IJBMC
International Journal of Body, Mind and Culture

Volume 12, Issue 8, pp 264-276
DOI: 10.61838/ijbmc.v12i8.1039

Article type:
Original Research

1 Department of Clinical and Health Psychology, To.C., Islamic Azad University, Tonekabon, Iran.
2 Department of Psychology, To.C., Islamic Azad University, Tonekabon, Iran.
3 Department of Psychology, Ga.C., Islamic Azad University, Garmsar, Iran.

Corresponding author email address: M.zarbakhsh@iau.ac.ir

Article history:

Received 20 Jul 2025
Revised 29 Aug 2025
Accepted 25 Sep 2025
Published online 01 Nov 2025

How to cite this article:
Salimi, L., Zarbakhsh Bahri, M., Pirkhaefi, A. (2025). The Mediating Role of Anxious Thoughts in the Relationship Between Emotional Dysregulation, Cognitive Functions, and Psychological Vulnerability in MS Patients. International Journal of Body, Mind and Culture, 12(8), 264-276.

The Mediating Role of Anxious Thoughts in the Relationship Between Emotional Dysregulation, Cognitive Functions, and Psychological Vulnerability in MS Patients

Laleh. Salimi[1], Mohammadreza. Zarbakhsh Bahri[2*], Alireza. Pirkhaefi[3]

ABSTRACT

Objective: Psychological vulnerability is a common concern among individuals with Multiple Sclerosis (MS), often exacerbated by emotional dysregulation and cognitive impairments. This study aimed to evaluate a structural model examining the role of anxious thoughts as a mediator between emotional dysregulation and cognitive functions in predicting psychological vulnerability in MS patients.

Methods and Materials: This descriptive-correlational study utilized Structural Equation Modeling (SEM) on a sample of 312 MS patients from the Tehran MS Society. Participants completed the Symptom Checklist (SCL-25), Toronto Alexithymia Scale (TAS-20), Cognitive Abilities Questionnaire, and Anxious Thoughts Inventory. Data were analyzed using SPSS-26 and AMOS-24. Bootstrapping was employed to test indirect effects.

Findings: Model fit indices indicated good model adequacy (CFI = 0.921, RMSEA = 0.076). Emotional dysregulation ($\beta = 0.311$, $p < 0.001$) and cognitive dysfunction ($\beta = 0.260$, $p < 0.001$) significantly predicted psychological vulnerability. Anxious thoughts had a direct effect on vulnerability ($\beta = 0.463$, $p < 0.001$) and significantly mediated the impact of both emotional dysregulation and cognitive impairment. The model explained 39.2% of the variance in psychological vulnerability.

Conclusion: The findings suggest that anxious thoughts are a key mechanism through which emotional and cognitive factors influence psychological vulnerability in MS patients. Psychological interventions that target emotional regulation and reduce anxious thinking may be effective in improving mental health outcomes in this population.

Keywords: Psychological Vulnerability, Emotional Dysregulation, Cognitive Functions, Anxious Thoughts, Multiple Sclerosis, Structural Equation Modeling.

Introduction

Among the stressful life events that affect an individual's psychological well-being is the diagnosis of chronic illnesses. People suffering from chronic diseases such as Multiple Sclerosis (MS) not only face physical challenges but also experience numerous psychological problems, which in turn can negatively influence the course of their illness (Ouraki & Sami, 2016), making them psychologically vulnerable. Stein (2010) defines psychological vulnerability as a pattern or syndrome of psychological or behavioral symptoms occurring in an individual, reflecting an underlying psychological dysfunction, which results in clinically significant impairment (e.g., deterioration in one or more important areas of functioning) or distress (e.g., a painful symptom). Symptoms of psychological vulnerability can be considered an expected response to a general stressor, a culturally sanctioned reaction to a specific event, or essentially a result of neurobiological factors (Pimple et al., 2019). Although symptomatic and immunomodulatory treatments are currently available for MS, the disease remains incompletely managed by existing therapies, and new treatment methods are emerging (Wilski et al., 2019). The uncertainty of treatment outcomes, progression of disability, and side effects of current treatments significantly hinder the psychological adjustment of MS patients and negatively affect their mental health (Minden et al., 2013). Previous studies provide clear evidence that the mental health of individuals with MS is significantly worse compared to the general population (Bashtan et al., 2017). Wood et al. (2013) also found that anxiety, depression, and fatigue commonly co-occur in people with MS.

According to many psychological researchers, stressful events play a critical role in the development of psychosomatic disorders. Severe emotional stress increases individual vulnerability to illness and slows recovery (Whitbourne & Halgin, 2015; Seyed Mohammadi, 2022). Therefore, emotional regulation and alexithymia (emotional deficiency) play prominent roles in MS. In recent years, alexithymia has been recognized as a personality trait that plays a crucial role in psychosomatic disorders (Miles & Merlo, 2021; O'Malley, 2023). Studies also reveal correlations between alexithymia and various psychological disorders including PTSD (Putica et al., 2021; Di Berardis et al., 2020), eating disorders (Lenzo, 2020; Minigazzo et al., 2022), panic disorder (Asi et al., 2023; Sago et al., 2020), depression (Hemming et al., 2019; Aron et al., 2019), and substance use disorders (Honkalampi et al., 2022). In relation to alexithymia and psychological vulnerability, Besharat and colleagues (2008, 2014) demonstrated that alexithymia has a significant positive correlation with both psychological and physical vulnerability in the general population. Faki et al. (2017) found that alexithymia is present among adolescents with depression and contributes to its development. In a study by Ertekin et al. (2015), alexithymia was associated with more severe symptoms, higher comorbidity, and functional impairment in patients with social anxiety. Barghi and colleagues (2014) reported that difficulty in identifying and describing emotions significantly correlates with the mental health status of MS patients. Similarly, Aron et al. (2019) showed that alexithymia is significantly associated with pain intensity, physical interference, depression, and anxiety in individuals with chronic pain.

