Physical Activity and Healthy Aging with Multiple Sclerosis—Literature Review and Research Directions

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Abstract

There is a "greying" of the population of persons with multiple sclerosis (MS) that coincides with both increased life expectancy and the shifting demographic landscape worldwide. This growing cohort of older adults with MS undergoes normal age-related declines in physical and psychologic functioning that may be compounded by the disease and its progression. Little is known about predicting and managing the progression and consequences of MS in older adults. We believe that a focus on physical activity behavior represents a novel opportunity for transformative research on healthy aging with MS. The current paper reviews existing evidence on physical activity rates, correlates, consequences, and interventions among older adults with MS, and highlights important areas for future research on physical activity and health aging with MS.

Keywords

Aging, exercise, multiple sclerosis, physical activity, sedentary behavior

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Of the 400,000 adults living with multiple sclerosis (MS) in the US, an estimated 30% are between the age of 55–64 years and nearly 15% are 65 years of age or older.[1] There is additional evidence of a shift in the peak prevalence of MS among older age groups. For example, the peak prevalence of MS in Manitoba, Canada occurred at 35–39 years of age, with no documented cases beyond an age of 64 years, in 1984.[2] By 2004, the peak prevalence was at 55–59 years of age, with cases of MS documented beyond 80 years of age.[2] This represents a "greying" of the MS population that coincides with both increased survival of those with MS and the shifting demographic landscape worldwide.[3] That is, there are greater numbers of older adults living with MS than ever before, and this trend will continue over the foreseeable decades. This will present both clinical and public health problems for managing the consequences of aging with MS as a chronic condition.

This growing cohort of older adults with MS undergoes age-related declines in physical and psychologic functioning that appear to be compounded by the disease and its progression.[4,5] Older adults with MS report poor health status and functioning, suicide ideation, depression, loneliness, cognitive difficulty, and dependence for activities of daily living.[6–11] There is additional evidence of a faster rate of disability progression among older than younger adults with MS,[12] and older age is a primary predictor of reaching disability milestones in MS (e.g., median age for unilateral assistance during walking is nearly 65 years).[13] We recently reported that older adults with MS who had a median age of ~60 years had a median Short Physical Performance Battery (SPPB) score of 9.0,[14] and this approximated the expected SPPB score for nondisabled, community-dwelling adults 71 years of age and older (estimated mean = 9.2).[15]

Little is known about predicting and managing the progression and consequences of MS in older adults. This is because older people with MS are often excluded from research. For example, there are 13 disease-modifying agents approved by the US Food and Drug Administration that represent the first line of therapy primarily for younger and middle-aged adults with relapsing-remitting MS; these agents have not been systematically examined in older adults with MS.[4,5,16] Some data suggest that disease-modifying agents might have no association with disability progression in older adults with MS.[17]

The focus on physical activity (PA) behavior may represent a novel opportunity for transformative research on healthy aging with MS.[18] This

is based on extensive evidence for benefits of PA participation among young and middle-aged adults with MS[19] and the even stronger body of evidence for benefits among older adults from the general population[20] and those with chronic conditions and diseases that impact mobility.[21] Such an opportunity would (a) focus on PA rates and associations with consequences such as worsening of symptoms and declining function, quality of life (QOL), and independence among older adults with MS and (b) facilitate the design and delivery of interventions that target PA behavior change for promotion of healthy aging with MS. This opportunity has untapped potential for exploration and discovery that can be actualized through an agenda that involves collaboration of experts in MS and gerontology. This further coincides with the recent viewpoint of placing more emphasis on wellness, rehabilitation, and QOL among older adults with MS,[22,23] consistent with the pillars identified during the Health and Wellness summit in October, 2014.[24] The current paper will review existing evidence on PA rates, correlates, consequences, and interventions in older adults with MS, and then highlight important areas for future research on PA and health aging with MS.

