Published in final edited form as:

J Neurosci Nurs. 2014 June ; 46(3): 171–179. doi:10.1097/JNN.0000000000000050.

Outcome Expectations and Physical Activity in Persons with Longstanding Multiple Sclerosis

Janet D. Morrison and Alexa K. Stuifbergen

The University of Texas at Austin

Abstract

Research suggests that persons with multiple sclerosis (MS) are much less physically active than the general population and that increased physical activity in persons with MS is associated with numerous benefits such as improvements in fatigue, mobility and quality of life (Motl & Pilutti, 2012). Potentially modifiable theory-based determinants of physical activity behavior need to be identified so that researchers may study their effectiveness in randomized clinical trials and clinicians may integrate them into practice to promote physical activity in this population. The purpose of this study was to explore the multidimensional (physical, social, and self-evaluative) outcome expectations for physical activity among persons with longstanding MS. A sample of 369 participants diagnosed with MS for more than 15 years completed surveys to measure multidimensional outcome expectations for exercise, MS functional limitations, and physical activity using two different instruments – one measuring physical activity engagement and the other physical activity capability. Results indicated that MS functional limitation was the strongest predictor of both physical activity engagement and physical activity capability. Physical and social outcome expectations contributed to the model explaining 12% of the variation in physical activity engagement while none of the outcome expectancy dimensions (physical, social, or self-evaluative) contributed to the model explaining variation in physical activity capability. While analyses of cross-sectional data does not infer causation, these findings suggest that positive physical and social outcome expectations for physical activity are associated with engagement in physical activity as well as being potential sources of motivation for increasing physical activity behavior in individuals living with longstanding MS.

A growing body of scientific research suggests that regular physical activity may have beneficial influences on physiologic and psychosocial sequelae of living with multiple sclerosis (MS) yet challenging personal, social, and environmental barriers to physical activity exist (Hebert, Corboy, Manago, & Schenkman, 2011; Motl & Gosney, 2008; Rietberg, Brooks, Uitdehaag, Kwakkel, 2004; Vollmer et al., 2012). Physical inactivity contributes to a progressively sedentary lifestyle, intensifies physical deconditioning and functional impairment, as well as the likelihood of developing secondary chronic conditions (e.g., cardiovascular disease, osteoporosis, depression, type 2 diabetes) as this population ages (Dalgas, Stenager, & Ingemann-Hansen, 2008). Effective, theory-based interventions

Correspondence concerning this article should be addressed to Janet D. Morrison, School of Nursing, The University of Texas at Austin, Austin, TX 78701. jmorrison@mail.nur.utexas.edu.

Janet D. Morrison, School of Nursing, The University of Texas at Austin; Alexa K. Stuifbergen, School of Nursing, The University of Texas at Austin.

are needed which promote the initiation and maintenance of physical activity behaviors among persons aging with MS (Nelson et al., 2007). Constructs derived from Bandura's (1986) social cognitive theory offer meaningful foci for interventions designed to foster physical activity behaviors in persons with MS (Suh, Weikert, Dlugonski, Sandroff, & Motl, 2011). While much has been reported on relationships among self-efficacy, goal setting, social support and physical activity behavior in this population, little is known of the relationship between outcome expectations (a key construct of social cognitive theory) and physical activity. A better understanding of outcome expectations for physical activity among persons with longstanding MS will inform theory-driven intervention studies designed to promote these behaviors.

Background

MS, which affects over 400,000 persons in the US, is characterized by areas of demyelination and axonal loss throughout the central nervous system and leads to a wide array of sensory, motor, and cognitive impairments (National MS Society, 2012). The disease commonly strikes young adults in their most active and productive years and is associated with significantly lower levels of physical activity throughout the course of this lifelong chronic disabling disease (Stuifbergen & Roberts, 1997; Stuifbergen, Blozis, Harrison, & Becker, 2006). Increasing and maintaining physical activity behavior in persons with MS is a recurrent theme in studies investigating health promotion and wellness due to its potential to enhance wellbeing and quality of life (Snook & Motl, 2009; Vollmer et al., 2012). Additionally, given evidence from the realm of geriatric research, physical activity may offer a much-needed therapeutic option for improving cognitive function for persons with MS (Motl, Sandroff, & Benedict, 2011).

For the purposes of this study, physical activity is defined as "any bodily movement produced by skeletal muscles that results in energy expenditure" (Caspersen, Powell, & Christenson, 1985). Accurate measurement of physical activity is challenging, especially in persons with MS who commonly experience balance and mobility impairments (Gosney, Scott, Snook, & Motl, 2007). Numerous measures of physical activity exist and each uniquely conceptualizes and operationalizes physical activity. The two self-report measures used in this study reflect such differences: the Human Activity Profile (Daughton, Fix, Kass, Bell, & Patil, 1982) that measures respondents' perceived ability to still do specific activities irrespective of actual frequency (e.g., daily, monthly) and the Health Promoting Lifestyle Profile (Walker, Sechrist, & Pender, 1995) that more broadly reflects physical activity behavior by including frequency, duration and intensity parameters.