One of the most common complaints among MS patients is cognitive impairment (Barlly et al., 2016; Tavakoli et al., 2015; Raqibi & Khosravi, 2012). Cognitive functions refer to information processing in the absence of emotional interference and include goal-directed, future-oriented skills such as planning, inhibition, flexibility, working memory, and monitoring, which are assessed in an emotion-neutral, analytical manner (Nozari et al., 2019). Genova et al. (2012) reported that the rate of cognitive impairment in MS patients increased from 26% to 53% over a ten-year period. The cognitive domains most commonly affected in MS include processing speed, attention, executive functioning, and memory (Hansen et al., 2017), all of which negatively impact daily activities, work, social interactions, and quality of life (Briken et al., 2014). Furthermore, damage to the cerebral cortex in MS patients has been linked to cognitive disorders (Silva et al., 2020).

Another issue frequently observed in MS patients is anxiety. Uncontrollable negative thoughts, particularly worry, are a hallmark of anxiety (Wells, 1994). Anxious thoughts involve negative beliefs about worry itself, leading to maladaptive mental control strategies that play a central role in the onset and maintenance of

anxiety (Wells, 2010; Wells et al., 2012). Hannah and Strober (2020) and Patel et al. (2018) found high levels of anxiety in MS patients. Research indicates that MS patients experience significantly higher levels of psychological disorders such as stress and anxiety compared to healthy individuals (Wilgenzingher, 2022; Simpson et al., 2014). One of the most significant exacerbating factors in MS is life stress (Alnajashi & Jabed, 2020), and a strong correlation exists between stress, anxiety, and disease exacerbation (Talaat et al., 2020; Giordano et al., 2011). Regarding the relationship between anxious thoughts and psychological vulnerability, Balazadeh et al. (2020) found a significant association between anxiety sensitivity and psychological vulnerability in asthma patients. Ranjbari et al. (2017) reported that individuals with generalized anxiety disorder suffer from high psychological vulnerability such as intolerance of uncertainty, supporting the triple vulnerability model of emotional disorders. Other studies have also indicated a relationship between alexithymia and anxious thoughts; for instance, Abbasi Kamal and Sobhi (2022) demonstrated that higher levels of alexithymia are associated with increased anxiety in patients with hypertension. Afshari et al. (2013) similarly found significant relationships between alexithymia, anxiety, and depression in patients with psychosomatic dermatological conditions. Regarding the effect of cognitive functions on anxious thoughts, Zare et al. (2014) observed that anxious individuals exhibit slower reaction times than depressed individuals.

Cognitive functions in MS patients play a role in improving quality of life, reducing anxiety and depression, enhancing self-care behaviors, and affecting physiological changes (Mattioli et al., 2012). Cognitive impairment significantly contributes to psychological vulnerability (Bodaqi et al., 2016). Moreover, greater psychological vulnerability in MS patients is associated with negative disease outcomes and beliefs about lack of symptom control (Jopson & Moss-Morris, 2003), which may increase health-related anxiety. On the other hand, Infrasca (1997) argues that alexithymia, limited emotional awareness, and impaired cognitive processes lead to prolonged physiological arousal, neural responses, and psychological stress, which may negatively impact the autonomic, immune, and hypothalamic-pituitary-adrenal (HPA) systems (Barghi Irani et al., 2014), thereby exacerbating MS symptoms. Individuals with alexithymic traits struggle with interpersonal relationships and adaptation, making them more susceptible to psychological disorders. Their reduced adaptability is particularly critical in MS, where adjusting to illness is essential for maintaining health; without such adjustment, deterioration in well-being is likely (Barghi Irani et al., 2014). Given the prevalence of MS in young adults, it often leads to reduced individual and social functioning and increases psychological and emotional problems. With disease progression and lack of adequate control, psychological vulnerability intensifies. Therefore, addressing the psychological issues, cognitive deficits, and emotional challenges of MS patients is essential. Most studies on MS have focused on physical aspects, with less attention paid to cognitive and emotional dimensions within a unified model. Based on this, the current study poses the following question: Does the psychological vulnerability model based on alexithymia and cognitive functioning in MS patients fit well, considering the mediating role of anxious thoughts? MS Research Center, the estimated number of such individuals was approximately 12,000 (N = 12,000).

Methods and Materials

Study Design and Participants

This study employed a descriptive-correlational research design, wherein the relationships between variables were examined without manipulation, using structural equation modeling (SEM). The statistical population included members of the MS Society of Tehran in 2022 who had active medical records and had sought counseling and treatment at the society. According to statistics from national MS societies and the

Inclusion criteria were: having an active file with the MS Society of Tehran in 2022, being diagnosed with MS for at least three years, basic literacy, providing informed written consent, and being under the age of 50. The sample consisted of 312 individuals with MS, selected through purposive sampling. The sample size was determined based on Kline's (2016) recommendation of at least 15 participants per observed variable in structural models. With 20 observed variables, the minimum sample size calculated was 300. Considering a potential 10% dropout rate, 330 questionnaires were

distributed. Eventually, 312 valid responses were collected

Cognitive Functioning Scale: To assess cognitive functions, the Cognitive Abilities Questionnaire developed by Nejati (2013) was used. This instrument consists of 30 items designed to measure various daily activities reliant on cognitive abilities, encompassing domains such as memory, inhibitory control and selective attention, sustained attention, cognitive flexibility, planning, decision-making, and social cognition. Responses are rated on a 5-point Likert scale from 1 (almost never) to 5 (almost always), yielding a total score between 30 and 150, with higher scores indicating lower cognitive functioning. Subscales are distributed as follows: memory (items 1–6), inhibitory control and selective attention (7–12), decision-making (13–17), planning (18–20), sustained attention (21–23), social cognition (24–26), and cognitive flexibility (27–30). Nejati (2013) reported the following Cronbach's alpha coefficients: memory (.76), inhibitory control and selective attention (.63), decision-making (.61), planning (.58), sustained attention (.53), social cognition (.44), cognitive flexibility (.46), and overall scale (.83). In the present study, the Cronbach's alpha coefficient was .81, indicating acceptable reliability.

