Loneliness in Multiple Sclerosis

Possible Antecedents and Correlates

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Abstract

Purpose: The prevalence and possible antecedents and correlates of loneliness in multiple sclerosis (MS) was examined.
Design: Cross-sectional, comparative study of MS (n = 63) and healthy adults (n = 21).
Methods: Data were collected using self-reports of loneliness and antecedents and correlates and analyzed using inferential statistics.
Findings: Those with MS had significantly higher loneliness scores than healthy adults ($p < .05$), and this was explained by employment status. Possible antecedents included marital status ($p < .05$), upper extremity function ($r = -.28$, p < .03), social disability frequency ($r = -.49$, $p < .00$), social disability limitations ($r = -.38$, $p < .00$), and personal disability limitations ($r = -.29$, $p < .03$). Social disability frequency (beta = −.41, $p < .001$) and marital status (beta = −.23, $p < .046$) accounted for 25% of the variance in loneliness scores. Possible correlates included depression ($r = .49$, $p < .00$), cognitive fatigue ($r = .34$, p < .01), psychosocial fatigue ($r = .30$, $p < .02$), and psychological quality of life ($r = .44$, $p < .00$).
Conclusions: We provide evidence of loneliness in persons with MS, and this is associated with possible antecedents (e.g., marital status and disability limitations) and correlates (e.g., depression and fatigue).
Clinical Relevance: Loneliness should be recognized clinically as an important concomitant of MS.

Keywords: Loneliness; Multiple sclerosis; Neurological.

Introduction

Multiple sclerosis (MS) is a chronic, immune-mediated disease of the central nervous system, with an estimated prevalence of 400,000 adults in the United States, and occurs in upwards of three times as many women as men (Page, Durtzke, Murphy, & Norman, 1993). This disease presents with a range and severity of symptoms, and its manifestations impact nearly all aspects of life. MS may result in loss of walking mobility, cognitive dysfunction, and symptomatic fatigue and depression. Such manifestations have been associated with unemployment, loss of employment, reduced quality of life (QOL), and restricted community and social participation (Benedict & Zivadinov, 2011; Krupp, 2004). Indeed, the impact of MS extends into "work roles, economic status, relationships within the family, and relationships between the family and the larger community" (Kalb & Scheinberg, 1992). It is reasonable to surmise, therefore, that MS and its manifestations make those living with this disease vulnerable to the experience of loneliness. Consequently, the present study examined the antecedents and correlates of loneliness among persons with MS.

Perlman and Peplau's social psychological theory conceptualizes loneliness as the unpleasant experience that occurs when a person's network of social relationships is significantly deficient in either quality or quantity (Perlman & Peplau, 1981) Loneliness is not synonymous with social isolation or aloneness and represents an unpleasant and distressing subjective experience associated with general dissatisfaction, unhappiness, depression, and anxiety (Cacioppo, Grippo, London, Goossens, & Cacioppo, 2015). The social psychological theory of loneliness further postulates that both predisposing factors and precipitating events may be antecedents of loneliness. Predisposing factors, such as characteristics associated with the individual or given situation, may increase the likelihood of loneliness, whereas precipitating events such as changes in a person's achieved, desired, or expected social relations may precede loneliness (Perlman & Peplau, 1981). The

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disease course of MS and its many manifestations can be considered antecedents of loneliness, and the symptoms of MS may be exacerbated by the experience of loneliness (i.e., correlates of loneliness).

Loneliness has been correlated with sociodemographic, functional, and cognitive outcomes in the general population. Whereas the possible antecedents of loneliness are numerous and varied, a meta-analysis of loneliness in older adults reported that loneliness was consistently associated with being a woman, low socioeconomic status and education level, competence (e.g., ability to maintain activities of daily living), and mobility (Pinquart & Sorensen, 2001). Additional correlates of loneliness include elevated depressive and anxiety symptoms, daytime dysfunction (e.g., low energy, fatigue), and decreased QOL (Arslantaş, Adana, Abacigil Ergin, Kayar, & Acar, 2015; Hawkley & Cacioppo, 2010).

