Health-Related Quality of Life and Physical Activity in Older Adults With Multiple Sclerosis

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ABSTRACT

BACKGROUND: People with multiple sclerosis (MS) are living longer but not necessarily better lives, and this portends reduced health-related quality of life (HRQOL). Physical activity (PA) may be a correlate of HRQOL for people with MS. We examined differences in HRQOL and PA between older adults with and without MS to determine whether PA is associated with HRQOL and whether it accounts for group differences in HRQOL.

METHODS: Thirty-one older adults with MS and 30 age- and sex-matched controls without MS completed the 36-Item Short Form Health Survey (SF-36) and the Godin Leisure-Time Exercise Questionnaire (GLTEQ). Data were analyzed using the Baron and Kenny approach for examining PA via the GLTEQ as a mediator of group differences in HRQOL.

RESULTS: The MS group had significantly lower component scores on the SF-36 and the GLTEQ than the control group. The GLTEQ scores were correlated with SF-36 physical component scores (r = 0.52), whereas the correlation with mental component scores (r = 0.23) was small and nonsignificant. Group assignment initially explained 31% of the variance in physical component scores (β = 0.55) and adding GLTEQ to the model accounted for an additional 12% of the variance in physical component scores. Thus, group (β = 0.42) and GLTEQ (β = 0.37) were both significant correlates of physical component scores. The group effect was modestly attenuated with the addition of GLTEQ in step 2 (step 1 β = 0.55; step 2 β = 0.42) and indicated partial rather than full mediation.

CONCLUSIONS: These results provide cross-sectional support for future research examining approaches to increase PA to possibly improve the physical component of HRQOL in older adults with MS.

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We are witnessing a demographic shift in the population of persons living with multiple sclerosis (MS) in the United States. Of the nearly 1 million adults living with MS in the United States,[1] those in the 55- to 64-year-old age group are the most prevalent, and men 65 to 74 years old and women 65 to 74 years old are the second and third most prevalent groups, respectively.[1] This suggests that there are more older adults than young and middle-aged adults living with MS; the shift has major implications for health and well-being.[2,3]

The shifting age demography of MS indicates that it is a lifelong disease wherein the effects of normal aging occur in conjunction with the effects of MS (ie, aging with a long-term disabling disease).[4] People with MS are living longer but not necessarily better lives, and this portends reduced health-related quality of life (HRQOL) in older adulthood. There are many changes in health status among older adults with MS, including increased rates of comorbid conditions such as hypertension, hyperlipidemia, heart disease, and diabetes.[5] There are other data indicating reduced lower-extremity physical function in older adults with MS.[6,7] Such changes can compromise HRQOL in older adults with MS, and this is supported by research documenting reductions in physical and/or mental health status compared with age-matched adults without MS.[8-10]

Physical activity (PA) too is reduced in older adults with MS and may be a leading correlate of HRQOL in this population. There are data supporting lower levels of PA in older adults with MS compared with controls of the same age without MS[11] and also data of declines in PA with increasing age in people with MS.[12] Physical activity has been associated with HRQOL in older adults in the general population[13] as well as in young and middle-aged adults with MS.[14] This finding supports the notion that PA might represent an important target of behavior change interventions to improve HRQOL among older adults with MS. To date, there is limited research comparing HRQOL and PA between older adults with MS and older adults without MS that further examines whether PA levels account for group differences in HRQOL.

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This study examined levels of HRQOL and PA in older adults with MS compared with age- and sex-matched controls. We hypothesized differences in HRQOL and PA between groups, and further hypothesized that PA would be associated with HRQOL and account for group differences in HRQOL. If correct, such results would provide cross-sectional support for future research examining approaches for increasing PA behavior and improving HRQOL in older adults with MS.

PRACTICE POINTS

People with multiple sclerosis (MS) are living longer but not necessarily better lives: many older adults with MS have reduced health-related quality of life (HRQOL).

As a possible correlate, physical activity may improve the HRQOL of older adults with MS. ■

METHODS

Participants

This study represents a secondary analysis of data from a project examining cardiorespiratory fitness and brain structure in older adults with MS and controls without MS.[15] Participants were recruited in the Birmingham, AL area through flyers posted in the community, letters sent to past research volunteers, and word of mouth. Those who responded to the call for participants were screened for the following study inclusion criteria: (1) physician-confirmed diagnosis of MS; (2) no MS relapses in the past 30 days; (3) 55 years or older; (4) ambulatory with or without an assistive device; (5) no contraindications for MRI (eg, free of metal implants); and (6) low risk of contraindications for strenuous exercise based on answering "no" to all the questions on the Physical Activity Readiness Questionnaire[16] or a single response of "yes" with a physician's approval. The controls were matched on age (±5 years) and sex, and inclusion criteria for the control group were the same except for MS diagnosis and relapse status. All control participants were free of neurologic disorders (eg, stroke, Parkinson disease).