Psychological Vulnerability Questionnaire: To assess psychological vulnerability, the 25-item Symptom Checklist developed by Najarian and Davoodi (2001) was utilized. This checklist is derived from the original SCL-90-R using exploratory factor analysis and assesses seven subscales: psychoticism, somatization, anxiety, depression, interpersonal sensitivity, phobia, and obsessive-compulsive symptoms. Responses are rated on a 5-point Likert scale from 1 (not at all) to 5 (extremely), resulting in total scores ranging from 25 to 125, where higher scores reflect greater psychological vulnerability. Subscale items are as follows: Psychoticism (items 1, 19, 23, 24), Somatization (2, 6, 12, 16–18, 25), Anxiety (3, 7, 8), Depression (4, 13), Interpersonal sensitivity (5, 9, 20), Phobia (10, 14, 15) and Obsessive-compulsive (11, 21, 22). Construct and content validity were confirmed by the authors. Convergent validity showed significant correlations with the Beck Depression Inventory (.49) and Hill's Perfectionism Questionnaire (.66). The overall Cronbach's alpha was reported as .78. In reliability testing by Najarian and Davoodi (2001), internal consistency was .97 for women and .98 for men, with test-retest reliability over five weeks being .78 for the total sample, .77 for women, and .79 for men. In another study by Tahmasbi et al. (2022), the Cronbach's alpha was .75. In the current study, the reliability coefficient was .70.

Toronto Alexithymia Scale (TAS-20): Emotional deficiency (alexithymia) was measured using the Toronto Alexithymia Scale (TAS-20) developed by Bagby et al. (1994). This 20-item instrument assesses three subscales: Difficulty Identifying Feelings (DIF), Difficulty Describing Feelings (DDF), and Externally Oriented Thinking (EOT). DIF: items 1, 3, 6, 7, 9, 13, 14; DDF: 2, 4, 11, 12, 17 and EOT: 5, 8, 10, 15, 16, 18, 19, 20. Items are rated on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Items 4, 5, 10, 18, and 19 are reverse scored. A total score is computed, with scores above 60 indicating high alexithymia, 40–60 moderate, and below 40 low. Bagby et al. (1994) reported strong psychometric properties, including Cronbach's alpha of .81 for the total scale, and .78, .75, and .66 for DIF, DDF, and EOT, respectively. In a clinical sample, Besharat (2007) reported reliability coefficients of .77 (total), .73 (DIF), .69 (DDF), and .65 (EOT). In this study, Cronbach's alpha was .76.

Anxious Thoughts Questionnaire: The Anxious Thoughts Inventory (Wells, 1994) is a multidimensional tool designed to assess worry. The items were derived from interviews with patients suffering from generalized anxiety disorder and panic disorder, as well as items from the Beck Depression Inventory, Maudsley Obsessive-Compulsive Questionnaire, and Trait Anxiety Inventory. The instrument contains 22 items and measures three subdomains: health anxiety, social anxiety, and meta-worry. Meta-worry: items 3, 6, 11, 13, 16, 21, 22; Social anxiety: 1, 8, 9, 12, 14, 17, 18, 20 and Health anxiety: 4, 5, 7, 10, 15, 19. Each item is rated on a 4-point Likert scale from 1 (almost never) to 4 (almost always), with total scores ranging from 22 to 88. Wells (1994) reported Cronbach's alpha coefficients of .84 (social anxiety), .81 (health anxiety), and .75 (meta-worry), with test-retest reliability coefficients of .76, .84, and .81 respectively. In the Iranian validation by Fathi et al. (2010), internal consistency values were .85, .74, and .81 respectively, with overall test-retest reliability of .92 and split-half reliability of .89. In this study, Cronbach's alpha was .78.

Ijbmc.org
E-ISSN: 2345-5802

Procedure

After obtaining ethical approval and an official letter of introduction from the university to the Tehran MS Society, as well as the required permissions, purposive sampling was conducted from among 12,000 registered MS patients. Participants met the inclusion criteria of an active file, disease duration of at least three years, and being under 50 years old. Following informed consent, participants were briefed on the study's aims and assured of confidentiality and that their personal and research data would only be used in this study. Although the population size was initially known, filtering based on inclusion criteria reduced the eligible population to 7,201 individuals. Based on Kline's (2016) recommendations and to account for potential dropouts, 330 individuals were selected. Participants then completed the following: Najarian and Davoodi's 25-item Symptom Checklist (2001), Toronto Alexithymia Scale (Bagby et al., 1994), Cognitive Abilities Questionnaire (Nejati, 2013), and Anxious Thoughts Inventory (Wells, 1994).Eventually, data from 312 participants were statistically analyzed.

Data analysis

Descriptive and inferential statistical methods were used. Descriptive statistics included mean, standard deviation, minimum and maximum scores, skewness, kurtosis, and graphs. Inferential analysis involved Pearson correlation and structural equation modeling (SEM), performed using AMOS version 24 and SPSS version 26.

Findings and Results

In this study, 312 patients with multiple sclerosis (MS), aged between 20 to 50 years, were examined. The mean age was 33.93 years with a standard deviation of 10.03. The average duration of illness was 8.12 years (SD = 6.85), ranging from 3 to 35 years. The demographic characteristics of the MS patients are presented in Table 1.

Table 1.

Demographic Variables of Patients with Multiple Sclerosis

Demographic Variable	Category	Frequency	Percentage
Gender	Male	78	25%
	Female	234	75%
Age (years)	20–30	134	42.9%
	30–40	69	22.1%
	40–50	109	34.9%
Duration of Illness (years)	3–5	168	53.8%
	5–10	86	27.6%
	>10	58	18.6%

As shown in Table 1, the majority of participants were female (234 individuals, 75%). Most patients (134 individuals, 42.9%) were in the 20–30 year age range, and most (168 individuals, 53.8%) had been living with MS for 3–5 years. Descriptive statistics (mean, standard deviation, skewness, and kurtosis) for emotional dysregulation, cognitive functioning, anxious thoughts, and psychological vulnerability are reported in Table 2.

Table 2.