There have been only two examinations of loneliness in persons with MS. One cross-sectional study examined the qualitative aspects of loneliness in persons with MS and compared them with cancer survivors and healthy adults (Rokach, 2004). The researchers included a 30-item questionnaire wherein participants described personal experiences of loneliness based on five domains: emotional distress, social inadequacy and alienation, growth and discovery, interpersonal isolation, and self-alienation. Compared to cancer survivors and healthy adults, those with MS had the lowest scores on all domains of loneliness, with the exception of growth and discovery, and women with MS expressed higher levels of loneliness than men with MS in all domains. The other cross-sectional study examined the prevalence and correlates of loneliness in women with MS and reported that 50% of the women felt lonely during the past week, with 15.5% and 8.3% feeling lonely a moderate amount of time or most or all of the time, respectively (Beal & Stuifbergen, 2007). Loneliness was significantly and moderately correlated with social responses of illness ($r = .37$) and social support ($r = -.37$), and significantly but weakly correlated with functional limitation ($r = .20$), self-rated health status ($r = -.25$), and marital status ($r = .20$).

The existing research on loneliness in MS is promising but has not included well-validated measures developed based on the standard definition of the construct. For example, one study included a 30-item, study-generated measure of loneliness with unknown psychometric properties (Rokach, 2004). The other study included only a single item from the Center for Epidemiological Studies Depression Scale; this item asks about the extent of loneliness over the past week (Beal & Stuifbergen, 2007). The continued study of loneliness in MS is of central importance and should be conducted using the UCLA (University of California, Los Angeles) Loneliness Scale (Russell, Peplau, & Ferguson, 1978). This scale was developed consistent with Perlman and Peplau's social psychological theory of loneliness and contains 20 items (e.g., I am unhappy doing so many things alone) that are rated on a 4-point Likert-type scale. The item scores are summed into an overall score that reflects varying degrees of loneliness. The scale has been validated based on correlations with self-reports of current loneliness and related emotional states, and comparison between participants in a loneliness clinic and a control sample (Russell et al., 1978). The UCLA Loneliness Scale has been included in a substantial amount of loneliness research across varying populations and demographics; this affords comparability of investigations of loneliness in MS with the general population (Paloutzian & Janigan, 1987; Russell, 1996).

This cross-sectional, comparative study was guided by Perlman and Peplau's (1981) social psychological theory of loneliness and examined the antecedents and correlates of loneliness using the UCLA Loneliness Scale among persons with MS. The specific aims were to (1) compare the extent of loneliness between persons with MS and healthy adults; (2) examine the association of sociodemographic variables, disability, and functional limitations and loneliness in persons with MS; and (3) examine depression, anxiety, fatigue, and QOL as possible correlates of loneliness. Such inquiry could inform future research investigating loneliness in MS and provide a new perspective and means of intervening on loneliness and other commonly reported symptoms of MS for healthcare providers.

Methods

Participants

Data were collected as part of another study examining measures of aerobic and muscular fitness in persons with MS compared with healthy adult and across the MS disability spectrum (Pilutti et al., 2015). Participants with MS were recruited through the North American Research Committee on MS registry and our lab database. The inclusion criteria were as follows: (1) ages of 18–64 years, (2) confirmed diagnosis of MS, (3) self-reported Expanded Disability Status Scale (EDSS) score of <8.0, (4) relapse free in past 30 days, (5) willing and able to visit the University of Illinois at Urbana-Champaign on two testing occasions, and (6) physician approval for undertaking exercise testing. The sample of healthy adults without MS was recruited using the University of Illinois weekly faculty and staff e-mail service. The inclusion criteria were (1) ages of 18–64 years, (2) willing and able to visit the University of Illinois at Urbana-Champaign on two testing occasions, and (3) physician approval for undertaking exercise testing. Healthy adults were matched to the MS sample on age, gender, height, and weight. Of the 86 individuals with MS who underwent screening, 82 met inclusion criteria and were scheduled for testing; however, 18 subsequently withdrew participation for transportation issues or because they were no longer interested in participating. All 22 healthy adults who underwent screening completed scheduled testing. One participant per group did not provide UCLA Loneliness Scale data resulting in a final convenience sample of 63 persons with MS and 21 healthy adults.

Measures

Loneliness

Loneliness was assessed using the UCLA Loneliness Scale (Russell et al., 1978). The original version was purposefully chosen rather than the revised and third versions, because both contain a mixture of positive and negatively worded items. The inclusion of both positively and negatively worded items on a scale creates a methodological artifact associated with item wording (i.e., two-factor measurement structure, with one factor representing positively worded items and one factor representing negatively worded items) that confounds formation and interpretation of a single overall score for a scale (DiStefano & Motl, 2006). The original version is further the most common and well-validated measure of loneliness and corresponds with accepted definitions of the construct (Luanaigh & Lawlor, 2008; Russell, 1996). The scale has 20 items that are combined as a single measure of one's subjective experience of loneliness and does not include terms such as "lonely" or "loneliness" to reduce response bias (Russell, Peplau, & Cutrona, 1980). Participants rate each item, such as "How often do you feel alone," as either O ("I often feel this way"), S ("I sometimes feel this way"), R ("I rarely feel this way"), or N ("I never feel this way"). The individual responses are scored (1–4) and then summed into an overall score that ranges between 20 and 80. Higher scores reflect higher degrees of loneliness. There is evidence that supports the reliability and validity of scores on this measure (Russell et al., 1978).