Physical activity is a complex behavior influenced by multiple factors. Demographic characteristics (e.g., age, gender, marital status, disease duration and education) are known to effect health-promoting behaviors such as physical activity (Pender, 1996). Patterns of physical activity in the general population vary with personal factors: men tend to be more active than women, people become more sedentary as they age, and more education is associated with higher levels of leisure-time physical activity (Pate et al., 1995). Consideration of these personal factors is a critical first step when exploring relationships

between concepts theorized to influence physical activity behavior in persons with MS (Becker, Stuifbergen, Ingalsbe, & Sands, 1989).

Prior reviews have shown that social cognitive constructs, particularly self-efficacy, are powerful predictors of health behavior change in persons including those with MS (Dlugonski, Wójcicki, McAuley, & Motl, 2011; Motl, Snook, McAuley, Scott, & Douglass, 2006; Stuifbergen, Becker, Blozis, Timmerman, & Kullberg, 2003). Outcome expectation, an important construct of both Bandura's social cognitive theory and Pender's health promotion model, reflects both positive and negative consequences an individual believes may occur by performing a specific behavior and may predict health behavior as well (Bandura, 1986; Pender, 1996). Outcome expectation is a multidimensional construct that includes physical (e.g., body structures and functions), social (e.g., intrapersonal relationships), and self-evaluative (e.g., emotional/affective reflections) components. While little research has been conducted on the significance of outcome expectations on physical activity in persons with MS, two recent cross-sectional studies used the Multidimensional Outcome Expectations for Exercise Scale (MOEES) to explore social cognitive correlates of physical activity among inactive individuals with relapsing-remitting MS (Dlugonski et al., 2011; Suh et al., 2011). Findings suggest that self-efficacy is indirectly related to physical activity via self-evaluative outcome expectation, social outcome expectation and physical activity are significantly and moderately related, and those who reported being more physically active were found to have higher social and overall outcome expectation scores (Dlugonski et al., 2011; Suh et al., 2011). Thus, the physical, social, and self-evaluative dimensions of outcome expectations for physical activity may be important mediators of behavior change in persons with MS warranting inclusion in behavioral interventions designed to promote physical activity in persons with MS.

Purpose

This paper seeks to explore the physical, social, and self-evaluative dimensions of outcome expectations for physical activity among persons with longstanding MS (defined here as having been diagnosed with MS for more than 15 years), a sample more likely to be sedentary and in greater need of physical activity. The purpose of this study was to examine the relationships among physical activity, personal demographic characteristics (i.e., age, duration of MS, gender, marital status, and years of education), functional limitations, and physical, social, and self-evaluative outcome expectations. Pearson's correlations and hierarchical regression analysis were conducted to answer the following research questions:

1. What are the relationships among multidimensional outcome expectations (physical, social, and self-evaluative), personal characteristics (age, gender, education, marital status), and disease-related variables (functional limitations and disease duration) in persons with longstanding MS?
2. How much variance in physical activity engagement, operationalized by the Health Promoting Lifestyle Profile II physical activity (PA) subscale, can be explained by personal characteristics, functional limitations, and outcome expectations in this sample of persons with longstanding MS?

3. How much variance in physical activity capability, operationalized by the Human Activity Profile-Adjusted Activity Score, can be explained by personal characteristics, functional limitations, and outcome expectations in this sample of persons with longstanding MS?

Methods

Participants and Procedures

Data analyzed for this study were collected as part of a larger ongoing (15 year) longitudinal descriptive study of persons with MS. The sample was initially recruited through two chapters of the National MS Society in a southwestern state and advertisements in rural newspapers (Stuifbergen & Roberts, 1997). Participants are community dwelling residents who have completed an annual questionnaire via the mail. The sample was originally recruited to participate in a cross-sectional descriptive study in 1996, then after institutional review board approval in 1999, re-consented to participate in the longitudinal study. This study's sample consists of 369 eligible participants (those still living and potentially able to participate) of the original 621 participants who joined the longitudinal study in 1999. Annual response rates from eligible participants have remained high, over 83%, throughout the length of the study. Participants annually completed a set of self-report instruments that measure health behaviors, attitudes, functional limitations, and quality of life. In 2011, additional measures of outcome expectations and physical activity were included. The current analysis examined responses to selected variables for the 369 individuals responding to the 2011 survey.

The sample for this study is predominantly female (85%), married (68%), and well-educated (73% have more than 12 years of education), findings that are typical among studies of this population. Ages of the participants ranged from 33 to 87 years with an average of 61.4 years ($SD = 9.3$). Average disease duration was 24.5 years ($SD = 6.6$). Employment data indicated that 31% were unemployed due to disability and 35% were retired, while 18% were employed either full or part-time (See Table 1).

