Physical Activity and Quality of Life in Older Adults: Influence of Health Status and Self-Efficacy

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ABSTRACT

Background: *Physical activity has been positively linked to quality of life (QOL) in older adults. Measures of health status and global well-being represent common methods of assessing QOL outcomes, yet little has been done to determine the nature of the relationship of these outcomes with physical activity.* ***Purpose:*** *We examined the roles played by physical activity, health status, and self-efficacy in global QOL (satisfaction with life) in a sample of older Black and White women.* ***Method:*** *Participants (N = 249, M age = 68.12 years) completed multiple indicators of physical activity, self-efficacy, health status, and QOL at baseline of a 24-month prospective trial. Structural equation modeling examined the fit of 3 models of the physical activity and QOL relationship.* ***Results:*** *Analyses indicated that relationships between physical activity and QOL, self-efficacy and QOL were all indirect. Specifically, physical activity influenced self-efficacy and QOL through physical and mental health status, which in turn influenced global QOL.* ***Conclusions:*** *Our findings support a social cognitive model of physical activity's relationship with QOL. Subsequent tests of hypothesized relationships across time are recommended.*

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INTRODUCTION

Physical activity interventions represent an effective behavioral strategy for attenuating functional decline, reducing risk of disability (1), and enhancing quality of life (QOL) in older adults (2). In the biomedical and behavioral medicine literature, it is quite common for QOL outcomes to reflect physical, mental, and social indicators of health status, or health-related quality of life (3). Conversely, measures of QOL in the psychological literature often capture a global sense of QOL or satisfaction with life (4) from the perspective of the respondent. Stewart and King (5) used the health-related quality of life approach to provide a framework for examining the QOL relationship with physical activity in older adults. The underlying elements of such models are proximal outcomes of physical activity and may be viewed as mediators in an expanded model that includes more global QOL constructs (6). Thus, one can think in terms of two potential models of the physical activity and QOL relationship. In one, the relationship between physical activity and QOL is direct, regardless of how QOL is conceptualized. That is, physical activity is related to multiple correlated indicators of QOL: in this case, physical health status, mental health status, and satisfaction with life. In the second model, the effect of physical activity on global QOL is indirect, through its effects on health status. In such a model, the bivariate relationship between physical activity and global QOL should be nonsignificant when controlling for the intermediate effects of health status.

Adopting a social cognitive perspective provides an additional model for explaining the physical activity and QOL relationship. In this model, physical activity is hypothesized to influence self-efficacy, which in turn would indirectly influence global QOL through physical and mental health status. In such a model, any bivariate relationship between physical activity and health status should be nonsignificant. Not only does such a model fit within a social cognitive framework, but it also provides a logical pathway from more temporally sensitive and easily modifiable factors to more global and stable factors associated with QOL.

In the study presented here, we tested the veracity of the three models in a sample of older women at baseline of a 24-month prospective study of aging and health behaviors. Our primary hypothesis was that a social cognitive model of physical activity and QOL would support the position that physical activity is indirectly related to global QOL through the influence of self-efficacy and physical and mental health status.

METHOD

Participants

Older (*M* age = 68.12 years, range = 59–84 years) Black (*n* = 81) and White (*n* = 168) women were recruited to participate in this study. Initially, 298 individuals expressed interest in participation, with 49 individuals being declared ineligible or declining further participation following a telephone screening interview. Details relative to recruitment and medical status of the sample have been described elsewhere (7).

Measures

Physical activity participation. Physical activity was assessed with two measures: the Physical Activity Scale for the Elderly (PASE) (8) and the Community Healthy Activities Model Program for Seniors physical activity measure (9).

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Self-efficacy. Beliefs regarding physical activity were assessed with two measures. The Exercise Self-Efficacy Scale (10) is a measure assessing individuals' beliefs in their ability to accumulate 30 min or more of physical activity per day on 5 or more days per week in the future. The Self-Efficacy for Walking Scale (11) assessed participants' beliefs in their ability to successfully walk for a specified duration, ranging from 5- to 40-min bouts, at a moderately fast pace without stopping.