Descriptive Statistics of the Main Variables in MS Patients (n = 312)

Variable	Mean	SD	Range	Skewness	Kurtosis
Emotional Dysregulation					
Difficulty Identifying Emotions	16.68	6.21	8–32	0.78	-0.26
Difficulty Describing Emotions	13.80	3.55	6–21	0.27	-0.67
Externally-Oriented Thinking	27.08	3.72	19–36	0.09	0.07
Total Score	57.57	10.73	36–87	0.67	0.85
Cognitive Functions					
Memory	10.65	4.64	6–22	0.93	-0.33

Inhibitory Control & Selective Attention	14.14	4.30	6–24	0.48	-0.08
Decision-Making	11.56	3.29	5–19	-0.11	-0.41
Planning	6.61	3.31	3–15	0.69	-0.29
Sustained Attention	8.56	2.68	3–15	0.23	-0.34
Social Cognition	10.71	2.86	3–15	-0.71	-0.05
Cognitive Flexibility	9.50	3.41	4–19	0.63	0.09
Total Score	71.75	16.31	45–106	0.31	-0.69
Anxious Thoughts					
Meta-Worry	13.87	4.93	7–27	0.80	0.31
Social Anxiety	13.93	4.58	7–24	0.40	-0.77
Health Anxiety	11.13	4.01	6–22	0.83	0.38
Total Score	38.95	12.17	20–73	0.66	0.07
Psychological Vulnerability					
Psychoticism	7.13	2.64	4–17	1.05	1.31
Somatization	17.33	6.44	7–32	0.33	-0.79
Anxiety	8.11	3.15	3–15	0.33	-0.47
Depression	4.61	2.60	2–10	0.72	-0.72
Interpersonal Sensitivity	6.83	2.74	3–15	0.84	-0.46
Phobia	5.37	2.04	3–13	1.04	1.57
Obsession–Compulsion	6.80	2.70	3–14	0.71	-0.07
Total Score	56.20	16.51	28–107	0.57	0.32

The exogenous variables—emotional dysregulation and cognitive functions—had means (SD) of 57.57 (10.73) and 71.75 (16.31), respectively. The mediating variable, anxious thoughts, had a mean (SD) of 38.95 (12.17). The endogenous variable, psychological vulnerability, had a mean (SD) of 56.20 (16.51). Based on the correlation matrix results, there were significant positive relationships between emotional dysregulation and cognitive functioning with both anxious thoughts and psychological vulnerability in patients with multiple sclerosis (P<0.001). Additionally, a significant positive correlation was found between anxious thoughts and psychological vulnerability (P<0.001). Moreover, each subcomponent of the measured variables had a significant and positive relationship with its respective total score (P<0.001).

To identify and control potential confounding variables, the relationships between demographic variables and the dependent variable (psychological vulnerability) were assessed using correlation tests. The results showed no significant association between the demographic variables and psychological vulnerability (P>0.05), indicating that no confounding variable was detected. Initially, the structural equation model (SEM) assumptions were evaluated. After verifying the assumptions, the model fit was assessed, and finally, the study hypotheses were tested. In SEM, if raw input data are used, they must be complete. Several preprocessing methods exist for handling missing data, such as listwise deletion (removing all cases with missing values) and pairwise deletion (calculating correlations using available data). Another common method is Maximum Likelihood Estimation (MLE), which predicts and replaces missing data optimally (Kline, 2023). In this study, MLE was used to address missing data.

Outliers are values that deviate significantly from the rest of the dataset. There are two types: univariate and multivariate outliers. A case with univariate outliers shows extreme scores on one or more variables, while multivariate outliers show unusual patterns across predictors (Giles, 2002). In this study: Univariate outliers were assessed using Z-scores in SPSS (version 26); no outliers were detected. Multivariate outliers were assessed using Mahalanobis distance. No Mahalanobis distance exceeded the critical chi-square value at p<0.001, indicating no multivariate outliers. Univariate normality was assessed using skewness and kurtosis indices. According to Kline (2016), skewness values < |3| and kurtosis values < |10| indicate acceptable normality. As shown in Table 2, no variable exceeded these thresholds, confirming univariate normality.

Multivariate normality was assessed using Mardia's standardized kurtosis and critical ratio. According to Blunch (2012), critical ratios less than 5 indicate no violation. In this study, Mardia's coefficient was 4.532 and the critical ratio was 2.114—both under the threshold of 5—thus satisfying the assumption of multivariate normality. Multicollinearity occurs when two predictors are highly correlated (e.g., r > 0.90), leading to shared variance in the dependent variable and inflating standard errors. To test this, Tolerance and Variance Inflation Factor (VIF) statistics were calculated: Tolerance = $1 - R^2$ (values < 0.10 indicate multicollinearity). VIF = $1 / (1 - R^2)$ (values > 10 indicate

Ijbmc.org
E-ISSN: 2345-5802

problematic multicollinearity). In this study, neither the tolerance values nor the VIFs indicated multicollinearity. All values were within acceptable ranges, as detailed in Table 4.

Table 4.

Tolerance and Variance Inflation Factor (VIF) for Predictor Variables

Predictor Variable	Tolerance	VIF
Emotional Dysregulation – Difficulty Identifying Emotions	0.50	2.01
Emotional Dysregulation – Difficulty Describing Emotions	0.46	2.16
Emotional Dysregulation – Externally-Oriented Thinking	0.88	1.12
Cognitive Functioning – Memory	0.54	1.85
Cognitive Functioning – Inhibitory Control & Selective Attention	0.33	3.07
Cognitive Functioning – Decision Making	0.43	2.30
Cognitive Functioning – Planning	0.51	1.92
Cognitive Functioning – Sustained Attention	0.52	1.90
Cognitive Functioning – Social Cognition	0.80	1.24
Cognitive Functioning – Cognitive Flexibility	0.48	2.07
Anxious Thoughts – Meta-Worry	0.37	2.64
Anxious Thoughts – Social Anxiety	0.30	3.26
Anxious Thoughts – Health Anxiety	0.47	2.11
Psychological Vulnerability – Psychoticism	0.59	1.67
Psychological Vulnerability – Somatization	0.44	2.27
Psychological Vulnerability – Anxiety	0.40	2.49
Psychological Vulnerability – Depression	0.35	2.82
Psychological Vulnerability – Interpersonal Sensitivity	0.39	2.54
Psychological Vulnerability – Phobia	0.68	1.46
Psychological Vulnerability – Obsession–Compulsion	0.31	3.21

Table 5.

