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Self-awareness assessment in patients with multiple sclerosis and its relationship with depression: A cross-sectional study

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Keywords
Multiple Sclerosis; Self-Awareness; Patients; Depression; Cross-Sectional Study

Abstract

Background: Multiple sclerosis (MS) is a widespread autoimmune disease that affects millions of people globally. Depression among patients with MS remains poorly understood. Self-awareness, the recognition of one's emotions and limitations, has emerged as a potential factor that influences mental health. This study assessed self-awareness and its link to depression in patients with MS, thus contributing to mental health knowledge. These findings may inform targeted interventions to achieve better outcomes.

Methods: This cross-sectional study assessed the self-awareness of patients with MS and included 97 patients referred to the MS Research Center at Sina Hospital, Tehran, Iran. Self-awareness was evaluated using the Self-Consciousness Scale-Revised (SCS-R). Depression was measured using the Beck Depression Inventory-Second Edition (BDI-II). SCS-R and BDI-II scores were calculated separately for each category. Participants completed an online questionnaire.

Results: The mean age of participants was 38.66 years. Family history was positive in 18.6% of the participants. The mean BDI-II was 18.40 ± 12.32. The mean for private self-consciousness was 10.28 ± 2.77, and for public self-consciousness and social anxiety was 13.32 ± 3.57 and 13.32 ± 3.40, respectively. A significant association was observed between self-awareness and BDI-II ($P < 0.05$).

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Conclusion: There is a statistically significant link between specific sub-categories of self-awareness and severity of depression in patients with MS. Patients with MS have low private self-consciousness scores and high scores on public self-consciousness, whereas the average score was noted for social anxiety. Concealed prognostic factors might be linked to self-awareness in individuals living with MS. Therefore, additional studies further examining these factors are highly endorsed.

Introduction

Multiple sclerosis (MS) is an abnormal immune reaction that affects the central nervous system (CNS).[1] Over 2.8 million people worldwide are affected by MS each year.[2] The disease exhibits clinical heterogenicity and variable progression of disability.[3] MS can be viewed from both the clinical and statistical perspectives as a single disease with varying clinical phenotypes rather than as an entity that encompasses several discrete diseases – the position of complexity rather than real heterogeneity.[4]

Self-awareness has been defined as the correctness of an individual's evaluation of their past, present, or future conduct, or as the capacity to notice issues brought on by reduced brain functioning after brain damage.[5] Online awareness is characterized by the difference between a participant's prediction and their evaluation of their task performance before and after completing a functional task, such as making purchases online, in comparison to their actual performance. Intellectual awareness refers to the variance observed between a participant's self-reported assessment of their day-to-day functioning and the assessment provided by an informant, as determined through evaluations such as the Money Management Survey, Functional Behavior Profile, and Sensory Profile.[6] Bringing attention to one's innermost or secretive aspects is a sign of private self-consciousness. The inclination to be conscious of one's appearance and anxious about leaving a positive impression on others is known as public self-consciousness.[7] Acute fear of judgment from others in social circumstances is the hallmark of social anxiety, a frequent human emotion.[8] Awareness-based coping has been shown to reduce symptoms, particularly cognitive impairment. A questionnaire-based study revealed that patients with MS had poor subjective assessments of the course of their disease. Although they have an intact retrospective metamemory, patients with MS struggle with prospective metamemory. The hypothesis that patients with MS demonstrate reduced relative accuracy on prospective judgments, particularly for episodic feelings of knowing (FOKs) and judgments of learning (JOLs) on tasks that are more dependent on recollective processes, was validated by research on the metacognitive system. It has been thought that a crucial factor contributing to reduced consciousness is the type of MS. Compared to the relapsing-remitting (RR) form, patients with secondary progressive (SP) and primary progressive (PP) forms judge their functioning incorrectly. Other factors that affect and worsen metacognitive knowledge in half of the patients with MS include fatigue, depression, and anxiety. A lack of awareness has been linked to cognitive impairments that cause disruptions in day-to-day activities. Owing to the distributive nature of MS lesions, which affect several CNS regions, some cognitive impairments have a recognizable profile. Executive skills, such as working memory, planning, and flexibility inhibition, are frequently hampered in patients with MS. Adaptation to a novel or complicated setting is another damaged function.[9]