Physical health status. To assess physical health status, we used two measures. The first was the Function component of the abbreviated version (7) of the Late-Life Function and Disability Instrument (12), which assesses basic and advanced lower extremity function and upper extremity function. The second measure used was the Physical Health summary measure of the 12-Item Short Form Survey (SF–12) (13) derived from the Medical Outcomes 36-Item Short Form Survey (14).

Mental health status. The Perceived Stress Scale (15) and the Mental Health summary measure from the SF–12 (13) were used to asses the latent construct of Mental Health Status.

QOL. To assess global QOL, we used the Satisfaction with Life Scale (SWLS) (4), a five-item measure developed to assess global life satisfaction in various age groups. Because we used only one measure to assess this construct, we employed each item as a measured indicator of QOL in our subsequent analyses. All measures employed in this study have adequate psychometric properties and have been fully described in the literature.

Procedure

Upon completion of the initial telephone screening interview, participants were scheduled for baseline assessment in our laboratory. Participants completed an approved Institutional Review Board–informed consent and a battery of questionnaires assessing basic demographic and medical information, physical activity (PASE), self-efficacy, satisfaction with life, perceived stress, and the SF–12. The Late-Life Function and Disability Instrument and Community Healthy Activities Model Program for Seniors were completed by interview.

Data Analysis

The data were analyzed using covariance modeling with the full-information maximum likelihood estimator in Mplus 3.1 (16). In the present study, 3.2% of PASE data were missing (n = 8); there were no missing data for any of the other variables.

Model testing. The data were analyzed using a two-step procedure (17). The first step involved confirmatory factor analysis for testing the fit of an overall measurement model composed of five correlated latent variables (i.e., physical activity, self-efficacy, mental health status, physical health status, and QOL).

The second step involved structural equation modeling for testing the relationships among the latent variables in the three hypothesized models described earlier. In Model 1 (direct effects model), the structural model specified direct effects of physical activity on the correlated factors of physical health status, mental health status, and SWLS. In Model 2 (indirect effects model), the structural model specified (a) direct effects of physical activity on physical and mental health status but not SWLS and (b) direct effects of physical and mental health status on SWLS. Finally, in Model 3 (social cognitive model), the structural model specified (a) direct effects of physical activity on self-efficacy but not physical and mental health status, (b) direct effects of self-efficacy on physical and mental health status but not SWLS, and (c) direct effects of mental and physical health status on SWLS. In all three models, we allowed a single correlation between disturbance terms for the mental and physical health status latent variables. All models were saturated for race of participants, which did not change the magnitude or direction of any relationships reported.

Model fit. Model–data fit was assessed using the chi-square statistic, standardized root mean square residual (SRMR), and comparative fit index (CFI). The models tested, standardized parameter estimates, and model fit indexes are depicted in Figure 1.