Fit Indices for the Proposed Structural Model

Fit Index	χ^2	df	P-value	CMIN/df	RMSEA (90% CI)	PNFI	CFI	PCFI	IFI	GFI
Proposed Model	395.026	140	<0.001	2.82	0.076 (0.06–0.09)	0.550	0.921	0.566	0.923	0.944

Acceptable thresholds: PNFI, PCFI (>0.5); CFI, GFI, IFI (>0.9); RMSEA (acceptable <0.1, good <0.08) (Kline, 2023).

The structural model was evaluated based on the revised measurement model. The model fit indices of the proposed structural model are presented in Table 5. As shown in Table 5, the fit indices (PCFI = 0.566, PNFI = 0.550, CMIN/df = 2.82, RMSEA = 0.076, IFI = 0.923, CFI = 0.921, GFI = 0.944) indicate that the proposed model demonstrates a good fit to the data. Hence, the psychological vulnerability model based on emotional dysregulation and cognitive functioning, with anxious thoughts as a mediator, is well-fitting for patients with multiple sclerosis. All path coefficients were statistically significant and exceeded 0.30. The highest path coefficient (β = 0.492) corresponded to the relationship between cognitive functioning and anxious thoughts, while the lowest coefficient (β = 0.260) was found between cognitive functioning and psychological vulnerability. The R^2 value, indicating the explained variance of the endogenous latent variable, was 0.392 for psychological vulnerability. According to Cohen (1992), R^2 values of 0.26, 0.13, and 0.02 are considered strong, moderate, and weak, respectively. Thus, the exogenous and mediating variables (emotional dysregulation, cognitive functioning, and anxious thoughts) explain 39.2% of the variance in psychological vulnerability, which is considered a strong effect.

Table 6.

Standardized Path Coefficients in the Proposed Model

Path	β (Standardized Coefficient)	SE	Critical Ratio (CR)	P-value
Emotional Dysregulation → Psychological Vulnerability	0.311	0.097	4.621	<0.001
Cognitive Functioning → Psychological Vulnerability	0.260	0.072	3.485	<0.001
Anxious Thoughts → Psychological Vulnerability	0.463	0.119	6.309	<0.001

Emotional Dysregulation → Anxious Thoughts	0.389	0.110	5.196	<0.001
Cognitive Functioning → Anxious Thoughts	0.492	0.125	7.223	<0.001

As shown in Table 6, anxious thoughts had a significant positive effect on psychological vulnerability (β = 0.463, P < 0.001). Likewise, emotional dysregulation (β = 0.389, P < 0.001) and cognitive functioning (β = 0.492, P < 0.001) significantly and positively influenced anxious thoughts. Next, the mediating effects were tested using the bootstrapping method. There were two indirect (mediated) paths in the proposed model, through which the effect of the independent variables on the dependent variable was examined via the mediator.

Table 7.

Bootstrapping Results for Indirect Paths

Pathway	Indirect Effect	SE	Lower Bound	Upper Bound	P-value
Emotional Dysregulation → Psychological Vulnerability via Anxious Thoughts	0.1794	0.0475	0.1121	0.2865	<0.001
Cognitive Functioning → Psychological Vulnerability via Anxious Thoughts	0.2254	0.0581	0.1362	0.3490	<0.001

The bootstrapping results confirmed that both indirect effects were statistically significant (P<0.001), indicating that anxious thoughts significantly mediate the relationship between both emotional dysregulation and cognitive functioning with psychological vulnerability in patients with multiple sclerosis.

Discussion and Conclusion

Based on the findings of this study, the model fit indices indicated that the proposed model had a good fit with the data, demonstrating satisfactory model adequacy. The psychological vulnerability model, based on emotional dysregulation and cognitive functioning with the mediating role of anxious thoughts in patients with multiple sclerosis, showed a suitable fit. Given the direct relationships among the model variables, the relationships are interpreted as follows:

Regarding the effect of emotional dysregulation on psychological vulnerability, the findings of the present study are consistent with those of Afshari et al. (2013), who found a significant relationship between emotional dysregulation, anxiety, and depression in patients with psychosomatic disorders. Similarly, the results of the study by Mazaheri et al. (2010) indicated a positive and significant correlation between difficulty in identifying emotions and depression, anxiety, and gastrointestinal symptoms in individuals with functional gastrointestinal disorders. Besharat (2008) also showed a correlation between emotional dysregulation and indicators of psychological vulnerability and well-being. Other studies, such as those by Honkalampi et al. (2022) and Sago et al. (2020), found that patients diagnosed with panic disorder displayed higher levels of emotional dysregulation, with difficulty identifying feelings being a prominent trait in panic disorder compared to other anxiety disorders. Marchesi et al. (2015) reported a relationship between emotional dysregulation and depression in patients with early-stage acute coronary syndrome. Furthermore, Besharat et al. (2014) found a significant positive correlation between emotional dysregulation and both psychological and physical vulnerability in the general population. Barghi et al. (2014) found that difficulty in describing and identifying emotions was significantly related to the mental health of MS patients. Similarly, Aron et al. (2019) demonstrated that emotional dysregulation was significantly associated with pain intensity, physical interference, depression, and anxiety in individuals with chronic pain.