Deficits in memory, information processing speed, and psychopathological states like depression are linked to neuropsychological impairment in MS. Cognitive impairment is closely associated and predictive of brain atrophy, especially measures of tissue atrophy such as whole-brain and central atrophy. Emotional dysfunction is associated with both lesion burden and atrophy, where brain atrophy predicts feelings of disinhibition and euphoria. Individuals diagnosed with MS exhibit delays in performing tasks requiring attention and encounter significant challenges in temporarily storing and manipulating information in working memory. These patients often report difficulties with memory function, and they commonly display deficiencies on objective assessments that focus on recalling recently acquired information without aid. For instance, during free-recall tests, patients with MS typically recall less information during initial learning attempts, show slower improvement with repeated attempts, and demonstrate only marginally faster rates of forgetting compared to individuals without MS. While not as extensively documented as impairments in other cognitive areas, deficits in executive function (such as abstract reasoning,

conceptual flexibility, behavioral planning, and organization) have also been observed in patients with MS, impacting their performance across various cognitive tasks.[10]

A study examined how self-awareness of functional status, performance in instrumental activities of daily living (IADLs), and quality of life (QOL) were interrelated in individuals with MS. Significant correlations were discovered among these factors, underscoring the importance of awareness in rehabilitation efforts. Patients with MS demonstrated diminished self-awareness levels when contrasted with healthy controls. Significant correlations were observed among IADLs performance, self-awareness regarding functional status, and QOL assessments. However, there was no significant correlation between QOL reports and IADLs performance.[11]

A study investigated the performance of patients with MS and normal controls on metamemory tests through a questionnaire gauging their everyday life event memory. Performance on tasks involving newly acquired and general information questions was compared between participants. Metamemory encompasses a wide range of knowledge related to an individual's own memory processes. This includes understanding task complexities, mnemonic techniques, and one's own learning capabilities. Patients with MS experiencing deficits in recognition memory and performance on the Wisconsin Card Sorting Test (WCST) exhibited impairments in metamemory.[12] An experiment examined metacognitive predictions among individuals with MS in comparison to a control group. Metacognition encompasses understanding, monitoring (self-evaluation), and controlling (implementing strategies) cognitive processes. Patients with RR-MS demonstrated comparable accuracy to the comparison group in episodic and semantic memory item assessments. Initially, patients with MS overestimated their overall performance, particularly in tasks where impairment was evident, indicating inaccurate metacognitive understanding. However, postdictions and item-by-item predictions revealed similar online metacognitive processes between patients with MS and non-MS participants.[13]

One study assessed the association between perceived and objective cognitive function in patients with MS, emphasizing the disparity between the two assessments and their correlation with depressive symptoms. The study employed a cross-sectional design, patient interviews, and assessment of the Expanded Disability Status Scale (EDSS) score as part of the methodology. Objective cognitive impairment was present in 72% of patients with MS. Decreased perceived cognitive function was reported by 51% of patients with MS.[14] Depression stands out as the predominant neuropsychiatric manifestation in MS, affecting roughly 50% of individuals. Its presence may influence the interplay between subjective and objective cognitive impairments. Research consistently links depression with subjective cognitive complaints, often leading to less accurate patient-reported cognitive difficulties. Moreover, fatigue is also implicated in subjective cognitive complaints.[15] Whether self-awareness is associated with demographic and clinical factors remains poorly understood. Studies have mostly focused on cognitive impairment in MS and its relationship with psychosocial factors. Therefore, we evaluated self-awareness in patients with MS and examines its relationships with socioeconomic variables—including age, gender, educational attainment,—as well as clinical parameters such as disease onset, duration, family history, MS subtype, disability status, and depression. Our main focus in this manuscript is grabbed around the self-awareness and its relationship with depression in MS.