Physical Activity Rates

The focus on PA rates and patterns is important for identifying the distribution of this health behavior in older adults with MS. We located three papers that provided data on PA behavior among older adults with MS.[23,25,26] One study involved semi-structured interviews on aging, health, and lifestyle habits among a sample of 18 persons with MS who were 55 years of age and older;[23] the participants further completed the Simple Lifestyle Indicator Questionnaire (SLIQ) for ascertaining health behaviors, particularly exercise participation. Of note, 33% of the sample of older adults with MS reported engaging in light exercise (e.g., light gardening or leisure walking), 28% reported engaging in moderate exercise (e.g., brisk walking, bicycling, or swimming), and only 6% reported engaging in vigorous exercise (e.g., running or weight training) on 4 or more days of the week. The most common types of PA included walking, yoga, tai-chi, swimming, strength training, and home exercises.

Another study examined PA levels in older adults with MS as part of the Canadian survey of health, lifestyle, and aging with MS.[25] That study included data from 743 persons with MS aged 55 years or older who completed the SLIQ and compared the data with those collected from the Canadian Community Health Survey 2012 version. Of note, the study reported that older people with MS were more likely to report engaging in some or moderate-to-vigorous PA (MVPA; 69.4%) compared with typical Canadians (45.3%). These data suggest that older adults with MS may be engaging in similar levels of PA compared with other older people.

The third study compared levels of PA (i.e., sedentary behavior, light PA [LPA], and MVPA) and rates of meeting public health guidelines for MVPA (i.e., ≥30 minutes/day) among young (i.e., ages 20–39 years), middle-aged (i.e., ages 40–59 years), and older adults (i.e., ages ≥60 years) with MS.[26] The sample included 963 persons with MS who provided demographic and clinical information and wore an ActiGraph accelerometer for a 7-day period. The data indicated that older adults with MS engaged in more sedentary behavior and less MVPA than middle-aged and young adults with MS. The average amounts of sedentary behavior and MVPA were 554.1 minutes/day and 12.6 minutes/day, respectively, for the older adults. Of note, only 14.0% of older adults with MS accrued ≥30 minutes/day of MVPA (i.e., met public health guidelines for PA) compared with 20.8 % and 28.4% of the middle-aged and young adults with MS, respectively. The rates of sedentary behavior and MVPA for older adults with MS are similar with values from the older adults in the general population.[27]

Collectively, these data suggest that many older adults with MS are not engaging in sufficient amounts of PA for accruing the physical and psychologic benefits associated with this behavior. The published data further suggest that PA levels decline as a function of increasing age among persons with MS. This snapshot provides an initial, but compelling, need for additional research on PA rates and patterns over time in older adults with MS.

Physical Activity Correlates

The focus on PA correlates is important for identifying possible modifiable and nonmodifiable determinants of this health behavior in older adults with MS. The modifiable correlates might become targets of behavior interventions, whereas nonmodifiable correlates might inform decisions about groups that should be targeted for behavior change. We located one study that examined correlates of PA as part of the Healthy Lifestyle and Aging with MS Canadian Consortium.[28] The sample included 743 Canadians who were over 55 years of age and an MS duration exceeding 20 years. The participants completed self-report questionnaires as part of a national survey. The sample was divided into Exercisers and Non-exercisers based on SLIQ scores, and the researchers examined possible demographic, personal, sociodemographic, physical health, exercise history, and healthcare support as predictors of exercise status. Walking ability, disability, perseverance, fatigue, disease duration, and cardiovascular comorbidities emerged as significant predictors of exercise group status. The researchers suggested that exercise programs should be developed for those with greater disability status, regardless of ambulatory status, and that perseverance, fatigue, and cardiovascular comorbidities represent possible modifiable targets for increasing exercise behavior in older adults with MS.

We located another study that examined demographic, illness-related, and psychologic variables as correlates of PA among 121 adults with MS who were over 60 years of age.[29] The data analysis indicated that higher levels of self-efficacy (i.e., situation-specific confidence) and lower levels of impairment correlated with higher levels of self-reported PA and perceived barriers for PA correlated with self-efficacy in the sample of older adults. This study supports self-efficacy and impairment as cross-sectional correlates of PA, and barriers as a correlate of self-efficacy, among older adults with MS.

Overall, we know little about correlates of PA among older adults with MS, as this obviously is not a well-developed area of inquiry. The preliminary evidence suggests that modifiable variables such as self-efficacy and fatigue might be targets of behavior change interventions, and the largest need for targeted interventions involves those with worse disability and perhaps ambulatory function.