These findings can be explained by acknowledging that emotional dysregulation is now widely accepted as a personality factor that plays a crucial role in psychosomatic illnesses (Miles & Merlo, 2021; O'Malley, 2023). Intense emotional stress increases vulnerability to disease and slows the recovery process. Hence, emotional regulation and dysregulation are highly relevant in MS. The high levels of stress, anxiety, and depression in MS patients place them at increased risk for psychological vulnerability. Individuals with emotional dysregulation often show a disconnection among components of their emotional responses, leading to heightened physiological reactivity and difficulty regulating emotions, which further contributes

Ijbmc.org
E-ISSN: 2345-5802

to their susceptibility to psychological disorders. Emotional dysregulation is considered a risk factor for many mental disorders because such individuals struggle with somatic correlates of unexpressed emotions, impeding emotion regulation and adaptive functioning. Theorists argue that those who cannot effectively manage emotions in response to daily events experience greater psychological vulnerability and mental health issues. Furthermore, any deficit in emotional regulation can render a person more vulnerable to psychological problems such as depression and anxiety.

Regarding the influence of cognitive functions on psychological vulnerability, the findings are aligned with the study by Kazemi-Mahyari (2019), which found a significant relationship between cognitive functions and quality of life in MS patients, including depressive symptoms. Similarly, Tavakoli et al. (2015) found significant differences in attention performance and immediate and delayed auditory memory between depressed MS patients, non-depressed MS patients, and healthy individuals.

These findings can be explained by the fact that cognitive dysfunction and memory deficits are well-documented symptoms of MS. Cognitive functions comprise a set of higher-order abilities including self-regulation, inhibition, self-initiation, strategic planning, abstract thinking, cognitive flexibility, and impulse control. Prior research shows that cognitive abilities and executive functions can predict adaptive behavior. In line with these findings, Housley et al. (2009) asserted that demyelination of nerve fibers affects not only sensory and motor systems but may also lead to psychological symptoms. MS is associated with numerous psychological abnormalities, including depression, anxiety, euphoria, bipolar disorder, and psychosis. Depression and anxiety are among the most common psychological symptoms in MS, significantly impairing patients' daily functioning. Cognitive processing impairments, especially attention and information processing, are common in MS and lead to functional dependence and emotional distress. Researchers have linked depression and anxiety to cognitive dysfunctions such as impaired working memory, slow information processing, and diminished executive functions. Cognitive decline, often a hidden symptom, contributes directly to anxiety and depression. Therefore, reduced cognitive ability may compromise social functioning and increase the risk of depression. Arnett et al. (2001) found that persistent failures after intense effort and slow information processing reduce patients' ability to plan, creating a foundation for depressive symptoms. Given the role of the prefrontal cortex in executive functions and its dysfunction in depression, it is expected that depression and anxiety would contribute to diminished attention, focus, and processing speed, while cognitive deficits themselves exacerbate anxiety and depression.

Regarding the effect of anxious thoughts on psychological vulnerability, the findings are in line with the study by Torabi-Zonouz et al. (2020), which found relationships between situational anxiety and somatization, anxiety, depression, phobia, and obsessive-compulsive symptoms, and between trait anxiety and depression, interpersonal sensitivity, and obsessive-compulsive behaviors. Balazadeh et al. (2020) reported that anxiety sensitivity affects psychological vulnerability in asthma patients through behavioral brain systems. Ranjbari et al. (2017) showed that individuals with generalized anxiety and OCD had greater biological and psychological vulnerabilities compared to healthy individuals, and suffered from high levels of psychological vulnerability such as intolerance of uncertainty. These findings support the tripartite vulnerability model for emotional disorders.

Anxiety serves as a warning sign of imminent danger, preparing individuals to face threats and making them aware of potential physical harm, pain, or social frustration. MS patients typically experience high levels of anxiety due to the unpredictable nature of the disease, treatment setbacks, and frequent relapses. As treatment is prolonged, anxiety, depression, and hopelessness may increase. Depression and anxiety also exacerbate fatigue. Central to anxiety is the sense of uncontrollability—particularly when individuals face tasks perceived as threatening. For these individuals, perceived failure reflects chronic inadequacy in coping with unpredictable and uncontrollable stressors, contributing to negative emotions. Repeated relapses in MS reflect a loss of control, leading to distress and psychological damage. This perceived lack of control significantly influences psychological vulnerability and activates the hypothalamic-pituitary-adrenal (HPA) axis, which mediates responses to stress and affects brain regions related to emotional disorders. This explains how the

interaction of various factors amplifies psychological vulnerability.

Regarding the relationship between emotional dysregulation and anxious thoughts, the findings are in agreement with the study by Abbasi-Kamal and Sobhi (2021), which found a positive correlation between emotional dysregulation (particularly difficulty identifying feelings) and anxiety in patients with hypertension. Afshari et al. (2013) also reported a significant relationship between emotional dysregulation and anxiety in psychosomatic dermatological patients. Mazaheri et al. (2010) confirmed a positive correlation between difficulty identifying emotions and anxiety in patients with functional gastrointestinal disorders. Similarly, Besharat (2008) reported a significant positive relationship between emotional dysregulation and anxiety.

This relationship may be explained by the nature of emotional dysregulation as a cognitive-emotional trait. Individuals with this trait are unable to process and regulate emotional experiences effectively, leading to cognitive and emotional confusion and distress. These individuals often lack emotional awareness and are unable to identify, understand, or express emotions, making adaptation to stressful conditions more difficult. Expressing emotions, especially in response to negative emotions, is a key strategy for coping with stress. When such expression is absent, emotional distress and anxious thoughts increase. Emotional arousal is typically accompanied by physiological arousal. Physical symptoms such as fatigue, chest pain, abdominal discomfort, and dizziness are common in anxiety and depressive disorders. Anxious individuals often suppress their emotional experiences to control fear related to somatic symptoms, thereby exhibiting traits of emotional dysregulation. This suppression is used as a defense mechanism and is associated with emotional avoidance.