Materials and Methods

In this cross-sectional study, 97 patients diagnosed with MS based on McDonald diagnostic criteria,[16] whose records were documented in the national MS disease registry at the MS Research Center, Sina Hospital (a tertiary clinic affiliated with Tehran University of Medical Sciences, Tehran, Iran), entered the study by convenience sampling. Patients with MS who responded to an online questionnaire were included. Patients who did not show interest in taking part in the research, those who filled out the questionnaire incompletely, and those who were illiterate were excluded. All patients in this study, after entering personal details in the information collection form filled out the Self-Consciousness Scale-Revised (SCS-R) and Beck Depression Inventory-Second Edition (BDI-II) questionnaires. Both questionnaires were translated to Persian and were available online. SCS-R is a revised version of the Self-Consciousness Scale (SCS) presented for use with general populations. Self-awareness was measured employing 22-item SCS-R questionnaire. Each item was scored from 0 to 3. SCS-R measures

participants' self-awareness by assessing three subscales: private, public, and social anxiety. The concept of private self-consciousness pertains to the inclination to contemplate and focus on the more concealed, internal facets of oneself – elements that are personal and not readily open to others' observations. This includes one's privately held convictions, ambitions, principles, and emotions. In contrast, public self-consciousness involves pondering the aspects of oneself that are observable to others, characteristics that contribute to the formation of impressions in the eyes of others. This encompasses one's outward actions, behaviors, individual quirks, and expressive attributes. Social anxiety is believed to entail a specific type of response to concentrating on the public self. The final values for each scale were then summed. The possible score for private self-consciousness ranges from 0 to 27. For subscale of public self-consciousness, the score ranges from 0 to 21 and for social anxiety, the possible range is 0-18.[17]

Depression was measured using the BDI-II, which consists of 21 multiple-choice options. BDI-II has a total score of 63, with higher scores indicating more severe depression symptoms.[18] The Beck Depression Inventory (BDI) is a self-report rating inventory that measures characteristic attitudes and symptoms of depression, and has been developed in various forms including a 21-item version, a 13-item short form, and a more recent BDI-II version.[19] Disability was measured by calculating the ambulatory score using the EDSS. An EDSS score < 6 represents mild disability, while a score > 6 represents moderate to severe disability, and a score of 10 indicates death due to MS. Functional system (FS) impairment was not measured in the participants' memory.[20]

Using the SPSS software (version 26, IBM Corporation, Armonk, NY, USA), our data were analyzed. In addition to descriptive analyses, linear regression was used to identify significant associations. A two-sided P-value of less than 0.05 was considered statistically significant. Subcategories of self-consciousness were entered separately as dependent variables to find significant associations with basic characteristics [age, gender, marital status (with or without a partner), education (with or without academic degree), family history (positive/negative), disease type (progressive or not), EDSS score below or equal/higher than 6, disease duration (in years), and BDI score].

This study was conducted after approval and provision of the ethical code by the Ethics Committee of Tehran University of Medical Sciences (Approval ID: IR.TUMS.SINAHOSPITAL.REC.1401.058). Participants' names were not included in the questionnaire. The goals of the study were fully described to the patients. Enrollment was optional and did not affect the services provided to the patients.

Results

A total of 97 participants participated in the study. The maximum patient age was 67 years, with a minimum age of 19 years. The number of male and female participants was 29 and 68, respectively. Sixty-two years was the maximum and 3 months was the minimum duration of disease among participants. The mean EDSS was 2.08 with a standard deviation (SD) of 2.71. RR-MS was prevalent among the participants. The BDI-II had a maximum score of 50 and a minimum score of zero. A description of this process is provided in table 1.

Table 1. Sociodemographic and clinical factors associated with participants

Characteristics	Value
Age (year)	38.66 ± 9.49
Sex (women)	68 (70.1)
Family history	
Positive	79 (81.4)
Negative	18 (18.6)
Type of MS	
RRMS	68 (70.1)
SPMS	24 (24.7)
PPMS	5 (5.2)
Disease duration (year)	9.76 ± 7.49
Education	
Bachelor's	45 (46.4)
Diploma	30 (30.9)
Master's	18 (18.6)
PhD	4 (4.1)
Marital status	
Married	55 (56.7)
Single	42 (43.3)
EDSS (score ≥ 6)	
Yes	13 (13.4)
No	84 (86.6)
BDI-II (total score)	18.40 ± 12.32

Data are presented as mean ± standard deviation (SD) or number (percentage)

