

Motivation for Physical Activity in Adults With Multiple Sclerosis: A Self-determination Theory-Based Approach

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ABSTRACT

BACKGROUND: Despite the benefits of regular physical activity (PA), most adults with multiple sclerosis (MS) are insufficiently active. Identifying the motivational correlates of PA is necessary to facilitate health behavior change. The extent to which the constructs of psychological need satisfaction and motivational regulations associate with self-determined PA in adults with the disease was examined.

METHODS: Individuals with MS were provided a link to a web-based survey. There were 290 respondents: 242 women and 48 men aged 22 to 71 (mean \pm SD, 49.50 \pm 12.05) years with primarily mild to moderate mobility impairment who completed the Psychological Need Satisfaction in Exercise scale, the Behavioral Regulation in Exercise Questionnaire, and the International Physical Activity Questionnaire.

RESULTS: Path analysis revealed that PA was best predicted by integrated regulation, competence, and mobility, explaining 28% of the variance in PA behavior. All 3 need satisfaction variables (relatedness, competence, and autonomy) and mobility impairment accounted for 43% of the variance in integrated regulation.

CONCLUSIONS: Increasing satisfaction of the need for relatedness, competence, and autonomy can lead to more integrated and internally motivated PA engagement in adults with MS.

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Multiple sclerosis (MS) is a neurodegenerative disease that presents with a range of symptoms that coalesce to decrease function¹ and negatively affect daily life.² As such, physical activity (PA) is often recommended,^{3,4} especially because regular participation confers a variety of health benefits.⁵ Benefits of being physically active for individuals with MS include, among other outcomes, improved fatigue, mood, mobility, cognition, and quality of life.⁶⁻⁹ Despite the value of regular PA, most adults with MS are insufficiently active to derive such outcomes and optimize function.^{10,11} In fact, research indicates that individuals with MS are 2.3 times less likely to report that they are meeting the recommended health guidelines of moderate to vigorous PA (MVPA) than individuals without MS.¹¹ In addition, PA levels decline over time,¹² which further compounds the problem and worsens symptoms and health.¹³

Considering the low PA participation rates of individuals with MS and the evidence that sedentary behavior is associated with increased risk of comorbidities,^{14,15} understanding the motivational underpinnings of PA in this group is necessary. One theoretical approach that is useful in identifying the motivational correlates of PA and facilitating health behavior change is self-determination theory (SDT).^{16,17} According to SDT, one's level of motivation exists on a continuum from intrinsic (engaging in the behavior for its inherent satisfaction) on one end to extrinsic (engaging in the behavior for some other outcome) on the other end. Because many health-promoting behaviors tend to be more extrinsic in nature,¹⁸ the extent to which extrinsic motives become more or less autonomous and valued over time depends on the degree to which the behavior is internalized and regulated. The most internalized form of extrinsic

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motivation is that which is integrated and reflective of behavior that is personally relevant or of value, whereas behaviors that are externally regulated and controlled are initiated in response to some external reward or demand. This is particularly important, given that those with more autonomous and self-determined motivation will experience greater interest, more confidence, and longer behavioral persistence.¹⁷ This has also been found to be true for those with MS. Riemann-Lorenz and colleagues¹⁹ found that autonomous motivation had a positive effect on long-term PA adherence in those with the disease. Other studies have also highlighted the association between more autonomous motivation and greater PA in this group.²⁰⁻²²

Although these findings are important to our understanding of PA behavior in adults with MS, it is also necessary to understand how motivation becomes more autonomous. From an SDT perspective, the degree to which an individual's motivation will be more autonomously regulated depends, in part, on the existing social context. Supportive interactions with significant others that satisfy a person's basic psychological needs for competence, autonomy, and relatedness are most conducive to fostering self-determined motivational regulations.¹⁶ In terms of PA, the more individuals experience a higher degree of satisfaction of their needs for competence, autonomy, and relatedness around being active, the more they become self-determined to initiate and maintain their activity behavior. However, few studies have examined autonomy-supportive contexts facilitating the development of internalized and self-regulated motivation for PA in individuals with MS. Kosma²³ found that psychological need satisfaction had a large effect on motivation, which, in turn, had a significant association with PA in their study sample. Other research has also shown that autonomy-supportive interactions with spouses offer a context for greater satisfaction of the need for relatedness, competence, and autonomy and facilitate self-determined PA behavior in adults with MS.²⁴