Neurological Disability

All participants underwent a neurological exam for generation of EDSS scores for describing the disability level of those with MS (Kurtzke, 1983). The examiners were doctoral-level graduate students who have undertaken training from neurologists and were Neurostatus-certified. Scores on the scale range from 0 to 10, with higher scores indicating a higher level of neurological disability.

Functional and Disability Limitations

The abbreviated Late Life Function and Disability Instrument measures self-reported functional limitations and disability (Motl, McAuley, & Suh, 2010). Functional limitations describe restrictions in basic physical and mental actions (e.g., walking one mile). Disability involves the expression of physical or mental limitations in a social context (e.g., difficulty doing activities of daily living that are required for one's employment, personal care, and recreation). The 15-item functional limitations component captures three subscales of upper extremity function, basic lower extremity function, and advanced lower extremity function (Jette et al., 2002). Each item is rated on a 5-point scale, with anchors of "cannot do" and "none," and summed into a composite measure of upper extremity, basic lower extremity, and advanced lower extremity functional limitations. Scores range between 5 and 25, and higher scores indicate fewer functional limitations. The disability component contains an eight-item measure of disability frequency (i.e., frequency of performing socially defined tasks) and an eight-item measure of disability limitations (i.e., limitations with performing socially defined tasks). Both items correspond with the social and personal components of disability. The two sets of items have different stems of "How often do you…" and "To what extent do you feel limited in…," and items are rated on a 4-point scale with anchors of "very often" and "never" or "not at all" and "completely." Scores range from 4 to 20, with higher scores reflecting less disability. The scale has been validated for use in persons with MS (Motl et al., 2010).

Symptoms

The 14-item Hospital Anxiety and Depression Scale measures the frequency of anxiety and depression symptoms over the past 4 weeks (Zigmond & Snaith, 1983). Scores are generated separately for anxiety and depression (ranging from 0 to 21), and higher scores per subscale indicate more frequent anxiety and depressive symptoms. The scale has good evidence of internal consistency and test–retest reliability (Zigmond & Snaith, 1983). The scale has further been validated in populations with MS (Honarmand & Feinstein, 2009).

Perceived impact of fatigue was measured with the Modified Fatigue Impact Scale, a 21-item shortened version of the Fatigue Impact Scale (Fisk et al., 1994). Items are aggregated into three subscales, including physical (scores range from 0 to 36), cognitive (scores range from 0 to 40), and psychosocial (scores range from 0 to 8) fatigue. Higher scores suggest a greater impact of fatigue on functioning in the specified domain. The scale has evidence of good reliability and validity in populations with MS (Learmonth et al., 2013).

Physical and Mental Health-Related QOL

The Multiple Sclerosis Impact Scale-29 provides a measure of the impact of MS from the patient's perspective (i.e., QOL). Physical (scores range from 20 to 100) and psychological (scores range from 9 to 45) aspects of QOL can be reported separately, or a combined score can be generated. Lower scores indicate less impact of MS on QOL, and the scale represents a reliable and sensitive measure of physical and mental aspects of QOL in persons with MS (McGuigan & Hutchinson, 2004).

Procedures

This study was approved by a university institutional review board, and participants provided written informed consent. Participants underwent a neurological evaluation for generation of an EDSS score and further completed self-report measures (Demographics Scale, UCLA Loneliness Scale, Hospital Anxiety and Depression Scale, Modified Fatigue Impact Scale, Multiple Sclerosis Impact Scale-29, and Late Life Function and Disability Instrument). Participants were remunerated $150.