Measures

Demographic data—Background personal information was collected concerning age, gender, year diagnosed with MS, ethnicity, and education in Year 3 of the longitudinal study. Employment and marital status questions are reported from the 2011 survey.

Physical Activity—Two self-report instruments were included to measure physical activity: the Health Promoting Lifestyle Profile II (HPLP II) PA subscale and the Human Activity Profile (HAP).

Health Promoting Lifestyle Profile II—The 8-item physical activity subscale, a measure of physical activity engagement, of the HPLP II includes items measuring frequency of physical activity behavior on a 4-point scale - never, sometimes, often or routinely (Walker et al., 1995). Participant responses broadly reflect the frequency, intensity (vigorous, light to moderate, usual daily activities, and leisure-time activities) and duration

of physical activity behaviors. Reliability and validity testing of the HPLP II has been conducted using samples of community-living adults and those with chronic disabling conditions such as MS (Walker & Hill-Polrecky, 1996; Stuifbergen et al., 2003). Significant associations between the physical activity subscale and indices of strength and flexibility have been reported in persons with MS (Stuifbergen, 1995; Stuifbergen et al., 2006). Additionally, scores on this subscale were significantly related to performance ($r = -.45$, $p < .01$) on a timed 25-foot walk test for a sub-sample ($N = 70$) of this group. Internal consistency reliability for this sample was 0.88.

Human Activity Profile—The Human Activity Profile (HAP) measures participants' perceived ability to perform 94 different physical activities (Daughton et al., 1982). The instrument asks respondents to indicate whether they are still doing, have stopped doing, or never did specific physical activities starting with those requiring low levels of energy expenditure (e.g., getting in and out of a chair or bed) escalating to activities requiring greater levels (e.g., walking, swimming, bicycling) in hierarchical fashion. Designed using a sample of patients with chronic obstructive pulmonary disease in rehabilitation programs, the HAP scale has since been validated among populations with chronic conditions including elderly adults living independently (Fix & Daughton, 1988), older people with polio (Hill & Stinson, 2004) and persons with MS (Packer, Sauriol, & Brouwer, 1994; Stuifbergen, 1997). Two scores are calculated for each participant; the Maximum Activity Score (MAS) interpreted as the highest level of energy expenditure the participant reports being capable of doing and the Adjusted Activity Score (AAS) interpreted as the best estimate of the respondent's average level of energy expenditure. Extensive construct validity and limited, but consistent, test-retest reliability was reported by Davidson and de Morton (2007) in their systematic review of the Human Activity Profile.

MS Functional Limitations—The Incapacity Status Scale (Kurtzke, 1981) was used to measure functional limitations due to MS in the present study. Developed and validated among persons with MS by the International Federation of Multiple Sclerosis Societies (Wingerchuk, Noseworthy, & Weishenker, 1997) and adapted for use as a self-report survey by Stuifbergen and Roberts (1997), the scale is an inventory of functional limitations for activities of daily living and role performance. A 5-point scale is used to rate sixteen domains of personal functioning (e.g., elimination, ambulation, and cognitive performance) with a response of 0 indicating no impairment in activity and a 4 reflecting severe or total inability to perform the function. Total scale scores range from 0 to 64. Internal consistency reliability for this measure was 0.86 in this sample.

Outcome Expectations—The Multidimensional Outcome Expectations for Exercise Scale (MOEES), developed in a sample of middle-aged and older adults by Wójcicki, White, and McAuley (2009), is a 19-item scale that measures three conceptually distinct constructs of outcome expectation: physical, social, and self-evaluative. Seven items explore physical dimensions of outcome expectation (e.g., muscle and bone strength, cardiovascular function, ability to perform daily activities); six items explore social dimensions (e.g., acceptance, companionship, social standing); and six-items explore self-evaluative dimensions (e.g., personal accomplishment, mental alertness, psychological state).

Respondents use a 5-point scale to indicate how strongly they agree or disagree with the 19 statements (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). Evidence of validity with objective and self-reported measures of physical activity and good internal consistency reliability among aging adults and persons with MS has been previously reported in the literature (Wójcicki et al., 2009; McAuley, Motl, White, & Wójcicki, 2010; Suh et al., 2011). Internal consistency reliability for the total outcome expectation measure as well as the three subscales ranged from 0.81 to 0.89 in this sample.