Measures

The Medical Outcomes Study 36-Item Short Form Health Survey (SF-36) was appropriate for all study participants and provides a generic measure of HRQOL.[17] The survey answers were summed into 2 scores (0-100) representing physical health and mental health; higher scores indicated better HRQOL.[17] The validity and reliability of the SF-36 is well established among persons with MS[18] and control groups.[17]

The Godin Leisure-Time Exercise Questionnaire (GLTEQ) provides a self-reported measure of health-promoting PA[19] and is a reliable and valid measure in persons with MS[20] and control groups.[19] The total GLTEQ score is calculated by multiplying the number of 15-minute or longer mild, moderate, and strenuous bouts of PA recorded in the past 7 days by weights of 3, 5, and 9, respectively, and then summing those values into an overall score (0-119). The health contribution score (HCS), our measure of health-promoting PA, is calculated by adding only the moderate and strenuous scores into an overall score (0-98).[19,21]

Procedure

The study procedure was approved by the University of Alabama at Birmingham institutional review board, and participants provided written informed consent before enrolling in the study. Participants completed 3 study visits, and all data contained in the present analyses were collected during the first study visit. The first visit took place at our laboratory, where all participants completed a demographics questionnaire, including clinical characteristics for those with MS, as well as the SF-36 and GLTEQ. Participants with MS further underwent a neurologic evaluation by a Neurostatus-certified examiner (level C) to establish disability status based on the Expanded Disability Status Scale. The participants completed 2 subsequent visits for other measures of the primary study, but these are not applicable to the present study.

Data Analysis

Data were analyzed using IBM SPSS Statistics for Windows, version 25.0 (IBM Corp) with an unadjusted significance level of $P < .05$. We first examined differences in age, sex, and race between participants with MS and participants without MS using independent-samples t tests or χ^2 tests, as appropriate. We then examined the data using the 3-step approach outlined by Baron and Kenny[22] to investigate whether PA was an explanatory variable (ie, mediator) accounting for group differences in HRQOL. Step 1 tested group differences in HRQOL and PA using independent-samples t tests. The magnitude of differences between groups was expressed as Cohen's d, with values of 0.2, 0.5, and 0.8 interpreted as small, moderate, and large, respectively.[23] In step 2, bivariate Pearson correlations (r) were calculated between PA and measures of HRQOL in the overall sample rather than in separate subsamples. Values of 0.1, 0.3, and 0.5 were interpreted as small, moderate, and large, respectively.[23] The last step involved hierarchical linear regression analyses with direct entry of variables using the overall sample rather than separate subsamples, whereby we regressed HRQOL (SF-36 physical and mental composite scores) by group (MS and control) in step 1, and then added PA (the HCS from the GLTEQ) in step 2. We examined the β coefficients to identify the independent contributions of the variables in the model as well as model fit based on R^2 and change in R^2 per step of the model. Mediation was determined based on a comparison of the group's standardized β coefficient between step 1 and step 2 of the regression, whereby attenuation of the group β coefficient toward zero

TABLE 1. Health-Related Quality of Life and Physical Activity Scores for the Samples of Older Adults With Multiple Sclerosis and Controls Without Multiple Sclerosis

Variable (scale range)	Scores, mean (SD)		
	Multiple sclerosis group (n = 31)	Control group (n = 30)	*P* value
Physical component, SF-36 (0-100)	39.2 (11.8)	51.6 (5.9)	<.001
Mental component, SF-36 (0-100)	50.1 (13.1)	56.0 (6.9)	<.05
Health contribution score, GLTEQ (0-98)	12.9 (14.2)	27.8 (23.1)	<.005

GLTEQ, Godin Leisure-Time Exercise Questionnaire; SF-36, Medical Outcomes Study 36-Item Short Form Health Survey.

and nonsignificance indicated full mediation; partial mediation was based on attenuation of the β coefficient.[22]

RESULTS

Participant Characteristics

Demographic and clinical characteristics are provided in **TABLE S1**, which is published online at IJMSC.org. The MS group (n = 31) and the control group (n = 30) were similar in age, sex, and race. The MS group predominantly had relapsing-remitting MS, a mean disease duration of 18.3 years, and moderate disability based on a median Expanded Disability Status Scale score of 4.0.

Group Differences in HRQOL and PA

The statistics for HRQOL and PA for the MS and control groups are provided in **TABLE 1**. The MS group had significantly lower scores on the mental and physical components of the SF-36 and, furthermore, had a statistically significantly lower HCS on the GLTEQ. The differences in the physical component of HRQOL (d = 1.40) and PA (d = 0.80) were large in magnitude, whereas the differences between groups in the mental component of HRQOL (d = 0.58) were moderate in magnitude.