Statistical Analysis

Statistical analyses were performed in IBM SPSS Statistics for Windows (Version 22; IBM SPSS, Inc., Armonk, NY). Descriptive statistics are given for both the MS and healthy adult groups and listed in text and tables as mean with standard deviation, unless otherwise noted (e.g., percentages). Initial differences in demographic variables between MS and healthy adult participants were compared using analysis of variance, t tests, and chi-square statistics. Between-group differences of the antecedents and correlates of loneliness in MS were compared using *t* tests with effect sizes based on Cohen's *d*, and associations were examined using bivariate Pearson (r) correlations. Furthermore, a stepwise regression analysis was performed to examine which of the antecedents best explained the variance of loneliness scores in MS; variables that demonstrated significant associations in the univariate analyses were included. The p value for entry was .05, and the p value for removal was .10 in the stepwise regression. The magnitude of the correlation coefficients was interpreted as small, medium, and large based on values of .1, .3, and .5, respectively (Cohen, 1988). Statistical significance was based on $p < .05$ for all other analyses.

Results

Sociodemographic and Clinical Characteristics

Participants with MS were primarily female (71.9%), Caucasian (90.6%), and married (63.0%) and had an annual household income of greater than $40,000 (67.2%; see Table 1). The mean age was 52.0 (7.8) years. The mean body mass index (kg/m2) was 27.1 (6.8). Less than half of the participants with MS were employed (43.8%). Healthy adult participants differed significantly from the MS sample only in employment status (90.9%). Regarding clinical characteristics, those with MS primarily had relapsing-remitting MS (78.0%), mild to moderate disability (median EDSS score of 4.0 [4.0]), and a disease duration of 13.2 (8.8) years.

Extent of Loneliness in MS and Healthy Adults

The sample of participants with MS had significantly higher UCLA Loneliness Scale scores than did the healthy adult sample, $F(1, 81) = 7.9$, $p < .05$, and the difference was moderate in magnitude ($d = 0.54$; see mean scores in Table 1). This difference in UCLA Loneliness Scale scores was not statistically significant when controlling for employment status as a covariate in a subsequent analysis of covariance, $F(2, 81) = 1.25$, $p = .27$.

Sociodemographic Variables and Disability and Functional Limitations as Antecedents of Loneliness

Marital status was the only categorical antecedent of loneliness based on a statistically significant difference in UCLA Loneliness Scale scores (Table 2). There were statistically significant negative correlations between loneliness scores and upper extremity function ($r = -.28$, $p < .03$), social disability frequency ($r = -.49$, $p < .00$), social

Table 1 Sociodemographic and Clinical Differences Between Multiple Sclerosis and Control Groups

Characteristic	Multiple Sclerosis (n = 63)	Control (n = 21)	χ^2/t value
Gender (% female)	71.9%	77.3%	0.24
Age, years	52.0 (7.8)	51.1 (10.4)	−0.42
Race (% Caucasian)	90.6%	77.3%	2.0
Body mass index (kg/m2)	27.1 (6.8)	25.7 (6.2)	−0.8
Marital status (% married)	63.0%	59.1%	0.1
Employed (% employed)	43.8%	90.9%	16.6*
Education (% some college)	84.4%	90.8%	1.4
Annual household income (% over $40,000)	67.2%	95.5%	2.4
EDSS, median (IQR)	4.0 (4.0)	–	–
Disease Course (% RRMS or benign)	78.0%	–	–
Disease duration, years	13.2 (8.8)	–	–
UCLA score	33.7 (13.1)	27.3 (8.3)	−2.8*
UCLA adjusted score[a]	33.1(1.6)	29.3 (2.8)	1.1

Note. Values are mean (SD), unless otherwise noted. EDSS = Expanded Disability Status Scale; UCLA = University of California, Los Angeles, Loneliness Scale; IQR = interquartile range; RRMS = relapsing-remitting MS.
[a] Adjusted mean scores (Standard Error) based on analysis of covariance controlling for employment status.
*$p < .05$.

disability limitations (r= −.38, $p < .00$), and personal disability limitations (r= −.29, $p < .03$; Table 3). UCLA Loneliness Scale scores were regressed on marital status, upper extremity function, social disability frequency, social disability limitations, and personal disability limitations using a stepwise entry. Social disability frequency (beta = −.41, $p < .001$) entered the model in Step 1, followed by marital status (beta = −.23, $p < .046$) in Step 2. The overall model was statistically significant, $F(2, 58) = 9.6$, $p < .05$, and the two variables accounted for 25% of the variance in loneliness scores (Table 4).

Symptoms of MS as Correlates of Loneliness

There were statistically significant positive correlations in the MS sample between loneliness and depression (r= .49, p < .00), cognitive fatigue (r= .34, $p < .01$), and psychosocial fatigue (r= .30, p < .02). Loneliness was further associated with psychological QOL (r= .44, $p < .00$; Table 3).