MS: Multiple sclerosis; PPMS: Primary progressive multiple sclerosis; SPMS: Secondary progressive multiple sclerosis; RRMS: Relapsing-remitting multiple sclerosis; EDSS: Expanded Disability Status Scale; BDI-II: Beck Depression Inventory-Second Edition

Table 2. Self-Consciousness Scale-Revised (SCS-R) dimensions

	SCS-R		
	Private self-consciousness subscale	**Public self-consciousness subscale**	**Social anxiety subscale**
Mean ± SD	10.28 ± 2.77	13.32 ± 3.57	8.60 ± 3.40
Median	10.00	13.00	9.00
Minimum	4	3	1
Maximum	20	21	18
Percentiles			
25	8.00	11.00	7.00
50	10.00	13.00	9.00
75	12.00	16.00	11.00

SCS-R: Self-Consciousness Scale-Revised; SD: Standard deviation

In our study, considering self-awareness (the score of sub-categories of the SCS-R), we found that private self-consciousness had a mean score of 10.28 ± 2.77. The mean score for public self-consciousness was 13.32 ± 3.57. The social anxiety subscale had a mean score of 8.60 ± 3.40. The outcomes of the self-consciousness scale are presented in table 2.

Next, we investigated the correlation of the subcategories of self-consciousness with sociodemographic and clinical risk factors. Sociodemographic factors and EDSS showed insignificant results with regard to self-consciousness. Linear regression was used to test whether self-consciousness significantly predicted BDI-II. Our results revealed a statistically significant association between the subscales of self-consciousness and BDI-II. The relationship between the BDI-II and self-consciousness was linear (Table 3).

The scatter plots reveal significant positive associations between BDI-II scores and private self-consciousness, public self-consciousness, and social anxiety. This suggests that higher levels of depressive symptoms are linked with increased levels of self-consciousness and social anxiety (Figure 1).

Table 4 provides a summary of the descriptive statistics of the different variables within the study population. These statistics revealed the distribution properties of the data. Having a good understanding of these descriptive measures is essential for understanding the profiles of the study participants and for interpreting the following analyses. The results show how scores on three different traits (private self-consciousness, public self-consciousness, and social anxiety) vary between women and men.

Independent t-test was carried out to measure any statistical differences across the gender. For all variables (private self-consciousness, public self-consciousness, and social anxiety), P-values exceeding 0.05 suggest no significant gender differences. Near-zero mean differences and confidence intervals (CIs) spanning zero also indicate a lack of substantial differences between genders.

Discussion

In this cross-sectional study of 97 patients, we evaluated self-awareness among patients with MS and its association with depression. We demonstrated that self-awareness was linked to depression in patients with MS. Information regarding self-awareness and its association with risk factors in patients with MS is insufficient. Our study is inimitable, as it focuses mainly on the different themes of self-awareness in MS. To our knowledge, this is the first study to assess major types of self-awareness and their association with depression in patients with MS.

Table 3. Regression analysis and model summary for self-consciousness and Beck Depression Inventory-Second Edition (BDI-II) score

Independent variable	**Dependent variables**	**Standardized coefficient**	**P**	**R square**	**Adjusted R square**	**SEE**	**F-statistic**
		Beta					
BDI-II	Private self-consciousness	0.219	0.031*	0.048	0.038	2.722	4.775
	Public self-consciousness	0.330	0.001*	0.109	0.100	3.390	11.623
	Social anxiety	0.379	0.001*	0.144	0.135	3.168	15.961

*P-value < 0.05

BDI-II: Beck Depression Inventory-Second Edition; SEE: Standard error of the estimate