Despite numerous studies underscoring the importance of self-determined PA behavior, SDT research examining both internalized and self-regulated motivation simultaneously in adults with MS remains limited. As such, the present study sought to examine the extent to which psychological need satisfaction and motivational regulations associate with PA in adults with MS. With such insight, behavioral change and maintenance interventions can be better conceived and delivered to those with MS, who can benefit from persistent participation in PA.

METHODS

Participants

Individuals with MS were recruited through a regional MS chapter in the northeast United States. An email

describing the purpose of the study and providing a link to the web-based survey was sent to those associated with the organization. Participants were informed that their involvement in the research necessitated only 1 completion of the survey and that all information they provide would be anonymous. They were also informed that completion of the surveys was strictly voluntary and that consent was implied from those responding to the survey. Individuals were included if they had physician-diagnosed MS, were 18 years or older, and had the cognitive capacity to complete the online survey. Eligibility was determined via self-reported answers to survey questions that assessed the requisite criteria. Approval for the study was obtained from the University of Vermont institutional review board.

Measures

Demographic and Other Characteristics

Participants reported their date of birth, sex, year they received a diagnosis of MS, and perceived mobility disability, using the Patient Determined Disease Steps (PDDS) scale.²⁵ Fear of falling was also assessed using the Falls Efficacy Scale-International.²⁶

Psychological Need Satisfaction

The 18-item Psychological Need Satisfaction in Exercise (PNSE) scale²⁷ was used to assess each of the 3 psychological needs (relatedness, competence, and autonomy) in a PA context. Each item is scored from 1 (false) to 6 (true), with higher scores reflecting greater need fulfillment. The validity and reliability of each PNSE subscale has been documented in exercise.²⁸

Behavioral Regulation

The Behavioral Regulation in Exercise Questionnaire (BREQ-3)²⁹ was used to measure the reasons why participants exercised. The 24-item questionnaire operationalizes exercise motivation across a self-determination continuum and includes subscales that assess intrinsic, integrated, identified, introjected, external regulation, and amotivation. Participants respond to each item on a 5-point Likert scale, anchored by 0 indicating "not true for me" and 4 indicating "very true for me." Previous research supports the BREQ's multidimensional structure and the internal consistency of each subscale.³⁰

Physical Activity

The International Physical Activity Questionnaire (IPAQ)³¹ short form was completed to assess the frequency of mild, moderate, and vigorous PA during a typical week. The number of days the individual engages in activity for at least 10 minutes is reported, and the typical amount of time (in minutes) of activity on each of those days is noted. The IPAQ has been routinely used and found to be reliable as a self-report measure of PA in adults with MS.³²

Statistical Analysis

Data analysis was performed using SPSS Statistics for Windows, version 26.0 (IBM). Observations with missing values were excluded from the analysis. For this study, PA was categorized into 3 levels: (1) inactive, with no reported minutes of MVPA in 1 week; (2) insufficiently active, with 0 to 149 minutes of MVPA in 1 week; or (3) meeting recommended guidelines, with equal to or greater than 150 minutes of MVPA in 1 week.

Subscale reliabilities were obtained using the Cronbach α . Pearson correlations were conducted to determine bivariate associations for continuous variables, and Spearman rho correlations were conducted between the SDT variables of competence, autonomy, and relatedness and exercise behavior.