Concerning the relationship between cognitive functions and anxious thoughts, the findings align with Zare et al. (2014), who found that individuals with anxiety exhibit slower reaction times compared to those with depression. One of the most common complaints among MS patients is cognitive impairment, including reduced processing speed, attention, executive functioning, and memory (Hansen et al., 2017), all of which negatively impact functioning, daily life, and quality of life. Cognitive functions involve processing information in the absence of emotional influence and refer to future-oriented skills such as planning, inhibition, cognitive flexibility, working memory, and monitoring. In MS patients, anxious thoughts lead to selective attention toward illness-related stimuli, which increases health anxiety and anxious thoughts. Cognitive deficit theories suggest that such patients experience general failure in cognitive control, particularly inhibition, as shown in anxiety disorders. The cognitive avoidance model (Borkovec, 2004) posits that worry operates as a verbal strategy to avoid emotionally distressing imagery. Rapee and Heimberg (1997) found that attention is directed toward internal threats, leading to protective behaviors such as avoiding eye contact and social interaction. People with social phobia scan their environment for signs of negative evaluation, interpret them rapidly, and struggle to disregard them. Keller et al. (2020) also reported a link between anxiety and attentional bias. These findings suggest that cognition plays a central role in the development and persistence of anxiety disorders, both in thought content and information processing. In individuals with anxious thoughts, suppression mechanisms and attentional biases regulate their response to threatening stimuli.

The study had several limitations, including non-random sampling, lack of control over MS subtypes (relapsing-remitting, primary-progressive, secondary-progressive, and progressive-relapsing), and unexamined effects of disease duration as a potential confounder. Future studies are encouraged to use probabilistic sampling to improve internal validity and to examine demographic moderators such as illness duration.

Given the effect of emotional dysregulation on psychological vulnerability, early identification of emotional dysregulation can help prevent physical and mental complications. Intervention models should be developed to manage emotional dysregulation. Since anxious thoughts contribute to psychological vulnerability, stressful and anxiety-inducing situations can trigger psychiatric disorders such as depression, anxiety, obsessive-compulsive behaviors, and interpersonal sensitivity, which should be addressed in psychoeducation programs for patients and families. Given the link between emotional dysregulation and anxious thoughts, evaluating and addressing emotional

Ijbmc.org
E-ISSN: 2345-5802

dysregulation is crucial for understanding psychological pathology in MS patients and improving treatment. Considering the role of cognitive functions in anxious thoughts, cognitive rehabilitation can enhance cognitive abilities and psychological health, emphasizing the need for new rehabilitative methods. Since cognitive functions affect psychological vulnerability, therapists and counselors should develop strategies to improve cognitive skills in MS patients to prevent psychological distress. Overall, the findings of this study may provide valuable guidance for developing a comprehensive therapeutic model addressing psychological vulnerability in psychosomatic patients.

Acknowledgments

The authors express their gratitude and appreciation to all participants.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. Ethical considerations in this study were that participation was entirely optional.

Transparency of Data

By the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

Funding

This research was carried out independently with personal funding and without the financial support of any governmental or private institution or organization.

Authors' Contributions

All authors equally contribute to this study.

References

Alnajashi, H., & Jabbad, R. (2020). Behavioral practices of patients with multiple sclerosis during Covid-19 pandemic. *PLoS One*, *15*(10), e0241103.

Arnett, P. A., Higginson, C. I., & Randolph, J. J. (2001). Depression in multiple sclerosis: relationship to planning ability. *Journal of the International Neuropsychological Society*, *7*(6), 665-674.

Bagby, R. M., Parker, J. D., & Taylor, G. J. (1994). The twenty-item Toronto Alexithymia Scale—I. Item selection and cross-validation of the factor structure. *Journal of psychosomatic research*, *38*(1), 23-32.

Besharat, M. A. (2007). Reliability and factorial validity of a Farsi version of the 20-item Toronto Alexithymia Scale with a sample of Iranian students. *Psychological reports*, *101*(1), 209-220.

Besharat, M. A., & Khajavi, Z. (2013). The relationship between attachment styles and alexithymia: Mediating role of defense mechanisms. *Asian Journal of Psychiatry*, *6*(6), 571-576.

Besharat, M. A., Rostami, R., Pourhossein, R., & Mirzamani, M. (2006). Assessing reliability and validity of Farsi version of the Toronto Alexithymia Scale-20 in a sample of opioid substance use disordered patients.

Blunch, N. (2012). *Introduction to structural equation modeling using IBM SPSS statistics and AMOS*. Sage.

Briken, S., Gold, S. M., Patra, S., Vettorazzi, E., Harbs, D., Tallner, A., ... & Heesen, C. (2014). Effects of exercise on fitness and cognition in progressive MS: a randomized, controlled pilot trial. *Multiple Sclerosis Journal*, *20*(3), 382-390.

Cohen, J. (1992). Statistical power analysis. *Current directions in psychological science*, *1*(3), 98-101.

De Berardis, D., Vellante, F., Fornaro, M., Anastasia, A., Olivieri, L., Rapini, G., ... & Di Giannantonio, M. (2020). Alexithymia, suicide ideation, affective temperaments and homocysteine levels in drug naïve patients with post-traumatic stress disorder: an exploratory study in the everyday 'real world'clinical practice. *International journal of psychiatry in clinical practice*, *24*(1), 83-87.

Ertekin, E., Koyuncu, A., Aslantaş Ertekin, B., & Özyıldırım, İ. (2015). Alexithymia in social anxiety disorder: is there a specific relationship or is it a feature of comorbid major depression?.

Genova, H. M., Lengenfelder, J., Chiaravalloti, N. D., Moore, N. B., & DeLuca, J. (2012). Processing speed versus working memory: contributions to an information-processing task in multiple sclerosis. *Applied Neuropsychology: Adult*, *19*(2), 132-140.

Giles D. (2002). *Advanced research methods in psychology*. New York: Routledge

Giordano, A., Granella, F., Lugaresi, A., Martinelli, V., Trojano, M., Confalonieri, P., ... & SIMS-Trial Group. (2011). Anxiety and depression in multiple sclerosis patients around diagnosis. *Journal of the neurological sciences*, *307*(1-2), 86-91.

Hanna, M., & Strober, L. B. (2020). Anxiety and depression in multiple sclerosis (MS): antecedents, consequences, and differential impact on well-being and quality of life. *Multiple sclerosis and related disorders*, *44*, 102261.

Hansen, S., Muenssinger, J., Kronhofmann, S., Lautenbacher, S., Oschmann, P., & Keune, P. M. (2017).