Physical Activity Outcomes

Little research has been conducted examining possible outcomes of PA in older adults with MS; this is in direct contrast with the large body of

research on outcomes in young and middle-aged adults with MS.[18,19] We located one study that examined the association between PA and depression in young (n=22, <45 years of age), middle-aged (n=76, 45–64 years of age), and older (n=14, >64 years of age) adults with MS.[30] The researchers reported that moderate PA levels, measured by the 2003 Behavioral Risk Factor Surveillance System questionnaire, were negatively associated with depression, based on the Patient Health Questionnaire (PHQ-9), for young, middle-aged, and older adults with MS, even when controlling for MS severity.

The limited evidence for outcomes of PA in older adults with MS could be buttressed by considering the broader research involving young and middle-aged adults with MS.[31] For example, there is evidence of associations between PA and integrity of anterior visual pathway (e.g., total macular volume), subcortical grey matter volumes (e.g., basal ganglia, thalamus, and hippocampus), subclinical and self-reported cardiovascular health, walking performance, cognition, symptoms of fatigue, depression, and pain, and QOL in persons with MS.[31] Other reviews have provided evidence that exercise training, a subtype of PA, had benefits across a spectrum of outcomes ranging from immunological parameters through community participation.[32] Collectively, the existing evidence portends great promise of possible beneficial outcomes of PA in older adults with MS, but this must be confirmed in future research.

Physical Activity Interventions

We are aware of one randomized controlled trial of a PA intervention delivered among older adults with MS,[33,34] and the intervention itself was originally developed and tested for effectiveness among the general population of older adults.[35] The study enrolled 48 persons with MS who were 50 years of age and older, and participants were randomly assigned into a 6-month DVD-delivered PA program or a healthy aging DVD control condition. The DVD PA program was well received with no adverse events. The DVD PA program resulted in statistically significant and moderate increases in overall PA and MVPA compared with the DVD control condition, and there was a marginally significant and moderate reduction in sitting time on weekdays (p=0.07). Of note, the DVD PA program yielded a small, clinically meaningful improvement in physical function, based on SPPB scores, and moderate improvement in overall QOL.

There is obvious room for expansion regarding the design and delivery of interventions for increasing PA and examining beneficial changes in health, wellness, and QOL outcomes. This too has been identified as an important area of research among young and middle-aged adults with MS.[31]

Future Research Directions

As there is a relatively small corpus of research on PA in older adults with MS, we believe that presenting a brief research agenda is of utmost importance. Such an agenda will help guide progress in health and wellness among older adults with MS. The agenda will focus on five overriding topics, namely PA measurement, patterns, correlates, consequences, and interventions among older adults with MS.

Physical Activity Measurement

The study of PA requires measures that have undergone rigorous psychometric examination for the reliability and validity of scores. This includes examinations of construct validity, accuracy, and responsiveness. The most common types of PA measures include self-report surveys and motion sensors, such as pedometers and accelerometers. Researchers should adopt a construct validity paradigm (i.e., multiple measures with a nomologic network) for establishing the validity of interferences from scores on self-report PA measures (e.g., Godin Leisure-Time Exercise Questionnaire) that have been included in middle-aged and young adults with MS.[36] Researchers might consider examining the accuracy of pedometers and accelerometers for capturing steps during over-ground or treadmill walking, as has been done in middle-aged and young adults with MS.[37] There further is a need for establishing benchmarks of clinically meaningful thresholds and changes on PA measures,[38] and examining the responsiveness of measures for capturing intervention-related changes in PA. There is a clear need for calibration of accelerometer output against metabolic data during walking and generation of associated thresholds or cut-points for quantifying time spent in MVPA in older adults with MS; this has previously been undertaken in middle-aged and young adults with MS and has yielded MS-specific cut-points.[39,40] This is important as older adults with MS might have a higher energetic cost of walking than middle-aged and younger adults, and this would translate into a lower cut-point for quantifying time spent in MVPA from accelerometers. The aforementioned endeavors will permit better examination and understanding of PA among older adults with MS.

