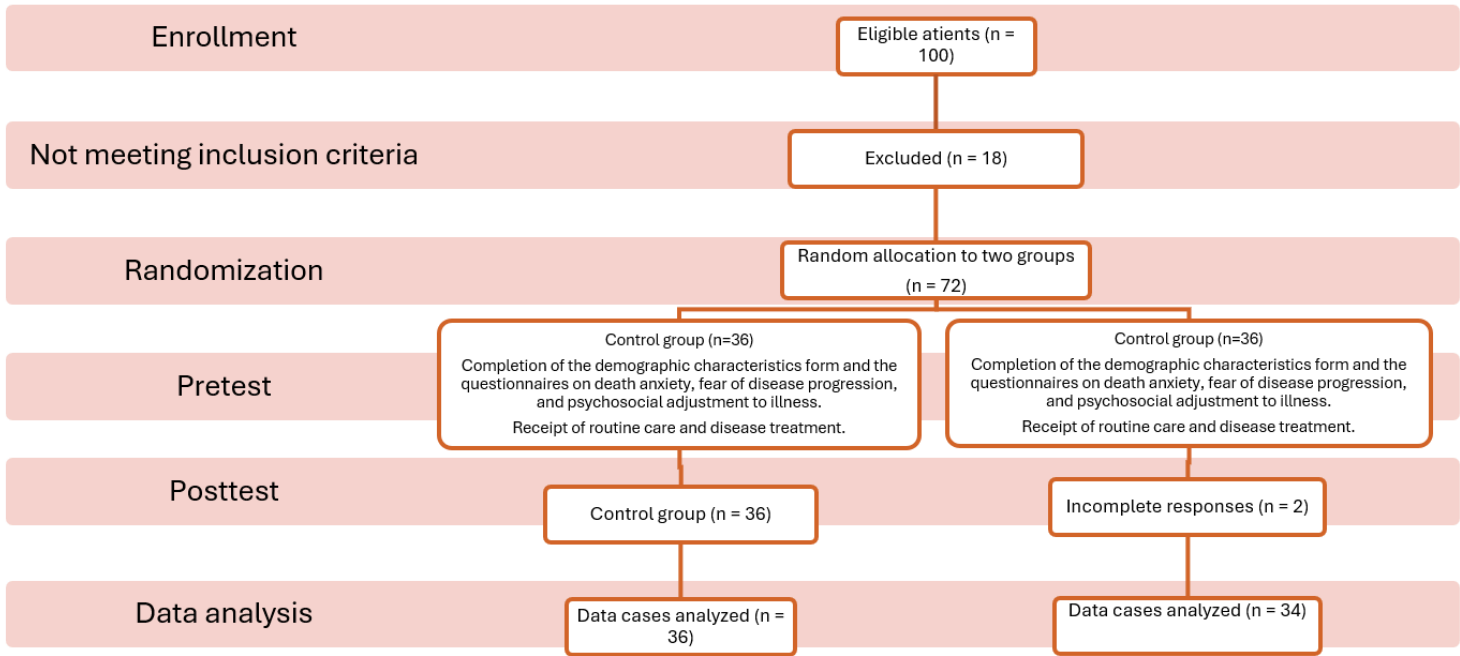


Figure 1

CONSORT Flow Diagram

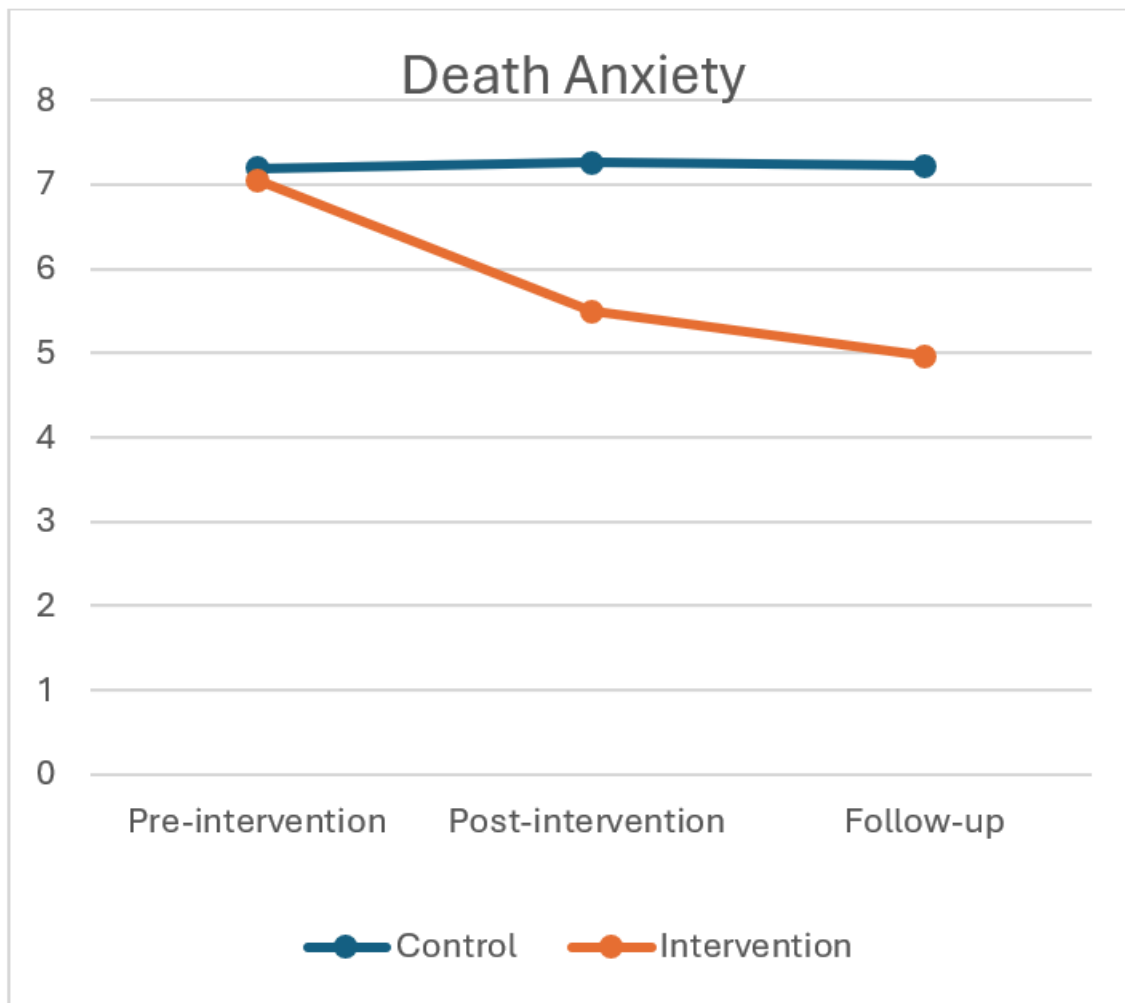


Figure 2

Figure 1. Changes in the mean death anxiety scores over time in the control and intervention groups