Data Analysis

Data were analyzed using IBM SPSS, version 20.0.0 (IBM Corp., Armonk, NY) after being proofed for accuracy by research staff. Six participants (1.6% of the sample) did not report their number of years of education and one (0.3% of the sample) did not indicate the year they were diagnosed with MS. The participants with missing data were excluded from the correlation and regression analyses. Summary descriptive statistics, including frequencies, means, and standard deviations, were used to assess participant characteristics. Pearson product-moment correlations were conducted on scores from the HPLP II PA subscale, Human Activity Profile Adjusted Activity Score, age, disease duration, and the three dimensions of outcome expectation (physical, social, and self-evaluative). Kendall's tau correlations were computed for the dichotomous variables: gender (female = 0, male = 1) and marital status (not married = 0, married or living with a significant other = 1). Separate hierarchical regression analyses were conducted to predict physical activity as conceptualized and operationalized by the HPLP II PA subscale (physical activity engagement) and the Human Activity Profile Adjusted Activity Score (physical activity capability). In each case: Step 1 included five personal characteristics as predictors (age, disease duration, gender, years of education, and marital status); Step 2 included the MS-Incapacity Status Scale, a measure of MS-related functional limitations; and Step 3 added the physical, social and self-evaluative outcome expectations subscales. The rationale for the order of entry was based on Pender's health promotion model (1996). The squared correlation coefficient (R^2) and change in R^2 (R^2_{change}) were used to determine the amount of variation explained by the combined predictor variables at each step of the hierarchical model.

Results

Descriptive statistics (means and standard deviation) were computed for this sample of 369 individuals with longstanding MS (See Table 2). Cronbach's alpha for all summated scales exceeded .80. Mean average item scores were highest for physical outcome expectancy (4.2 ± 0.1), followed by self-evaluative outcome expectancy (4.1 ± 0.1), then social outcome expectancy (3.2 ± 0.3).

The Human Activity Profile, one of two measures of physical activity used for this study, provides two scores: the Maximum Activity Score that reflects the highest level of activity the individual reports still being able to engage in and the Adjusted Activity Score, a reflection of current activity that adjusts for activities the person has stopped doing. This sample had lower scores than norms reported for healthy adults, older adults, and individuals

with chronic pain by Fix and Daughton (1988) but scores similar to a sample of 37 adults with MS reported by Stuifbergen (1997). Maximum activity scores for this sample were higher than those with COPD, while their adjusted activity scores were lower. Greater variation (SD) was found in maximum and adjusted activity scores among persons with MS compared to all other groups (See Table 3).

Pearson's bivariate correlations indicate a moderate ($r = .47, p < .01$) positive linear relationship exists between the two measures of physical activity, the HPLP II PA subscale and Human Activity Profile Adjusted Activity Score (See Table 4). Statistically significant, positive, linear relationships exist between the two physical activity measures and the three outcome expectation measures, yet the strength of the relationships is stronger among HPLP II PA subscale scores ($r = .44, .36$, and $.41$) than for Human Activity Profile adjusted activity scores ($r = .36, .16$, and $.28$) respectively. Moderate to strong positive correlations were found among the three outcome expectations subscale scores indicating that physical, social, and self-evaluative outcome expectations may be valuable constructs to include in physical activity promotion interventions.

We performed hierarchical linear regression analyses to predict physical activity twice; first using the HPLP II PA subscale (physical activity engagement) and second using the Human Activity Profile Adjusted Activity Score (physical activity capability). The independent variables were entered in three blocks: (1) personal characteristics (2) functional limitations and (3) multidimensional outcome expectations. Therefore, it was possible to examine the predictive utility of the multidimensional outcome expectation variables, controlling for the effects of personal characteristics, as well as functional limitation due to MS in both analyses. Results showed that all variables in the model, when considered together, contributed towards the 34.6% variance explained in HPLP II PA subscale scores and 66.1% of the variance explained in Human Activity Profile Adjusted Activity Scale scores (See Tables 5 & 6). Personal characteristics explained 5.2% of the variation in the HPLP II ($R^2_{\text{change}} = .052, p < .01$) and 9.7% in the Human Activity Profile Adjusted Activity Scale ($R^2_{\text{change}} = .097, p < .01$) in step 1 of the model. MS functional limitations (MS-ISS) explained an additional 17.9% of the variation in the HPLP II ($R^2_{\text{change}} = .179, p < .01$) and 55.8% in the Human Activity Profile Adjusted Activity Scale ($R^2_{\text{change}} = .558, p < .01$) in step 2. While physical and social outcome expectations added 11.5% to explained variance in the HPLP II ($R^2_{\text{change}} = .115, p < .01$), none of the three outcome expectations explained significant variation in the Human Activity Profile Adjusted Activity Scale ($R^2_{\text{change}} = .006, p = .10$) in step 3.

Discussion

This study was designed to explore multidimensional outcome expectations for physical activity in persons with longstanding MS using two different self-report measures of physical activity. The HPLP II broadly measures physical activity engagement by including intensity, duration, and frequency of both planned and lifestyle physical activity while the Human Activity Profile is more narrowly focused on participant's perceived capability to engage in an activity regardless of frequency or duration. While a strong association between the measures is expected, considerable variance is left unexplained reflecting the

differences in the two measure's conceptualization and operationalization of physical activity.