Cognitive screening in multiple sclerosis: the five-point test as a substitute for the PASAT in measuring executive function. *The Clinical Neuropsychologist*, *31*(1), 179-192.

Hemming, L., Haddock, G., Shaw, J., & Pratt, D. (2019). Alexithymia and its associations with depression, suicidality, and aggression: an overview of the literature. *Frontiers in psychiatry*, *10*, 203.

Honkalampi, K., Jokela, M., Lehto, S. M., Kivimäki, M., & Virtanen, M. (2022). Association between alexithymia and substance use: A systematic review and meta-analysis. *Scandinavian Journal of Psychology*, *63*(5), 427-438.

Jopson, N. M., & Moss-Morris, R. (2003). The role of illness severity and illness representations in adjusting to multiple sclerosis. *Journal of psychosomatic research*, *54*(6), 503-511.

Kline, R. (2023). *Data preparation and psychometrics review. Principles and practice of structural equation modeling* (4th ed., pp. 64-96). New York, NY: Guilford.

Kline, R. B. (2016). *Principles and practice of structural equation modeling*. Guilford publications.

Lenzo, V., Barberis, N., Cannavò, M., Filastro, A., Verrastro, V., & Quattropani, M. C. (2020). The relationship between alexithymia, defense mechanisms, eating disorders, anxiety and depression. *Rivista di psichiatria*, *55*(1), 24-30.

Marchesi, C., Ossola, P., Scagnelli, F., Mellini, L., Tonna, M., Ardissino, D., & De Panfilis, C. (2015). The role of alexithymia in predicting incident depression in patients at first acute coronary syndrome. *Comprehensive psychiatry*, *62*, 86-92.

Mattioli, F., Stampatori, C., Scarpazza, C., Parrinello, G., & Capra, R. (2012). Persistence of the effects of attention and executive functions intensive rehabilitation in relapsing remitting multiple sclerosis. *Multiple sclerosis and related disorders*, *1*(4), 168-173.

Minden, S. L., Ding, L., Cleary, P. D., Frankel, D., Glanz, B. I., Healy, B. C., & Rintell, D. J. (2013). Improving the quality of mental health care in multiple sclerosis. *Journal of the neurological sciences*, *335*(1-2), 42-47.

O'Malley, P. (2023). Alexithymia in Children/Adolescents and Psychosomatic Families. In *Handbook of Mind/Body Integration in Child and Adolescent Development* (pp. 157-166). Cham: Springer International Publishing.

Patel, V. P., Walker, L. A., & Feinstein, A. (2018). Revisiting cognitive reserve and cognition in multiple sclerosis: A closer look at depression. *Multiple Sclerosis Journal*, *24*(2), 186-195.

Pimple, P., Lima, B. B., Hammadah, M., Wilmot, K., Ramadan, R., Levantsevych, O., ... & Vaccarino, V. (2019). Psychological distress and subsequent cardiovascular events in individuals with coronary artery disease. *Journal of the American Heart Association*, *8*(9), e011866.

Putica, A., Van Dam, N. T., Steward, T., Agathos, J., Felmingham, K., & O'Donnell, M. (2021). Alexithymia in post-traumatic stress disorder is not just emotion numbing: Systematic review of neural evidence and clinical implications. *Journal of Affective Disorders*, *278*, 519-527.

Rapee, R. M., & Heimberg, R. G. (1997). A cognitive-behavioral model of anxiety in social phobia. *Behaviour research and therapy*, *35*(8), 741-756.

Sago, D., Babic, G., Bajic, Z., & Filipcic, I. (2020). Panic disorder as unthinkable emotions: alexithymia in panic disorder, a croatian cross-sectional study. *Frontiers in Psychiatry*, *11*, 466.

Silva, B. A., Leal, M. C., Farías, M. I., Erhardt, B., Galeano, P., Pitossi, F. J., & Ferrari, C. C. (2020). Environmental enrichment improves cognitive symptoms and pathological features in a focal model of cortical damage of multiple sclerosis. *Brain research*, *1727*, 146520.

Simpson, R., Booth, J., Lawrence, M., Byrne, S., Mair, F., & Mercer, S. (2014). Mindfulness based interventions in multiple sclerosis-a systematic review. *BMC neurology*, *14*(1), 1-9.

Stein, D. J., Phillips, K. A., Bolton, D., Fulford, K. W. M., Sadler, J. Z., & Kendler, K. S. (2010). What is a mental/psychiatric disorder? From DSM-IV to DSM-V. *Psychological medicine*, *40*(11), 1759-1765.

Talaat, F., Ramadan, I., Aly, S., & Hamdy, E. (2020). Are multiple sclerosis patients and their caregivers more anxious and more committed to following the basic preventive measures during the COVID-19 pandemic?. *Multiple sclerosis and related disorders*, *46*, 102580.

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International journal of medical education*, *2*, 53.

Taylor, G. J., Bagby, R. M., & Porcelli, P. (2023). Revisiting the concept of Pensée Opératoire: some conceptual, empirical, and clinical considerations. *Psychodynamic Psychiatry*, *51*(3), 287-310.

Wells, A. (1994). A multi-dimensional measure of worry: Development and preliminary validation of the Anxious Thoughts Inventory. *Anxiety, Stress and Coping*, *6*(4), 289-299.

Wells, A. (2010). Metacognitive theory and therapy for worry and generalized anxiety disorder: review and status. *Journal of Experimental Psychopathology*, *1*(1), jep-007910.

Wilski, M., Brola, W., & Tomczak, M. (2019). Health locus of control and mental health in patients with multiple sclerosis: Mediating effect of coping strategies. *Research in Nursing & Health*, *42*(4), 296-305.

Wood, B., Van Der Mei, I. A. F., Ponsonby, A. L., Pittas, F., Quinn, S., Dwyer, T., ... & Taylor, B. V. (2013). Prevalence and concurrence of anxiety, depression and fatigue over time in multiple sclerosis. *Multiple Sclerosis Journal*, *19*(2), 217-224.

Ijbmc.org
E-ISSN: 2345-5802