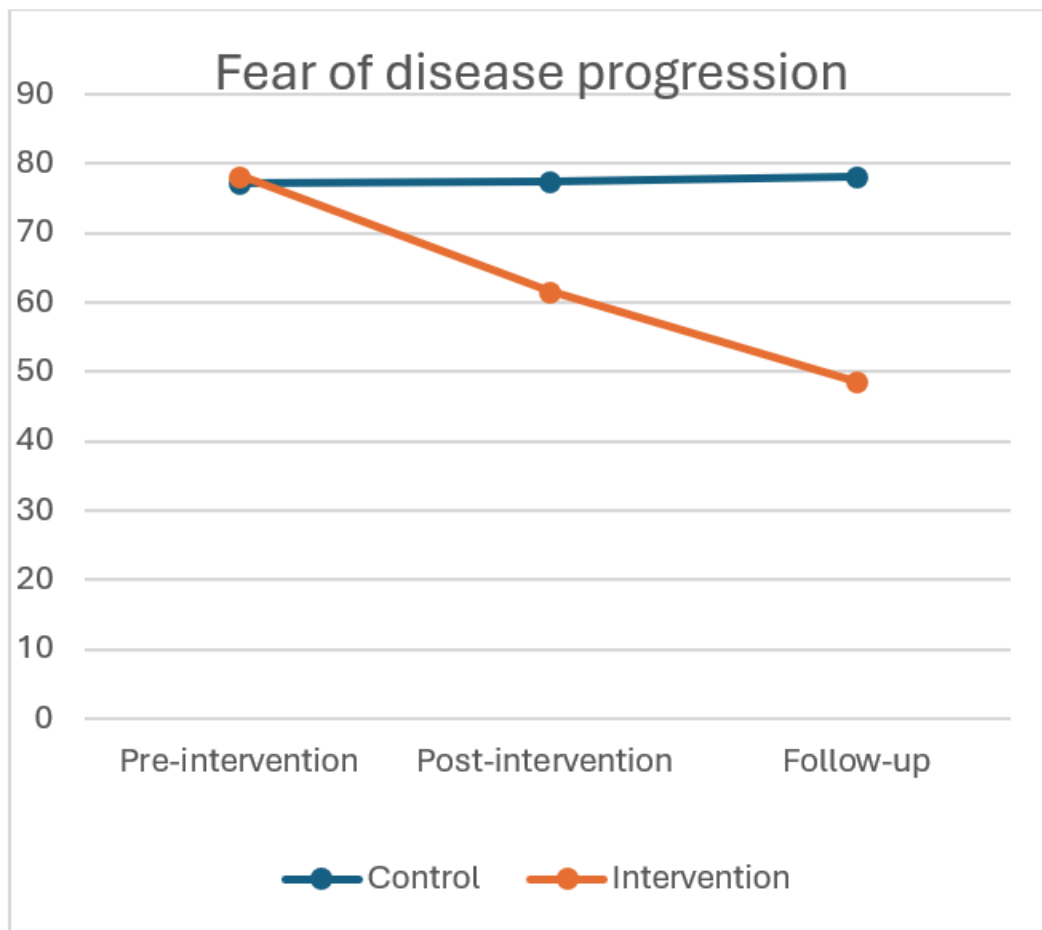


Figure 3

Figure 2. Changes in the mean fear of disease progression scores over time in the control and intervention groups

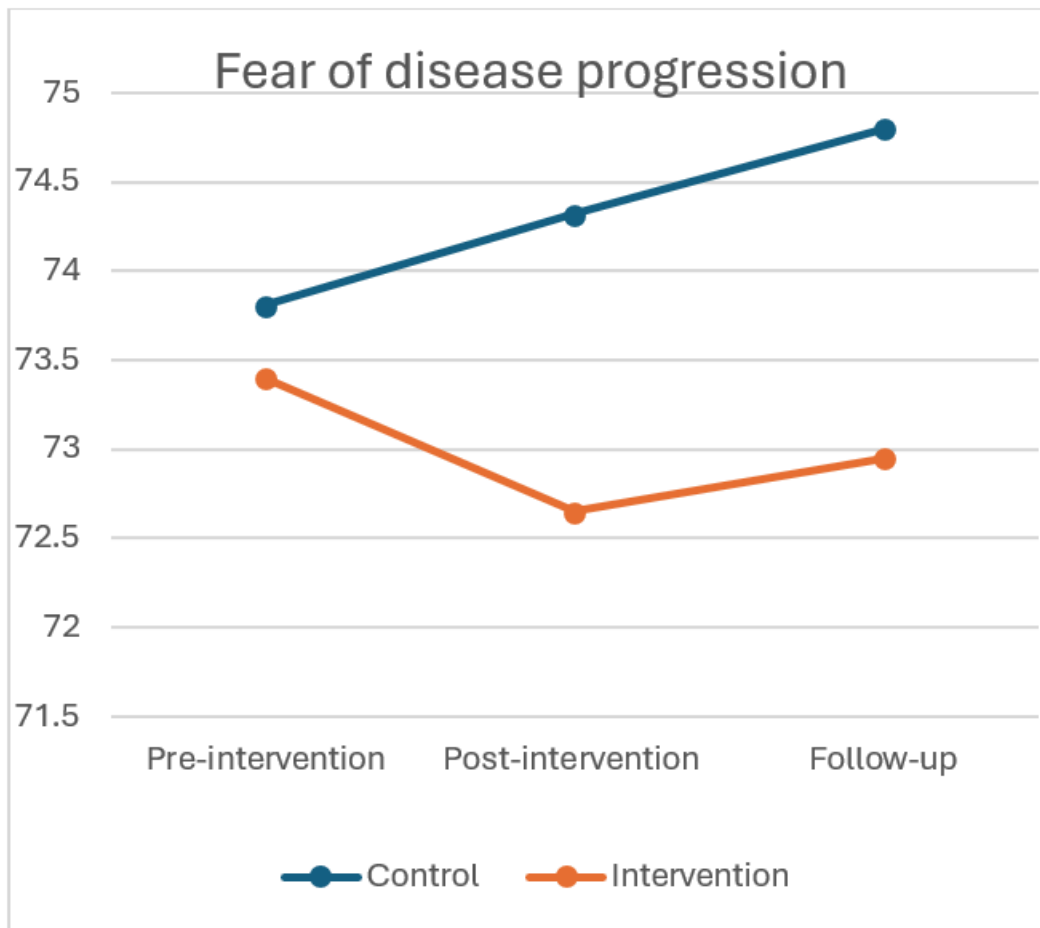


Figure 4

Figure 3. Changes in mean psychosocial adjustment to illness scores over time in the control and intervention groups