MS functional limitation was found to be the strongest predictor of physical activity in this sample of persons with longstanding MS using either measure of physical activity and multidimensional outcome expectations more strongly correlated with the HPLP II than with the Human Activity Profile. This variation in the relationship between predictors and physical activity outcomes was consistent with the differences in the conceptualization and operationalization of physical activity in the two physical activity measures. The disablement process (Verbrugge & Jette, 1994, p. 4) conceptualizes disability arising from "difficulty doing an activity in any domain of life and functional limitations as restrictions in basic physical and mental actions". The HPLP II is more congruent with physical activity conceptualized as disability, what the person with MS does do, while the Human Activity Profile conceptualizes physical activity as a functional limitation, what the person with MS can do. Conceptually, it makes sense that the positive and negative outcomes the individual anticipates to occur from physical activity may explain variation in behavior the individual actually does do while these same outcome expectations do not explain variation in what the person is physically capable of doing.

These findings suggest that positive physical and social outcomes attributable to physical activity participation are associated with physical activity behavior in individuals with longstanding MS. Our results complement those found in the study by Ferrier, Dunlop, and Blanchard (2010) who used a single dimension measure of outcome expectation among persons with MS suggesting that outcome expectancy was associated with increased physical activity levels and may be a potential source of motivation for increasing physical activity in this population. The documented benefits of physical activity among persons with MS include improved fatigue and reduced anxiety (self-evaluative outcomes), improved walking speed and muscle tone (physical outcomes), and companionship (social outcomes) may be potent physical activity motivators for this population and warrants further investigation (Hebert et al., 2011; Rietberg et al., 2004; Oken et al., 2004). Future physical activity promotion intervention studies should include content related to the physical and social benefits of physical activity in addition to other social cognitive determinants (e.g., self-efficacy and goal setting).

Nurses are in a unique position to promote physical activity among their patients with chronic disabling conditions such as MS. Interactions (e.g., clinic visits, inpatient stays, phone calls) with patients offer prime opportunities to explore physical activity behaviors and beliefs with individuals when they are receptive to communication with healthcare providers. Nurses can begin by exploring what physical activity outcome expectations (beliefs) the individual holds. Findings from this study indicate that positive physical and social outcomes are associated with increased physical activity behavior. Nurses can validate and encourage positive physical outcome beliefs (improvements in body functioning and better ability to perform activities, stronger muscles and bone) and social outcome beliefs (positive contact with friends, meeting new people, companionship) as strategies to promote physical activity. Exploring negative outcome expectations (e.g., pain, fatigue) may provide an opportunity to devise compensatory strategies such as planning

physical activities for the morning when well-rested and breaking activities into short 10-minute sessions a couple times a day. Barriers to physical activity are another important topic to explore with patients, as transportation and accessibility issues are common barriers to participation in physical activity for this population (Becker & Stuijbergen, 2004). Discussions with the patient should also include setting realistic goals based on the patient's current level of physical activity and functional limitations. Federal physical activity guidelines for adults with disabilities recommend at least 150 minutes per week of moderate-intensity physical activity to promote health (US DHHS, 2008). This guideline may be daunting so individuals should be counseled to start slowly by adding a few minutes each week to their current level of physical activity and to divide episodes of physical activity into short 10-minute segments distributed evenly over the week to minimize fatigue. Patients may need guidance in adapting activities to their personal needs or finding accessible facilities. Nurses can assist patients by sharing community resources (transportation services, adaptive fitness programs) and making referrals (National MS Society, Can Do MS) to address their needs.

Limitations of this study include a lack of demographic diversity in this predominantly well-educated, white, married, female sample with longstanding MS. The cross-sectional design and correlational analyses prohibit attributing causal means to the findings. In addition, participants are "survivors" in a 15-year longitudinal study and may differ in unknown ways from other groups of persons with longstanding MS. To our knowledge, this is the first study published on physical activity where the entire sample is known to have longstanding MS (MS diagnosis for more than 15 years).

Physical and social outcome expectations may be valid sources of motivation for increasing physical activity among persons with longstanding MS. Multidimensional outcome expectations correlated higher with physical activity defined broadly to include daily and leisure-time activities (HPLP II) than defined narrowly as physical capability (Human Activity Profile) which is chiefly influenced by disease progression and functional capability. Findings support the expected theoretical relationships between outcome expectations and self-reported physical activity behavior. Additional research is needed to explore if interventions to enhance multidimensional outcome expectation for physical activity would result in increases in physical activity participation in persons with longstanding MS.