Physical Activity Patterns

The validation of outcomes will afford better study of PA rates and patterns in cross-sectional and longitudinal research. To that end, researchers should better describe and understand the patterns and levels of PA among older adults with MS. For example, pedometers, if accurate for measuring steps, could be used by researchers for establishing normative or expected values of steps/day among older adults with MS, and further informing decisions about PA encouragement in clinical practice. The improvement in measurements should further guide examination of trajectories of changes in PA over time (i.e., aging) in older adults with MS.

Physical Activity Correlates

The study of correlates is important for identifying possible modifiable and nonmodifiable determinants of PA in older adults with MS, and might follow one of two general paradigms. The first paradigm involves the examination of general determinants of PA as often performed in the general population.[41] This would involve examining demographic (e.g., gender or education), behavioral skills (e.g., self-monitoring), psychologic (e.g., enjoyment, personality, or self-efficacy), social (e.g., social isolation or support from family or friends), physical environment (e.g., facility access or walkable communities), and PA (e.g., intensity of PA) variables and characteristics as correlates of cross-sectional and longitudinal PA patterns in older adults with MS. Such an approach is largely exploratory and based on the general literature involving adults from the general population, and might inform the design of behavior interventions, but clearly inform decisions on persons most in need of behavioral interventions.

The second paradigm involves examining correlates of PA based on theoretical models of behavior changes. For example, most previous

research in young and middle-aged adults with MS has been based on Social Cognitive Theory,[42] and some researchers have adopted the Health Action Process Approach[43] and Transtheoretical model.[44] The benefits of adopting theory include: (a) a discrete set of variables that have a logical basis for explaining health behavior; (b) hypothesis testing rather than hypothesis generation or exploratory research; and (c) articulated processes for targeting the theoretical variables for changing health behaviors. Collectively, this second paradigm provides direct, guided inquiry into correlates of PA among older adults with MS, but is only as good as the theoretical models for describing the unique aspects of aging and MS.

Physical Activity Consequences

There are many consequences of MS and aging, and these may be particularly prevalent in older adults with MS. For example, older adults with MS report poor health status and functioning, suicide ideation, depression, loneliness, cognitive difficulty, and dependence for activities of daily living.[6–11] There is additional evidence of a faster rate of disability progression among older adults with MS,[12] and older age is a primary predictor of reaching disability milestones in MS (e.g., median age for unilateral assistance during walking is nearly 65 years).[13] We recently reported that older adults with MS demonstrate advanced decline in physical functioning.[14] Such observations support the further examination of PA and its association with these outcomes among older adults with MS using cross-sectional and longitudinal designs. Researchers might further examine associations between PA and integrity of anterior visual pathway (e.g., total macular volume), subcortical grey matter volume (e.g., basal ganglia, thalamus, and hippocampus), subclinical and self-reported cardiovascular health and other comorbidities, walking performance, cognition, symptoms of fatigue, depression, and pain, and QOL in older adults with MS.[30] There might be additional benefit of formative, qualitative research for identifying possible consequences of PA that are less commonly cited, but meaningful putative outcomes.

Physical Activity Interventions

The final end-point of our agenda involves behavioral interventions, and such endeavors will be dependent upon the successes and progress within the aforementioned four topics. The development of behavioral interventions is paramount considering the rates of PA and sedentary behaviors in older adults with MS. Of note, behavioral interventions will require valid, accurate, responsive, and reliable measures for capturing intervention effects on PA, and likely will be designed based on the identified correlates of PA from prominent theoretical models. The outcomes of changing PA will be informed by research establishing the consequences of PA among older adults with MS. These interventions might further follow models and approaches for changing PA developed for older adults without MS or other diseases[35] that can be easily adopted into MS,[33] or might be developed ground-up for older adults with MS, as has been done in young and middle-aged adults with MS.[45] The development and testing of behavioral interventions will be the final proving ground of PA for healthy aging with MS.

Conclusion

The time is ripe for developing an agenda on healthy aging with MS through PA. The emerging cohort of older adults with MS represents a clinical and public health priority, and older adults with MS should benefit considerably from an agenda that places emphasis on wellness, rehabilitation, and QOL through PA.[22,23] We are well positioned to undertake informed research on PA for healthy aging in MS. This will be essential for informing clinical practice considerations of this segment of persons living with MS. There is great potential for resilience through PA in older adulthood[46] and this is no doubt true for those aging with MS. ■

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