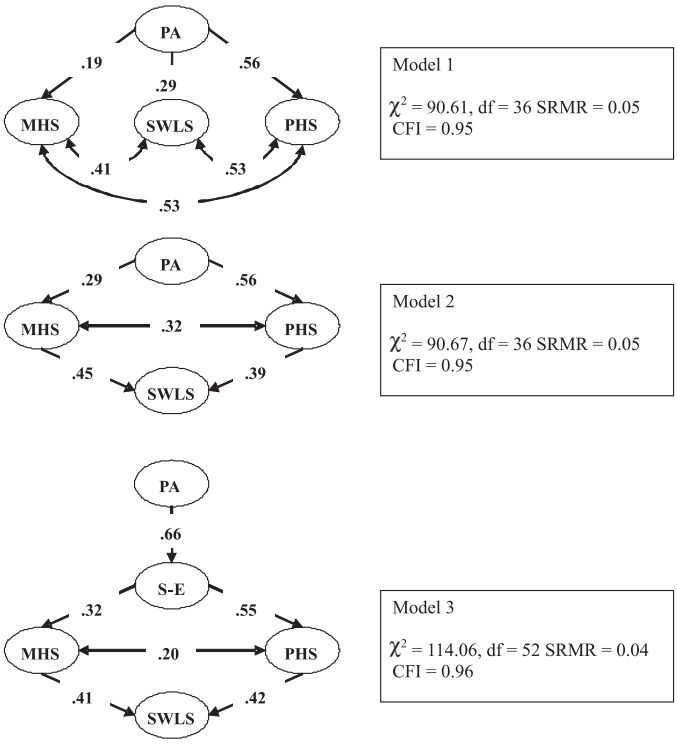

FIGURE 1 Three structural models of physical activity and quality of life depicting standardized parameter estimates and model fit indexes. Items and uniquenesses were not included to improve the clarity of the figure. PA = physical activity; SE = self-efficacy; MHS = mental health status; PHS = physical health status; SWLS = Satisfaction with Life Scale; SRMR = standardized root mean square residual; CFI = comparative fit index.

RESULTS

Descriptive Statistics

Mean scores and standard deviations for the measures included in the data analysis are provided in Table 1.

Step 1: Confirmatory Factor Analysis

The five-factor measurement model allowing correlated uniquenesses among Items 1 and 2 and Items 4 and 5 of the SWLS represented a good fit for the data, $\chi^2(53, N = 49) = 133.59$, SRMR = .05, CFI = .95. The correlations among latent variables, which are presented in Table 2, were all statistically significant and moderate to large in magnitude.

Step 2: Structural Equation Model Testing

As can be seen in Figure 1, all three models provide a good fit to the data meeting the accepted criteria suggested by Hu and Bentler (18), with SRMRs below .08 and CFIs approximating .95. Model 1 represented the direct effect of physical activity on three correlated QOL factors (physical and mental health status and SWLS) and, as can be seen, physical activity was significantly related to physical health status (β = .56), mental health status (β = .19), and global QOL (β = .29). All three indicators of QOL were significantly correlated (βs = .41–.53).

Model 2 represented the direct effect of physical activity on physical and mental health status and an indirect effect on the SWLS through the health status factors. As can be seen in Figure 1, being physically active was associated with greater positive mental (β = .29) and physical health status (β = .56), which were positively related to global QOL (βs = .45 and .39, respectively). Thus, there is support for the argument that both physical and mental health status are proximal indicators of QOL in the physical activity and QOL relationship.

The final model to be tested was a social cognitive model of the physical activity and QOL relationship (see Model 3 in Figure 1). As hypothesized, physical activity had a significant direct association with self-efficacy (β = .66). In addition, the hypothesized relationship between self-efficacy and physical and mental health status were supported (βs = .55 and .32, respectively), as were the associations between physical and mental health status and global QOL (βs = .42 and .41, respectively). Thus, there is support for the social cognitive perspective that self-efficacy and physical and mental health status variables play intermediary roles in the physical activity and QOL relationship.

TABLE 1
Descriptive Statistics for All Measures for the Overall Sample

Variable	*M*	*SD*
CHAMPS	20.1	10.1
PASE	156.6	70.6
ESE	80.9	28.1
SEW	71.7	31.8
SF–12: Mental health	52.8	8.7
PSS	11.2	6.3
SF–12: Physical health	47.1	9.8
LL–FDI: Overall function	65.6	9.5
SWLS: Item 1	5.2	1.6
SWLS: Item 2	5.1	1.5
SWLS: Item 3	5.4	1.5
SWLS: Item 4	5.5	1.6
SWLS: Item 5	4.4	1.9

Note. CHAMPS = Community Healthy Activities Model Program for Seniors physical activity questionnaire; PASE = Physical Activity Scale for the Elderly; ESE = Exercise Self-Efficacy Scale; SEW = Self-Efficacy for Walking Scale; SF–12 = 12-Item Short Form Survey; PSS = Perceived Stress Scale; LL–FDI = Late Life Function and Disability Instrument; SWLS = Satisfaction with Life Scale.

TABLE 2
Correlations Among the Five Latent Variables in the Initial Confirmatory Factor Analysis

Latent Variable	*1*	*2*	*3*	*4*	*5*
1. Physical activity	—				
2. Exercise self-efficacy	.66	—			
3. Mental health	.31	.39	—		
4. Physical health	.58	.68	.48	—	
5. Satisfaction with life	.21	.35	.58	.53	—

Note. All correlations are statistically significant ($p < .05$).