Discussion

To date, little is known about loneliness in persons with MS, and previous research has neither been informed by theory nor included an accepted measure of loneliness. This study adopted the social psychological theory of loneliness and the UCLA Loneliness Scale to examine the extent of loneliness in MS compared with healthy adults and its antecedents and correlates in those with MS. Our results indicated that (1) persons with MS reported worse loneliness than healthy adults, and this difference was seemingly based on employment status; (2) marital status and functional and disability frequency and limitations represented potential antecedents of loneliness among those with MS; and (3) depression, fatigue, and QOL represented correlates of loneliness among those with MS.

One objective of this study involved comparing UCLA Loneliness Scale scores between persons with MS and healthy adults considering that MS itself might be an antecedent consistent with the social psychological theory of loneliness. The results indicated that persons with MS were significantly lonelier than healthy adults, and this difference was explained by employment status. Such results are consistent with Perlman and Peplau, who originally reported that groups who are marginalized or chronically cut off from social contacts would be at risk for loneliness and those with MS who are unemployed would seemingly represent one such group (Perlman & Peplau, 1981). Our results further align with previous research outside of MS, wherein both unemployed men and women expressed greater loneliness than employed counterparts (Winefield & Tiggemann, 1985). Such an observation is important as current studies of employment and work loss in MS report unemployment rates ranging between 24% and 80% (Julian, Vella, Vollmer, Hadjimichael, & Mohr, 2008) and therefore provide further rationale for supporting continued employment in MS.

This study examined antecedents of loneliness among those with MS. Regarding demographic factors, marital status was associated with loneliness scores, whereas

Table 2 Categorical Antecedents of Loneliness in the Multiple Sclerosis Group

Characteristics	n (%)	UCLA mean (SD)	t test	Cohen's d
Gender				
Female	45 (71.4)	33.2 (13.2)	−0.46	0.13
Male	18 (28.6)	34.9 (13.2)		
Race				
Caucasian	58 (92.1)	33.3 (13.2)	0.97	0.45
Other	5 (7.9)	39.2 (11.1)		
Marital status				
Married	40 (63.5)	30.8 (11.6)	2.48*	0.64
Not married	23 (36.5)	38.9 (14.2)		
Employment status				
Employed	28 (44.4)	30.5 (13.0)	1.78	0.45
Unemployed	35 (55.6)	36.3 (12.8)		
Education				
No college education	9 (14.3)	31.7 (13.0)	−0.51	0.18
Some college education	54 (85.7)	34.1 (13.2)		
Annual household income				
<$40,000	20 (31.7)	35.8 (11.4)	0.83	−0.22
>$40,000	43 (68.3)	32.8 (13.9)		
Type of multiple sclerosis				
RRMS and benign multiple sclerosis	49 (77.8)	34.0 (13.9)	−0.35	−0.10
Progressive multiple sclerosis	14 (22.2)	32.7 (10.4)		

*$p < .05$. RRMS = relapsing-remitting MS.

Table 3 Continuous antecedents and consequences of loneliness in the multiple sclerosis group

Variable	Pearson correlation coefficients
Antecedents	
Age, years	.19
Disease duration, years	.16
EDSS	.11
Body mass index	.16
LL-FDI, Upper Extremity Function	–.28*
LL-FDI, Basic Lower Extremity Function	–.15
LL-FDI, Advanced Lower Extremity Function	–.10
LL-FDI, Social Disability Frequency	–.49*
LL-FDI, Personal Disability Frequency	–.20
LL-FDI, Social Disability Limitations	–.38*
LL-FDI, Personal Disability Limitations	–.29*
Consequences	
HADS, Anxiety	.24
HADS, Depression	.49*
MFIS, Physical Fatigue	.21
MFIS, Cognitive Fatigue	.34*
MFIS, Psychosocial Fatigue	.30*
MSIS-29, Physical QOL	.25
MSIS-29, Psychological QOL	.44*

Note. EDSS = Expanded Disability Status Scale; LL-FDI = Late Life Function and Disability Instrument; HADS = Hospital Anxiety and Depression Scale; MFIS = Modified Fatigue Impact Scale; MSIS-29 = Multiple Sclerosis Impact Scale-29; QOL = quality of life.