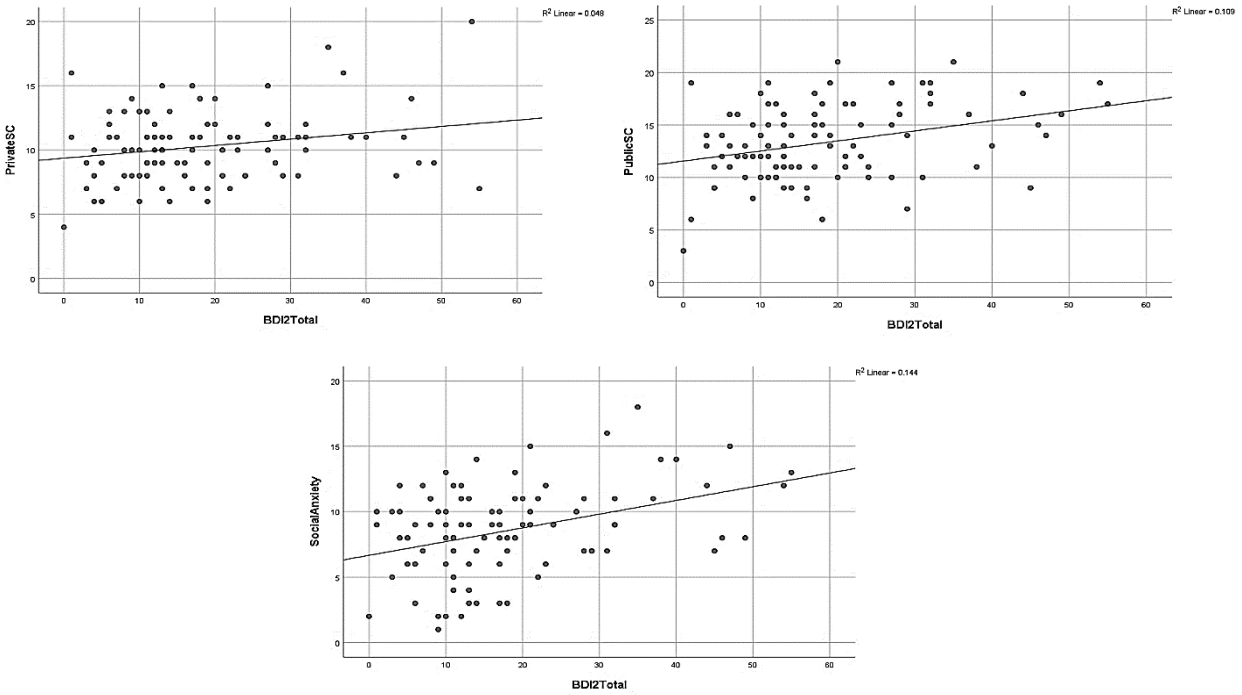


Figure 1. Significant results of association between self-consciousness and depression
PrivateSC: Private self-consciousness; PublicSC: Public self-consciousness; BDI2Total: Beck Depression Inventory-II total score

Table 4. Descriptive statistics of Self-Consciousness Scale-Revised (SCS-R) by gender of the participants

SCS-R	Gender	Value
Private self-consciousness	Women	10.34 ± 2.60
	Men	10.14 ± 3.19
Public self-consciousness	Women	13.28 ± 3.22
	Men	13.41 ± 4.33
Social anxiety	Women	8.49 ± 3.24
	Men	8.86 ± 3.79

Data are presented as mean ± standard deviation (SD)
SCS-R: Self-Consciousness Scale-Revised

In the present study, we evaluated self-awareness using the SCS-R questionnaire, which is divided into three main subcategories. Private self-consciousness included 9 themes like "I think about myself a lot", "I am constantly thinking about my reasons for doing things", "I know the way my mind works when I work through a problem". Public self-consciousness evaluated 7 themes such as "I am concerned about what other people think of me", "I am self-conscious about the way I look". Social anxiety includes dimensions like "Large groups make me nervous", "It is easy for me to talk to strangers", "It takes me time to get over my shyness in new situations". A study was conducted in an MS hospital in England to investigate how patients with MS perceived themselves. Twelve participants participated in the study through interviews. The study observed three themes: 1) "My body did not belong to me": changes in the body's relationship, 2) "I miss the way I feel about myself": self-body changes, and 3) "Let's just try and live with it": integrating self and MS. It has been concluded that MS affects the self, as evidenced by changes in the self. It was found that changes in the self in patients with MS negatively affected the frame of the mind.[21] Kessler Medical Rehabilitation Research and Education Corporation piloted a report analyzing self-awareness and cognitive activity in patients with MS. Neuropsychological tests and the Frontal Systems Behavior Scale (FrSBe) were employed in the study, and responses were recorded from 26 patients. Self-awareness of neural and behavioral symptoms was linked to a decline in cognition.[22]