A multistage path analysis approach was used to determine independent predictors of exercise behavior. This approach adds a relationship structure to the regression analysis that allows the capture of direct and indirect effects and comparison of the magnitudes of influence from each included variable.³³ The analysis involved a model respecification method whereby path coefficients that did not meet the criteria of statistical significance and/or meaningfulness were deleted from the model.³⁴ Paths in the model were deleted if: (1) the path regression coefficients were less than 0.05 or (2) the path regression coefficients were less than 0.10 when the path was not meaningful or did not make theoretical sense according to SDT. In this study, 2 regression analyses were performed, one in which PA behavior was regressed on the 5 behavioral regulations, the 3 psychological needs, and any significant univariate correlations between demographic variables and PA, and a second in which any significant behavioral regulation predictors of PA were regressed on the 3 psychological needs and the significant demographic variables. Last, bivariate correlations between demographic variables and the 3 psychological needs were appraised.

RESULTS

Participants included 290 individuals with MS: 242 women and 48 men aged 22 to 71 (mean \pm SD age, 49.50 \pm 12.05) years. Mean \pm SD time since diagnosis was 11.87 \pm 8.60 years, with falls ranging from 0 to 25 across the sample. Forty-one percent of respondents reported mild mobility impairment (PDDS score of 1), 34% reported moderate gait disability (PDDS score of 2-4), and 25% had substantial mobility impairment (PDDS score \geq 5). Only 44.5% of the study sample met the recommended level of 150 minutes of MVPA. **TABLE 1** provides demographic details of the study participants.

Descriptive data for the variables measured in the study are also in Table 1. The PNSE subscales of relatedness, competence, and autonomy were found to be

TABLE 1. Demographic and Descriptive Variables for the 290 Study Participants

Variable	Value
Sex	
Female	242 (83)
Male	48 (17)
PDDS score	
1 (mild)	118 (41)
2-4 (moderate)	99 (34)
\geq 5 (severe)	73 (25)
Physical activity	
Not active	66 (22.8)
Insufficiently active	95 (32.8)
Sufficiently active	129 (44.5)
Falls	
0	155 (53.4)
1	48 (16.6)
\geq 2	87 (30.0)
Age, y	49.50 \pm 12.05
Time since diagnosis, y	11.87 \pm 8.60
FES-I score	27.35 \pm 10.34
PNSE scale score	
Relatedness	24.57 \pm 9.59
Competence	23.22 \pm 9.21
Autonomy	31.53 \pm 6.46
BREQ-3 score	
Intrinsic regulation	2.51 \pm 1.16
Integrated regulation	2.44 \pm 1.30
Identified regulation	3.01 \pm 0.92
Introjected regulation	2.14 \pm 1.14
External regulation	0.72 \pm 0.91
Amotivation	0.23 \pm 0.52

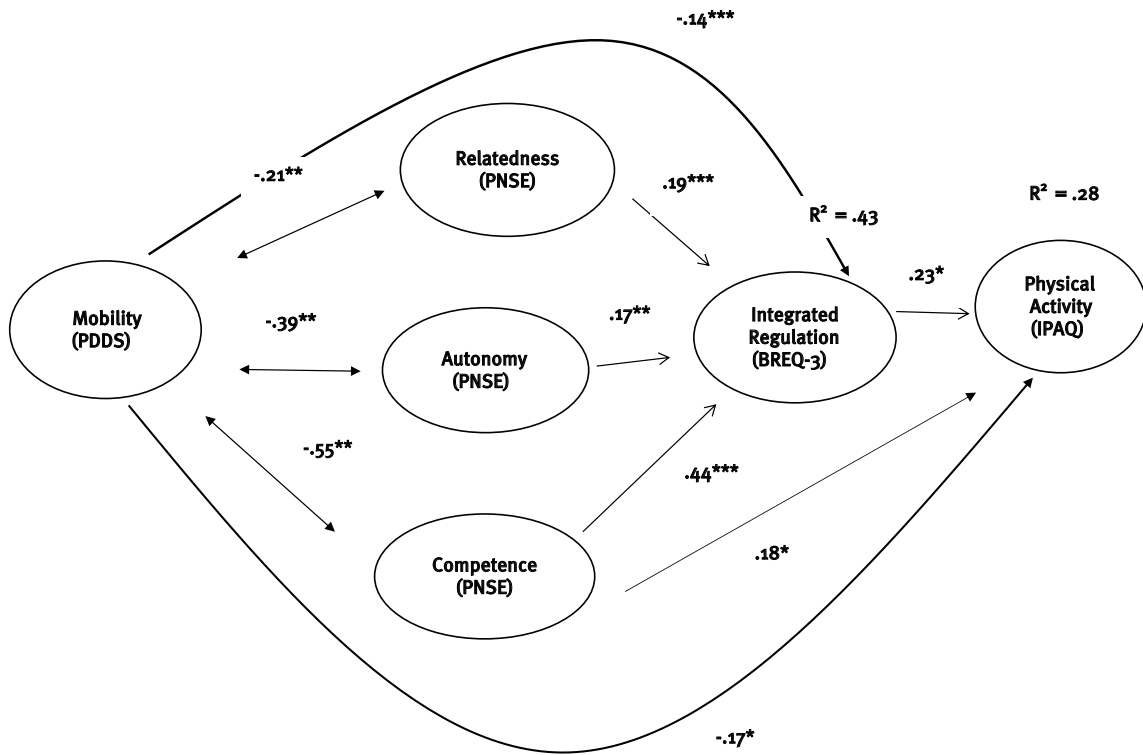
BREQ-3, Behavioral Regulation in Exercise Questionnaire; FES-I, Falls Efficacy Scale-International; PDDS, Patient Determined Disease Steps; PNSE, Psychological Need Satisfaction in Exercise.