Acknowledgments

This project was supported by Grant R01NR003195, NINR, NIH

References

- Bandura, A. Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, N.J: Prentice-Hall; 1986.
- Becker H, Stuijbergen A. What makes it so hard? Barriers to health promotion experienced by people with multiple sclerosis and polio. *Family and Community Health*. 2004; 27:75–85. [PubMed: 14724504]

- Becker HA, Stuijbergen AK, Ingalsbe K, Sands D. Health promoting attitudes and behaviors among persons with disabilities. *International Journal of Rehabilitation Research*. 1989; 12:235–250. [PubMed: 2534309]
- Caspersen CJ, Powell KE, Christenson GM. Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports*. 1985; 100:126–131. [PubMed: 3920711]
- Dalgas U, Stenager E, Ingemann-Hansen T. Multiple sclerosis and physical exercise: Recommendations for the application of resistance-, endurance- and combined training. *Multiple Sclerosis*. 2008; 14:35–53. [PubMed: 17881393]
- Daughton DM, Fix AJ, Kass I, Bell CW, Patil KD. Maximum oxygen consumption and the ADAPT quality-of-life scale. *Archives of Physical Medicine and Rehabilitation*. 1982; 63:620–622. [PubMed: 7149948]
- Davidson M, de Morton N. A systematic review of the Human Activity Profile. *Clinical Rehabilitation*. 2007; 21:151–162. [PubMed: 17264109]
- Dlugonski D, Wójcicki TR, McAuley E, Motl RW. Social cognitive correlates of physical activity in inactive adults with multiple sclerosis. *International Journal of Rehabilitation Research*. 2011; 34:115–120. [PubMed: 21301353]
- Ferrier S, Dunlop N, Blanchard C. The role of outcome expectations and self-efficacy in explaining physical activity behaviors of individuals with multiple sclerosis. *Behavioral Medicine*. 2010; 36:7–11. [PubMed: 20185396]
- Fix, A.; Daughton, D. Human activity profile: Professional manual. Odessa, FL: Psychological Assessment Resources, Inc; 1988.
- Gosney JL, Scott JA, Snook EM, Motl RW. Physical activity and multiple sclerosis: Validity of self-report and objective measures. *Family and Community Health*. 2007; 30:144–150. [PubMed: 19241650]
- Hebert JR, Corboy JR, Manago MM, Schenkman M. Effects of vestibular rehabilitation on multiple sclerosis-related fatigue and upright postural control: A randomized controlled trial. *Physical Therapy*. 2011; 91:1166–1183. [PubMed: 21680771]
- Hill KD, Stinson AT. A pilot study of falls, fear of falling, activity levels and fall prevention actions in older people with polio. *Aging Clinical and Experimental Research*. 2004; 16:126–131. [PubMed: 15195987]
- Kurtzke JF. A proposal for a uniform minimal record of disability in multiple sclerosis. *Acta Neurologica Scandinavica*. 1981; 64(s87):110–129.
- McAuley E, Motl RW, White SM, Wójcicki TR. Validation of the multidimensional outcome expectations for exercise scale in ambulatory, symptom-free persons with multiple sclerosis. *Archives of Physical Medicine and Rehabilitation*. 2010; 91:100–105. [PubMed: 20103403]
- Motl RW, Gosney JL. Effect of exercise training on quality of life in multiple sclerosis: A meta-analysis. *Multiple Sclerosis*. 2008; 14:129–135. [PubMed: 17881388]
- Motl RW, Pilutti LA. The benefits of exercise training in multiple sclerosis. *Nature reviews. Neurology*. 2012; 8:487–497.
- Motl RW, Sandroff BM, Benedict RH. Cognitive dysfunction and multiple sclerosis: Developing a rationale for considering the efficacy of exercise training. *Multiple Sclerosis*. 2011; 17:1034–1040. [PubMed: 21685231]
- Motl RW, Snook EM, McAuley E, Scott JA, Douglass ML. Correlates of physical activity among individuals with multiple sclerosis. *Annals of Behavioral Medicine*. 2006; 32:154–161. [PubMed: 16972813]
- Nelson ME, Rejeski WJ, Blair SN, Duncan PW, Judge JO, King AC, Castaneda-Sceppa C. Physical activity and public health in older adults: Recommendation from the American College of Sports Medicine and the American Heart Association. *Circulation*. 2007; 116:1094–1105. [PubMed: 17671236]
- National Multiple Sclerosis Society. Who gets MS?. 2012. Retrieved from <http://www.nationalmssociety.org/about-multiple-sclerosis/what-we-know-about-ms/who-gets-ms/index.aspx>