Forty-three patients were assessed for recognition deficits and frequency of anosognosia in MS. Visual Analog Test assessing anosognosia for motor impairment (VATA-m) and Mayo-Portland Adaptability Inventory (MPAI) scales were used in this study. This study suggests an impaired self-awareness mechanism in patients with MS.[23] A survey measuring personality, illness symptoms, disease management, coping strategies, self-efficacy, locus of control, psychological well-being, and QOL was completed by 230 patients with MS. Using a variety of questionnaires to assess disease symptoms and

management, personality was measured using NEO-Five Factor Inventory-3 (NEO-FFI-3), and SPSS software was used for statistical analysis. The International Personality Item Pool (IPIP) Social Discomfort Scale was also completed by participants. The Modified Fatigue Impact Scale (MFIS) is an adapted version of the Fatigue Impact Scale (FIS) designed specifically for individuals with MS. It comprises 21 items derived from interviews with patients with MS, focusing on the effects of fatigue on various aspects of their lives. The scale is divided into three subscales: physical, cognitive, and psychosocial functioning. Personality traits, notably type D personality, exert considerable influence on the lives of individuals with MS, impacting disease symptoms, management, coping mechanisms, psychological health, and overall QOL.[6]

A case-control study was conducted with 94 patients with MS and 65 healthy controls to elucidate metacognitive awareness in MS. Participants performed activities such as a money management survey and completed the purchase using the internet. Intellectual awareness is significantly affected by tasks such as social interaction, money management, and task performance. There were no significant differences in online awareness between the patients with MS and healthy controls.[24] Ninety-eight patients with MS participated in a study, undergoing a range of evaluations encompassing magnetic resonance imaging (MRI) scans, cognitive tests, and personality trait assessments via the NEO Five Factor Inventory (NEO-FFI). The research sought to examine how personality traits affected the interplay between gray matter volume and cognitive/neuropsychiatric manifestations of MS. Patients with MS who underwent MRI were assessed using the Symbol Digit Modalities Test (SDMT) and the Neuropsychiatric Inventory (NPI). The NEO-FFI was used to evaluate personality traits. Linear regression analysis showed a relationship between cognitive function and gray matter volume, as well as low conscientiousness measured by the NEO-FFI. The study findings showed that in MS, lower levels of conscientiousness and higher levels of neuroticism correlated with neuropsychiatric issues, impacting the association between gray matter volume and euphoria.[25]

In our study, we found that patients with MS were low in private self-awareness. Furthermore, based on the mean scores of SCS-R, we deduce that patients with MS were associated with high public self-awareness and showed average social anxiety scores. Numerous studies have found that individuals high in private self-awareness have increased awareness of inner feelings, improved consistency in behavior over time, stronger associations between behavior and self-reporting, and increased efficiency of extraneous mood variables. Those with higher levels of private self-awareness provided more detailed and accurate descriptions of themselves than those with lower levels.[26-33] This finding is consistent with Mazancieux et al., who reported that mood states, particularly depression, significantly modulated self-perception and awareness in patients with MS.[9] Similarly, Kiropoulos et al. demonstrated that a strong self-concept, which included private self-consciousness, was inversely related to depressive symptoms in patients with MS.[34] Additionally, Goverover et al. found that patients with MS often had poor awareness of their cognitive deficits, which can exacerbate depressive symptoms.[5] This aligns with our findings and underscores the need for interventions targeting cognitive impairments to improve self-awareness and mental health outcomes. Further support comes from Beatty and Monson, who highlighted metamemory deficits in patients with MS, linking them to reduced self-awareness.[12] Individuals with high public self-awareness have been seen to have high levels of self-reporting conventionalism, an increased need for connection, decreased self-respect, and minimal risk-taking. Subjects with high public self-consciousness are more obedient than those with low public self-consciousness in experimental settings.[20,35,36] A study conducted by Hope and Heimberg reported that women with high public self-awareness were more likely to be rejected by peers than women with low public self-awareness.[37] Our finding is consistent with Chen and Goverover who reported that depressive and anxiety symptoms often distorted MS patients' perceptions of their functional abilities, leading to increased public self-consciousness.[38] Furthermore, Darviri et al. found that interventions aimed at reducing stress and anxiety, which contributed to high public self-consciousness, could significantly improve psychological well-being in patients with MS. This suggests that addressing public self-consciousness through psychological interventions could mitigate its negative impact on mental health.[39]