Note: Values are given as number (percentage) or mean \pm SD.

highly reliable, with Cronbach α values of 0.95, 0.96, and 0.94, respectively. Reliability of each of the subscales of the BREQ-3 was also found to be high, with coefficients of 0.82, 0.86, 0.84, 0.84, 0.92, and 0.94 for amotivation, external regulation, introjected regulation, identified regulation, integrated regulation, and intrinsic motivation, respectively.

Bivariate correlations among demographic characteristics, SDT variables, and PA behavior are presented in **TABLES S1** and **S2**, which are published in the online version of this article at ijmsc.org. There was a significant inverse correlation between mobility disability and PA ($r = -0.27$; $P < .01$) and between fear of falling and PA ($r = -0.30$; $P < .01$), indicating reduced activity levels with increasing walking impairment and fear of falling. Regarding the SDT variables, most correlations were statistically significant and in the expected direction. A significant inverse correlation was found

FIGURE 1. Final Regression Model of Independent Variables, Psychological Need Satisfaction, Motivational Regulation, and Physical Activity



BREQ-3, Behavioral Regulation in Exercise Questionnaire; IPAQ, International Physical Activity Questionnaire; PDDS, Patient Determined Disease Steps; PNSE, Psychological Need Satisfaction in Exercise. Standardized regression coefficients for relationships between integrated regulation and physical activity, psychological needs in exercise and integrated regulation, and psychological needs in exercise, mobility, and physical activity. Paths between amotivation, external regulation, introjected regulation, and identified regulation did not reach statistical significance and were deleted from the model.

between PA and amotivation (-0.26 ; $P < .01$), whereas positive and significant associations were observed between PA and introjected regulation (0.15), identified regulation (0.44), integrated regulation (0.44), and intrinsic motivation (0.38) ($P < .01$ for all). No statistically significant relationship was found between external regulation and PA. In addition, autonomy was statistically significantly related to all but introjected regulation, relatedness to all but external and introjected regulation, and competence to all behavioral variables. PA was statistically significantly correlated with all 3 of the psychological needs, such that greater fulfillment of these needs related to increased PA.

FIGURE 1 presents the final regression model. The overall model explained 28% of the variance in PA behavior ($F_{11,278} = 9.91$; $P < .001$), with significant contributions from integrated regulation ($\beta = 0.23$; $P < .05$), competence ($\beta = 0.18$; $P < .05$), and mobility ($\beta = -0.17$; $P < .05$). All 3 need satisfaction variables and mobility impairment accounted for 43% of the variance in integrated regulation ($F_{5,284} = 43.67$; $P < .001$), with competence ($\beta = 0.52$; $P < .001$),

relatedness ($\beta = 0.24$; $P < .001$), autonomy ($\beta = 0.15$; $P < .01$), and mobility impairment ($\beta = 0.19$; $P < .01$) having significant independent associations. Finally, mobility impairment was significantly and inversely correlated with competence ($r = -0.55$; $P < .01$), relatedness ($r = -0.21$; $P < .01$), and autonomy ($r = -0.39$; $P < .01$).