- Oken BS, Kishiyama S, Zajdel D, Bourdette D, Carlsen J, Haas M, Mass M. Randomized controlled trial of yoga and exercise in multiple sclerosis. *Neurology*. 2004; 62:2058–2064. [PubMed: 15184614]
- Packer TL, Sauriol A, Brouwer B. Fatigue secondary to chronic illness: Postpolio syndrome, chronic fatigue syndrome and multiple sclerosis. *Archives of Physical Medicine and Rehabilitation*. 1994; 75:1122–1126. [PubMed: 7944918]
- Pate RR, Pratt M, Blair SN, Haskell WL, Macera CA, Bouchard C, et al. Physical activity and public health. A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *JAMA*. 1995; 273:402–407. [PubMed: 7823386]
- Pender, NJ. *Health Promotion in Nursing Practice*. Stamford, CT: Appleton-Lange; 1996.
- Rietberg MB, Brooks D, Uitdehaag BMJ, Kwakkel G. Exercise therapy for multiple sclerosis. *Cochrane Database of Systematic Reviews*. 2004
- Snook EM, Motl RW. Effect of exercise training on walking mobility in multiple sclerosis: A meta-analysis. *Neurorehabilitation and Neural Repair*. 2009; 23:108–116. [PubMed: 18948413]
- Stuifbergen AK. Health-promoting behaviors and quality of life among individuals with multiple sclerosis. *Scholarly Inquiry for Nursing Practice*. 1995; 9:31–50. [PubMed: 7777743]
- Stuifbergen AK. Physical activity and perceived health status in persons with multiple sclerosis. *Journal of Neuroscience Nursing*. 1997; 29:238–243. [PubMed: 9307926]
- Stuifbergen AK, Becker H, Blozis S, Timmerman G, Kullberg V. A randomized clinical trial of a wellness intervention for women with multiple sclerosis. *Archives of Physical Medicine and Rehabilitation*. 2003; 84:467–476. [PubMed: 12690582]
- Stuifbergen AK, Blozis SA, Harrison TC, Becker HA. Exercise, functional limitations, and quality of life: A longitudinal study of persons with multiple sclerosis. *Archives of Physical Medicine and Rehabilitation*. 2006; 87:935–943. [PubMed: 16813781]
- Stuifbergen AK, Roberts GJ. Health promotion practices of women with multiple sclerosis. *Archives of Physical Medicine and Rehabilitation*. 1997; 78:S3–S9. [PubMed: 9422001]
- Suh Y, Weikert M, Dlugonski D, Sandroff B, Motl RW. Social cognitive correlates of physical activity: Findings from a cross-sectional study of adults with relapsing-remitting multiple sclerosis. *Journal of Physical Activity & Health*. 2011; 8:626–635. [PubMed: 21734307]
- Walker, SN.; Hill-Polrecky, D. Psychometric evaluation of the Health–Promoting Lifestyle Profile II. Washington, DC: 1996 Jun. Proceedings of the 1996 Scientific Session of The American Nurses Association’s Council of Nurse Researchers
- Walker, SN.; Sechrist, KR.; Pender, NJ. *The Health-Promoting Lifestyle Profile II*. Omaha: NE: Author; 1995.
- Wingerchuk DM, Noseworthy JH, Weinshenker BG. Clinical outcome measures and rating scales in multiple sclerosis trials. *Mayo Clinic Proceedings*. 1997; 72:1070–1079. [PubMed: 9374984]
- Wójcicki TR, White SM, McAuley E. Assessing outcome expectations in older adults: The multidimensional outcome expectations for exercise scale. *The Journals Of Gerontology. Series B, Psychological Sciences And Social Sciences*. 2009; 64:33–40.
- U.S. Department of Health and Human Services. 2008 Physical activity guidelines for Americans. 2008. Retrieved from <http://www.health.gov/paguidelines/pdf/paguide.pdf>
- Verbrugge LM, Jette AM. The disablement process. *Social Science & Medicine*. 1994; 38:1–14. [PubMed: 8146699]
- Vollmer TL, Benedict R, Bennett S, Motl R, White A, Bombardier CH, Hebert JR. Exercise as prescriptive therapy in multiple sclerosis: A consensus conference white paper. *International Journal of MS Care*. 2012; 14(Suppl 3):2–14. [PubMed: 24453726]

Table 1

Participant Demographic Characteristics (N = 369)

<i>Variable</i>	M	SD	Range
Age	61.4	9.3	33–87
Disease Duration (years)	24.5	6.6	15–55
	n	%	
Gender			
Female	315	85	
Male	54	15	
Marital Status			
Married or living with Significant Other	250	68	
Ethnicity/Race			
Non-Hispanic White	340	92	
Years of Education			
12 or less	93	25	
13 to 16	206	56	
More than 16	64	17	
Missing	6	2	
Employment			
Working (Full or Part-Time)	68	18	
Unemployed Due to Disability	114	31	
Retired	128	35	

Table 2

Descriptive Statistics for Persons with Longstanding MS (N=369)