Kalron and Aloni demonstrated that depressive

symptoms were strongly related to self-reported physical impairments rather than objective measures, indicating that public self-consciousness might amplify perceived deficits. This supports our findings and highlights the need for interventions that address self-perception and public self-consciousness in patients with MS.[40] Franzoi[31] and Turner[32] also found that high public self-consciousness was associated with increased self-reporting of conventionalism and concern about others' perceptions, reinforcing the importance of addressing this dimension in patients with MS.

Prominent levels of public self-consciousness may be essential prerequisites for social anxiety.[41,42] The social anxiety scores among our patients with MS were average, indicating moderate levels of anxiety in social interactions. This finding aligns with Kalron and Aloni who found that depressive symptoms were strongly related to self-perception of physical abilities, such as walking difficulties, rather than objective measures.[40] Social anxiety is closely tied to depressive symptoms and public self-consciousness, as noted by Crouch et al., who showed that social anxiety mediated the relationship between cognitive impairments and QOL in patients with MS. This suggests that reducing social anxiety could improve overall well-being in this population.[43]

Further, studies by Schlenker and Leary[41] and Hope and Heimberg[37] emphasized the role of social anxiety in self-presentation and its impact on psychological well-being. These findings support the need for comprehensive interventions targeting social anxiety to enhance QOL in patients with MS. The study by Morrison and Heimberg also highlighted the significance of social anxiety disorder and its implications for individuals with chronic conditions like MS, reinforcing our findings.[8]

A study examined discrepancies between self-ratings and informant ratings of neuropsychological functioning in patients with MS, revealing associations with cognitive function, depression, personality traits, and neuropsychiatric symptoms. Overestimators displayed less depression and conscientiousness, yet exhibited greater cognitive impairment, euphoric behavioral disinhibition, and unemployment compared to underestimators. The Multiple Sclerosis Neuropsychological Questionnaire (MSNQ) may predict euphoria and disinhibition syndromes in MS. The methodology entailed contrasting patient self-assessment and informant-reported questionnaire ratings of neuropsychological functioning, utilizing the MSNQ, neuropsychological evaluations, and assessments for depression, personality, and neuropsychiatric symptoms. Patients were categorized based on the distribution of divergence scores, with analysis of variance (ANOVA) employed to compare test scores across various groups.[44] A study investigated how depression and fatigue impacted subjective cognitive complaints and objective neuropsychological impairment in individuals with MS. The study employed a secondary analysis of data from a randomized controlled trial (RCT) that investigated two depression therapy approaches in patients with MS. With a participant pool of 127 individuals diagnosed with MS, the study utilized telephone-administered self-report measures, objective cognitive functioning assessments, and depression evaluations. Recruitment was conducted through specific healthcare groups and MS society chapters, adhering to pre-established inclusion and exclusion criteria. The results indicated that enhancements in depression and fatigue levels did not influence objective neuropsychological performance, but were associated with alterations in subjective impairment. This underscores the significance of precise identification of cognitive dysfunction in individuals with MS.[45]

Our study supports the finding that self-awareness is associated with the severity of depressive symptoms in MS.

The significant link between self-awareness and depression observed in our study is supported by multiple lines of existing research. Wang et al. highlighted the complex interplay between genetic and non-genetic factors in the development of depression in patients with MS, emphasizing the role of self-awareness in managing depressive symptoms.[46] Fischer et al. demonstrated the effectiveness of self-report questionnaires like the BDI and IDS-SR30 in assessing depression in patients with MS, reinforcing our use of the BDI-II in evaluating depressive symptoms related to self-awareness.[47]

Kidd et al. conducted a systematic review showing that self-management interventions, which enhance self-awareness, could improve depression and anxiety in patients with MS. This aligns with our findings, suggesting that targeted interventions for improving self-awareness could

be beneficial in managing depression in patients with MS.[48] Similarly, Strober[6] and Benedict et al.[25] found that personality traits, including self-awareness, significantly influenced health outcomes in patients with MS, highlighting the importance of addressing cognitive and emotional aspects to improve mental health outcomes.