DISCUSSION

Considering the immediate and long-term health benefits of regular exercise participation, understanding how best to increase the reportedly low levels of PA observed in adults with MS is important.¹¹ The present study lends support to promoting more PA in this population. Less than 50% of participants in the present study were meeting recommended levels of health-promoting PA. More concerning, of the 55% of individuals who were not sufficiently active, 23% reported no minutes of MVPA. Most notably, the present findings revealed that along with level of mobility, integrated regulation and satisfaction of the need to feel competent were statistically significantly associated with PA behavior. Moreover, all 3 need satisfaction variables—relatedness, competence, and

autonomy—and level of mobility impairment accounted for a meaningful percentage of the variance in integrated regulation.

Although the PA behavior of participants in this study is lower than it is for those without MS,³¹ it was greater than or comparable with that observed in other MS research.^{32,35,36} The differing levels of reported PA can, in part, be attributed to the mobility limitations accompanying MS. The present results support previous findings that individuals with MS with increasing mobility impairment are not only less active but also engage in less intense activity.³⁵ For participants in this study who met the recommended minutes of MVPA, 48% reported mild mobility impairment (PDDS score of 1), 39% reported moderate mobility impairment (PDDS score of 2-4), and 13% reported more severe mobility impairment (PDDS score of 5-7). In addition to mobility impairment, fear of falling was also statistically significantly associated with whether individuals with MS met the recommended levels of MVPA. This is not surprising, as those with MS who have increased fear of falling often curtail their PA.^{36,37} Although correlated with PA, fear of falling did not remain as a statistically significant independent predictor in the path model when considered in combination with the other variables. This was likely because of the significant contribution that motor impairment and mobility difficulties themselves make to fear of falling.^{1,36-38} In addition to being statistically significant, mobility impairment also made sense, given its association with PA.³⁵

As SDT proposes,¹⁷ the analytical model revealed that each of the 3 psychological needs were significantly associated with behavioral regulation, which, in turn, significantly predicted PA. The SDT variables, along with mobility impairment, explained 28% of the variance in PA. Regarding behavioral regulation, only the more autonomous integrated regulation statistically significantly and independently contributed to PA behavior. It seems that for individuals in the present study, their PA had become more internalized and integrated, whereby they made decisions to engage in this behavior based on internal values and regulations rather than on external ones. In other words, these individuals likely saw being physically active as part of who they are and their identity and felt it personally important to be active. The present findings are similar to those of Fasczewski and Gill,²² who also found a significant and direct contribution of internalized regulation to PA. Although identified regulation (not integrated regulation) was shown to be the best predictor of PA in their study, this difference may likely be a result of the different versions of the BREQ instrument used across the 2 studies rather than the degree of internalization. In their study as well as ours, both external regulation and intrinsic motivation did not have statistically significant effects on PA. This study's findings also align with those

PRACTICE POINTS

- » Promoting greater levels of autonomously motivated physical activity (PA) in individuals with MS is an important health imperative.
- » PA behavior that is more integrated and personally relevant contributes to greater engagement from and continuity by individuals with MS.
- » Health and PA practitioners who can help foster relevance, competence, and autonomy around PA can enhance the internalized and self-regulated PA motives of individuals with MS.

found across the research involving healthy adults. In a systematic review by Teixeira and others,³⁹ there is consistent evidence to support the positive relationship between more autonomous forms of motivation and exercise behavior. It seems reasonable to find that external and introjected forms of motivational regulation did not significantly predict the PA of the present study participants. Previous research has not shown individuals with MS to exercise because of controlled motives.^{40,41} Instead, it is likely that participants in this study reflected a more autonomous and self-endorsed willingness to be physically active because of its personal value and utility.¹⁷ PA engagement in this group often centers around meeting goals of improved disease management and overall health²¹ rather than on the expectations of others, or because it is inherently pleasurable.