Associations Between PA and HRQOL in the Overall Sample

The GLTEQ HCS had a large correlation with the physical component score from the SF-36 (r = 0.52; P < .001). The HCS from the GLTEQ had a small and nonsignificant correlation with the mental component score from the SF-36 (r = 0.23; P = .09). There was no correlation between the mental and physical SF-36 component scores (r = −0.002; P = .99), and this is consistent with the notion of the 2 distinct concepts being measured by the SF-36.[17]

Regression Analyses for HRQOL in the Overall Sample

The results of the regression analysis examining whether PA accounted for group differences in HRQOL are provided in **TABLE 2**. We did not perform regression analyses for the mental component of HRQOL because it was not associated with PA and did not meet the conditions set forth by Baron and Kenny.[22] Group differences initially explained 31% of the variance in the physical component of HRQOL (β = 0.55). The inclusion of PA in the model accounted for an additional 12% of the variance in the physical component of HRQOL, and group (β = 0.42) and PA (β = 0.37) were both significant correlates of HRQOL. The effect of group was modestly attenuated with the addition of PA in step 2 (step 1 β = 0.55, step 2 β = 0.42), and this is consistent with partial rather than full mediation.

DISCUSSION

This study examined levels of HRQOL and PA in older adults with MS compared with age- and sex-matched controls without MS. We observed differences in HRQOL and PA between groups, and PA partially accounted for group differences in the physical component of HRQOL.

Older adults with MS reported lower levels of physical and mental HRQOL than age- and sex-matched controls without MS. The differences between groups exceed a half standard deviation (ie, Cohen's d of 0.5), the threshold established for meaningful HRQOL differences.[24,25] The difference in the physical component of HRQOL was nearly 2.5 times larger than the difference in the mental component of HRQOL. This corresponds with the emergence of declines in both walking performance and lower-extremity physical function that occur with increasing age in MS,[6,7,26] whereas there are less pervasive changes in domains of mental health with increasing age in MS.[8] To that end, the changes in the physical component of HRQOL may represent a perceived outcome of declines in physical function, and this should be examined in future research. Importantly, previous research has documented associations between PA, walking performance, and lower-extremity function in older adults with MS,[6,7,27] and this would align with our interest in PA as an important determinant of physical HRQOL in older adults with MS.

Older adults with MS further demonstrated a reduction in health-promoting PA compared with age- and sex-matched controls without MS. The difference between groups in HCSs was large in magnitude, and this was consistent with previous research reporting reductions in PA as a function of aging in MS[12] and when comparing older adults with MS and older adults without MS.[11] The reduction in PA among older adults with MS has been explained, in part, by variables from Social Cognitive Theory,[28] and this may support future efforts toward

TABLE 2. Regression Analysis Examining Physical Activity as a Mediator of Group Differences in the Physical Component of HRQOL

Step	Variable	B	Standard error of B	β	R^2	ΔR^2
Step 1	Group	12.38	2.47	0.553	0.31	NA
Step 2	Group	9.43	2.43	0.421	0.43	0.12
	GLTEQ HCS	0.21	0.06	0.370	NA	NA

GLTEQ, Godin Leisure-Time Exercise Questionnaire; HCS, health contribution score; HRQOL, health-related quality of life; NA, not applicable.

the design and delivery of theory-based behavior change interventions for this group.

We examined PA as a mediator of group differences in the physical component of HRQOL, as the mental component did not meet the necessary preconditions for mediator variable analysis (ie, there was no correlation between HCS and the mental component of HRQOL). The data indicated that PA, based on the HCS, satisfied the preconditions for examining mediation and partially accounted for the group effect on the physical component of HRQOL. This suggests that PA may be only 1 of many targets to improve the physical component of HRQOL in older adults with MS, and the partial mediation suggests that future research might examine factors other than PA to explain the reduced physical component of HRQOL. Such additional factors might include resilience, healthy lifestyle factors (eg, diet and nutrition), social support, depression, and fatigue.[29] Nevertheless, our initial results lend some support for developing theory-based behavior change interventions to increase PA and for examining the secondary effects on the physical component of HRQOL in older adults with MS.

There are obvious limitations to the present study. The most significant are the cross-sectional research design and the self-report measure of PA. The design precludes causality inferences among variables; this could be overcome in future longitudinal or intervention trials. The self-report measure of PA may support that the correlation with the physical component of HRQOL is driven by similar measurement methods (ie, self-report). We counter that concern based on the lack of an association between PA and the mental component of HRQOL but recognize that future research should include device-based measurement of PA. We did not examine the results as a function of disability status overall or subsystem scores within MS, and future researchers might do so with a larger sample to inform the design and delivery of targeted interventions by therapists and trainers. We did not include a measure of fatigue to consider its association with PA in the present analysis, and future research might clarify its bidirectional association with PA and, perhaps, HRQOL. Finally, the sample was primarily female and White race: the results cannot be broadly generalized.

The results provide initial support for future research examining approaches to increase health-promoting PA and to examine secondary improvements in the physical component of HRQOL among older adults with MS. Such future research, if positive, may support efforts toward maximizing longevity and quality of life among the growing population of older adults with MS in the United States.[30,31]

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