*$p < .05$.

employment status, gender, race, age, education, and body mass index were not. The observation that those who were single were lonelier than married counterparts with MS aligns with current literature among the general population and emphasizes the importance of fulfilling relationships in MS. Indeed, there is an increasing rate of divorce and separation following MS diagnosis, and our results suggest that this might increase the degree of loneliness (Pfleger, Flachs, & Koch-Henriksen, 2010). Importantly, the frequency and degree of limitations with socially defined tasks and degree of limitations with personally defined tasks were associated with loneliness. Such results align with previous research in MS whereby greater social demands of illness and functional limitations were associated with loneliness (Beal & Stuifbergen, 2007). Importantly, our regression analysis identified frequency of problems with socially defined tasks and marital status as two independent antecedents of loneliness, extending previous loneliness research in MS. Those two variables represent potential risk factors for loneliness and should become the focus of interventions for reducing the risk of loneliness in MS.

This study examined symptoms of MS and QOL as possible correlates of loneliness. Our analyses indicated that loneliness was associated with symptoms of depression, fatigue, and psychological QOL in MS. These common symptoms of MS have been documented as correlates of loneliness in other populations (Arslantaş et al., 2015; Cacioppo, Hughes, Waite, Hawkley, & Thisted, 2006; Deckx et al., 2015). Moreover, one longitudinal study of cancer survivors and older adults reported that lonelier participants experienced more concurrent pain, depression, and fatigue and larger increases in symptom cluster levels over time than less lonely participants (Jaremka et al., 2014). This offers a novel perspective for some of the most common and debilitating symptoms of MS, namely, these might represent consequences of loneliness and may subside through interventions aimed at ameliorating loneliness. This requires further examination using prospective and experimental research designs.

The social psychological theory views loneliness as a social deficiency—a discrepancy between one's desired and achieved levels of social contact. This study examined loneliness in MS using the UCLA Loneliness Scale consistent with that perspective. The theory further provides a framework for conceptualizing loneliness and identifies several antecedents of loneliness, such as events resulting in changes in a person's desired or expected social relationships and individual characteristics of a person, and correlates of loneliness, such as depression and anxiety. The theory postulates that cognitive processing, especially attributions (e.g., people's casual explanations for success and failures), have a central role in modulating the loneliness experience. Indeed, much is still unknown about loneliness in MS, and future research should investigate this expression based on the social psychological framework developed by Perlman and Peplau.

This study is not without limitations. The sample size was not based on a power analysis, as this was a secondary analysis of previously collected data, and the sample size might be small and yield an elevated Type II error rate. The current sample of persons with MS was relatively homogenous. The sample was primarily Caucasian (90.6%), female (71.9%), and married (63.0%). The sample included mostly participants with RRMS (78.0%) and

Table 4 Summary of Hierarchical Regression Analysis for Variables Predicting Loneliness in the Multiple Sclerosis Group (n = 63)

Variable	B	SE B	β
Step 1			
LL-FDI, Social Disability Frequency	–2.31	0.61	–.44
Step 2			
LL-FDI, Social Disability Frequency	–2.15	0.60	–.41
Marital status	–6.38	3.13	–.23

Note. R2 = .20 for Step 1; change *R2* = .05 for Step 2 (*ps* < .05). LL-FDI = Late Life Function and Disability Instrument.

was characterized by mild to severe mobility disability. Our results may not necessarily be generalizable among other subpopulations of persons with MS or those with progressive MS. In addition, loneliness was a secondary outcome of the primary study, and this limited our inclusion of possible antecedents and correlates of loneliness, as well as cognitive processing attributions, in alignment with Perlman and Peplau's model (Pilutti et al., 2015). This is a problem, as important third variables were omitted from the data analysis that might further inform our understanding of loneliness in MS. This study provides an initial, theory-based examination of loneliness in MS, and future researchers could undertake an expanded focus and understanding.

Our results suggest that MS and its manifestations represent potential antecedents and consequences of loneliness. Additional research using a social psychological framework is needed for continued understanding of the antecedents and correlates of loneliness in MS. Such studies could include longitudinal explorations of loneliness and its correlates as an approach for informing the natural history of loneliness in MS and developing interventions for reducing loneliness and its consequences. The current study may indeed inform rehabilitation nurses and other healthcare providers of the importance of addressing loneliness in persons with MS perhaps more so than in the general population. Rehabilitation nurses could intervene on loneliness in individuals with MS through existing programs or through collaboration with other healthcare practitioners, possibly resulting in an improvement in symptoms commonly attributed to the disease itself rather than the experience of loneliness. This would represent a novel opportunity for understanding, managing, and improving manifestations of MS.

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