According to one study, people with MS who have lower social cognitive function tend to have more anxiety, depression, and psychosocial fatigue.[49] Private self-consciousness connects significantly more strongly with the personal than with the social aspects of identity, whereas public self-consciousness is considerably more strongly correlated with social than with the personal components of identity.[7] Physical severity, cognitive decline, and reported illness management have been linked to anxiety and depression in patients with MS, which has been validated by previous research.[50] A cross-sectional population-based study conducted in Sweden implied that the prevalence of depression in MS was high, irrespective of demographic factors, including age and disease severity. This fact supports our finding of worsening character of depression and its relationship with worse self-reporting and decreased sense of coherence. Sense of coherence denotes the collective inner strengths and capabilities that assist individuals in effectively managing stressors, leading to improved health outcomes. It represents an individual's perception of the world as meaningful, understandable, and manageable.[51] A personality trait disposition that indicates the magnitude of undesirable events, such as depression, anxiety, self-awareness, and anger, has been referred to as neuroticism.[52] Increased neuroticism is associated with MS in patients with depression. It has been found that patients with MS suffering from depression were extraverted to a lesser extent and less aware than patients with MS without depression.[53] One hundred and eighty-nine patients with MS with a verified diagnosis were recruited from three French hospitals for a cross-sectional questionnaire survey. Participants answered questions covering the following topics: Hospital Anxiety and Depression Scale (HADS) results for anxiety and depression, as measured by the Emotional Processing Scale-25 (EPS-25). The Positive and Negative Emotionality Scale (EPN-31) measures both positive and negative emotions. The Bermond-Vorst Alexithymia Questionnaire measured alexithymia, whereas the CHIP-Neuro questionnaire measured coping with health problems and injuries. The connections between these areas were investigated using a path analysis. This study demonstrated that both direct and indirect pathways caused anxiety to increase a person's risk of depression.[54]

Limitations: This study has a few limitations. One important limitation is that there were not any data on the cognitive performance of the patients. Another limitation of the study is that there was no control comparison group. As a result, it cannot be fully determined if these effects would also be observed in healthy individuals, or if they were more specific to MS. Furthermore, the sample is very highly educated which might impact the nature of relationships. A noteworthy constraint of this study was its modest sample size. Furthermore, this study was not designed for the illiterate.

Future recommendations: Our study underscores the need for comprehensive assessments and targeted interventions to enhance self-awareness and mitigate its impact on depression in patients with MS. Future research should focus on developing and implementing interventions such as cognitive behavioral therapy (CBT), mindfulness-based stress reduction (MBSR), and other psychological therapies that address both cognitive and emotional aspects. Longitudinal studies are also needed to examine the long-term effects of enhanced self-awareness on depression and QOL in patients with MS.

In conclusion, our study highlights the intricate relationships between private self-consciousness, public self-consciousness, social anxiety, and depression in patients with MS. By comparing our findings with existing literature, it becomes evident that addressing self-awareness through comprehensive cognitive and psychological interventions can play a crucial role in managing depression and improving QOL in patients with MS. Future research should continue to explore these relationships and develop targeted strategies to enhance self-awareness and mitigate its impact on depression in MS.

To sum up, the deployment of different scales and interventions to explore self-awareness and its association with variable determinants in MS is highly endorsed.

Conclusion

MS is a disease of unknown etiology, with a range of unpredictable clinical manifestations. Our study evaluated self-awareness and its subclasses, such as private self-consciousness, public self-

consciousness, and social anxiety, in persons with MS. This study found a statistically significant correlation between aspects of self-awareness in patients with MS and the severity of depression. Based on the statistical values, it can be concluded that private self-consciousness, public self-consciousness, and social anxiety are strongly related to depression in MS. We further conclude that patients with MS gained low scores on private self-consciousness, whereas high scores can be seen on public-self-consciousness and social anxiety. Improving self-awareness can affect the prognosis of the various signs and symptoms of MS. Moreover, patients with MS can be considered for insight therapy. Nonetheless, high-quality studies on the self-awareness of patients with MS are warranted.

Conflict of Interests

The authors declare no conflict of interest in this study.

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