	Mean	SD	Range
Health Promoting Lifestyle Profile II - Physical Activity Subscale	16.3	6.1	8–32
Human Activity Profile - Adjusted Activity Score	44.6	23.3	1–94
Multiple Sclerosis Incapacity Status Scale	18.7	10.1	1–49
Physical Outcome Expectations	29.3	4.5	11–35
Social Outcome Expectations	19.0	4.9	6–30
Self-Evaluative Outcome Expectations	24.3	4.2	6–30

Table 3
Comparison of Reported Human Activity Profile Scores to Scores of Persons with Longstanding MS

Sample	N	Age	MAS		AAS	
		Range	M	SD	M	SD
Healthy Participants *	477	20-79	85.3	7.0	83.2	7.8
Older Adults *	102	60-88	75.7	6.2	71.6	7.1
Chronic Pain *	83	16-65	63.3	13.1	51.6	16.2
MS Group **	37	23-77	61.2	19.3	43.4	21.5
Longstanding MS Sample	369	33-87	60.0	20.2	44.6	23.3
COPD *	30	37-77	58.8	13.2	48.7	14.2
Dialysis *	39	22-83	55.2	14.0	43.6	19.1

Note:

* Fix & Daughton, 1988,

** Stuifbergen, 1997,

Maximum Activity Score (MAS), Adjusted Activity Score (AAS)

Table 4
Correlations Among Personal Characteristics, Disease Related Variables, and Outcome Expectations

Measure	1	2	3	4	5	6	7	8	9	10
1. HPLP II-PA	—									
2. HAP-AAS	.47**	—								
3. Age	-.05	-.24**	—							
4. Gender	-.04	.02	.03	—						
5. Education	.20**	.11*	-.03	.02	—					
6. Marital Status	.10*	.11**	-.02	.09	.12**	—				
7. Disease Duration	.20**	-.15*	.36**	.12*	-.07	-.01	—			
8. MS-ISS	-.46**	-.80**	.12*	.08	-.17**	-.19**	.16**	—		
9. POE	.44**	.36**	-.10	-.07	.18**	.03	-.10	-.37**	—	
10. SOE	.36**	.16**	-.01	-.01	.09	.06	-.01	-.16**	.43**	—
11. SEOE	.41**	.28**	-.07	-.14**	.13*	.05	-.07	-.27**	.76**	.55**

* $p < .05$.

** $p < .01$.

Kendall's tau

Note: Health Promoting Lifestyle Profile II - Physical Activity Subscale (HPLP II-PA); Human Activity Profile - Adjusted Activity Score (HAP - AAS); Physical Outcome Expectancy (POE); Social Outcome Expectancy (SOE); Self-Evaluative Outcome Expectancy (SEOE); Multiple Sclerosis-Incapacity Status Scale; Gender (female=0, male=1); Marital Status (not married=0, married or living with significant other=1)

Table 5

HPLP II-PA Regression Analysis

		B	SEB	β	t	p	R ²	R ²	p
Step 1	Age	.01	.03	.02	.33	.74			
	Gender	.14	.78	.01	.18	.86			
	Disease Duration	.02	.04	.02	.49	.63			
	Education	.22	.11	.09	1.98	.05			
	Marital Status	.21	.59	.02	.36	.72	.052	.052	.00
Step 2	MS-ISS	-.21	.03	-.34	-7.14	.00	.231	.179	.00
Step 3	POE	.22	.10	.16	2.31	.02			
	SOE	.22	.07	.17	3.27	.00			
	SEOE	.14	.11	.10	1.33	.18	.346	.115	.00

Note: Health Promoting Lifestyle Profile II - Physical Activity Subscale (HPLP II-PA); MS-Incapacity Status Scale (MS-ISS); Physical Outcome Expectancy (POE); Social Outcome Expectancy (SOE); Self-Evaluative Outcome Expectancy (SEOE)

Table 6

HAP-AAS Regression Analysis

		<i>B</i>	<i>SE B</i>	β	<i>t</i>	<i>p</i>	<i>R</i> ²	<i>R</i> ²	<i>p</i>
Step 1	Age	-.35	.09	-.14	-4.08	.00			
	Gender	4.26	2.12	.06	2.01	.05			
	Disease Duration	-.11	.12	-.03	-.87	.39			
	Education	-.31	.30	-.03	-1.03	.31			
	Marital Status	-.65	1.60	-.01	-.41	.69	.097	.097	.00
Step 2	MS-ISS	-1.76	.08	-.76	-22.02	.00	.655	.558	.00
Step 3	POE	.11	.26	.02	.42	.67			
	SOE	.02	.18	.00	.08	.93			
	SEOE	.35	.29	.06	1.21	.23	.661	.006	.10

Note: Human Activity Profile – Adjusted Activity Score (HAP – AAS); MS-Incapacity Status Scale (MS-ISS); Physical Outcome Expectancy (POE); Social Outcome Expectancy (SOE); Self-Evaluative Outcome Expectancy (SEOE)