The present study extends the foundational research on self-determination and PA in those with MS by examining both the motivation and what underpins such motivation. According to SDT, satisfaction of the basic psychological needs for autonomy, competence, and relatedness is considered essential to the development of internalized motivation and behavioral outcomes.¹⁶ In the present study, need satisfaction explained 43% of integrated regulation, with satisfaction of the need for competence found as a significant independent predictor. This finding is consistent with the postulates and motivational sequence observed in other SDT research.³⁹ Unlike the present findings, Fasczewski and Gill²² found self-efficacy, along with the SDT motivation constructs, to be a strong predictor of PA, with identified regulation and self-efficacy explaining 20% of the variability in this outcome. In the present model, self-efficacy was not a statistically significant predictor and did not offer anything more to the model, in part because of the statistical approach that differed across the 2 studies. In the previous study, self-efficacy was modeled as a copredictor of PA rather than as a predictor of behavioral regulation, as in the present research. Specifically, SDT posits that the basic psychological needs for autonomy, competence, and relatedness are essential to the development of

internal motivation, which then promotes PA. In addition, it has also been shown that self-efficacy does not always associate with PA in individuals with MS³⁹ and that there is a conceptual difference between perceived competence for activity and activity self-efficacy.⁴² Although self-efficacy centers around the belief that one can execute a specific task within a given circumstance,⁴³ perceived competence is the need to master personally meaningful and challenging tasks by exerting control over one's environment.⁴⁴

Because behavior that is integrated and internally regulated leads to greater engagement and adherence,¹⁷ the present findings highlight the importance of supportive contexts that satisfy the psychological needs for relatedness, competency, and autonomy in facilitating self-determined PA in adults with MS. PA practitioners are well positioned to create motivational climates that support these very needs. Need-supportive contexts are those in which practitioners foster perceptions of belonging and connectedness through the ways in which they conduct their programs and interact with participants, enhance feelings of competence and capability by structuring and scaffolding activities, and promote feelings of autonomy and volition by offering choices around PA. By doing so, they have the potential to enhance the internalized and self-regulated PA motives of those with MS.

Some study strengths and limitations should be noted. This study adds to the current research in MS, as few studies have tested a more complete application of the SDT sequence in a PA context. It is one of the first studies to theoretically test and empirically examine the role of need satisfaction in fostering more internalized forms of behavioral regulation and its association with PA in those with the disease. The study also used a validated measure of PA and, more importantly, examined PA in accordance with the recommended guidelines for health-enhancing outcomes.

Although the present analytical approach corroborated and extended existing research, the study design and model, although informative, were associative, which limits the ability to make causal inferences. In addition, the model was not inclusive of all variables conceived to contribute to self-determined behavior. It has been suggested that other constructs, such as participation motives, orientations, and need-supportive settings and interactions, be included to derive greater understanding and more fully explain the drivers of motivation.⁴⁵ Another consideration is that PA levels were derived through self-report. Although the IPAQ is often used to measure PA in individuals with MS, subjective reports of moderate and vigorous PA rely on relative intensity, and those who are less fit tend to overestimate.⁴⁶ Using an objective measure would increase the validity of these results. The study is also limited in its generalizability. The sample underrepresented men

and mostly consisted of individuals who reported more mild disability and 0 to 1 fall. Thus, the model and its resultant relationships might not be representative of men and/or others with MS who have greater functional challenges and more falls and/or fear of falling. It might be prudent to explore the SDT model with a larger and more functionally diverse sample to better understand the motivational profiles in these individuals.

In conclusion, despite the acknowledged limitations, the study findings suggest that fostering increased satisfaction of the need to feel relatedness, competence, and autonomy around PA has the potential to promote greater internalized motivation for PA participation in adults with MS. Because individuals are more likely to be self-regulated and autonomously motivated to be physically active in settings where they experience the satisfaction of these needs, practitioners might consider strategies that include multiple contexts and support systems to ensure these needs are met. □

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