DISCUSSION

We examined three potential models for understanding the relationship between physical activity and QOL in older adults. Our findings suggest that the relationship is not a simple bivariate association but is better expressed as following a pathway through health status factors via modifiable, temporally sensitive, downstream factors (e.g., self-efficacy) to more stable, upstream, global constructs (e.g., satisfaction with life or global QOL). This series of relationships can be best understood from a social cognitive perspective (19). In the present study, older women who were more active had greater self-efficacy, which was associated with more positive physical and mental health status. In turn, health status was positively related to satisfaction with life. More important, the initial bivariate associations between the latent factors of physical activity and QOL and health status and between self-efficacy and QOL were no longer significant.

Such findings may have important implications for conceptualizing QOL outcomes in older adults and for examining physical activity effects on, and relationships with, QOL. That positive mental health was associated with satisfaction with life is consistent with Diener and colleagues' (4) position that affective well-being is important in making judgments relative to satisfaction with life. There is a considerable literature that suggests that physical activity enhances positive affect (20) and that self-efficacy is instrumental in this relationship (7). Such relationships are supported in our social cognitive model of the physical activity and QOL relationship. Rejeski and Mihalko (21) noted that few studies exist that examine factors that may underlie the physical activity and life satisfaction (QOL) rela-

tionship. However, they made the case on logical grounds that self-efficacy may play a role in this relationship. We believe that our data provide initial evidence to suggest a more complex model of the physical activity and QOL relationship.

The present study has a number of strengths. For example, we adopted a social cognitive model (19) to better understand the relationships among physical activity, self-efficacy, health status, and QOL in a relatively large sample of older Black and White women. Employing a latent variable modeling approach provided a more powerful and accurate test of structural relations among theoretical constructs as the relationships are less biased by measurement error. Moreover, we were able to test three potentially competing models of the physical activity and QOL relationship. We are conscious of the fact that the hypothesized models were tested within a cross-sectional framework and that such data are not optimal for testing mediation effects or assuming causality. However, we contend that the presence of *theoretically relevant* relationships can be tested in such a design and that longitudinal data can be used to further corroborate relationships among variables over time. Our subsequent two assessments over the next 12 months should allow us to effectively track relationships among changes in model constructs over time.

Findings from the present study offer a strong theoretical foundation for testing physical activity and QOL relationships in older adults. Seeman and Chen (22) reported data that suggested that changes in levels of functioning in older adults with chronic conditions were predicted not simply by health status or disease state but also by physical activity and self-efficacy. These findings echo the present series of relationships and speak to the potential power of intervening on factors that are modifiable in an effort to enhance physical and health status and, ultimately, QOL in older adults. Physical activity interventions should be structured to maximize growth in self-efficacy by targeting the primary sources of efficacy information. The wisdom of adopting such an approach is inherent in the observations of Seeman et al. (23), who noted that there is a tendency in older adults with low self-efficacy to reduce the number of activities in which they engage and to reduce the degree of effort expended in such activities. These reductions, in turn, provide fewer opportunities to experience successful, efficacy-enhancing behaviors leading to further reductions in efficacy. Our data would suggest that such declines are likely to lead to subsequent reductions in health status and, ultimately, QOL.

In closing, we have presented the physical activity and QOL relationship in older adults within the context of a meaningful theoretical framework and have identified some potential mediating variables in this relationship. The cross-sectional status of the data notwithstanding, we believe that such a framework provides an important perspective for testing the proposed relationships in prospective and randomized controlled designs. We further believe this to be an important starting point in attempts to address the challenges laid out by Rejeski and Mihalko (21) to further unravel the relationship between physical activity and quality of life, a vital aspect of aging and public health.

REFERENCES

(1) Keysor JJ: Does late-life physical activity or exercise prevent or minimize disablement? A critical review of the scientific evidence. *American Journal of Preventive Medicine.* 2003, *25:*129–136.

(2) Miller ME, Rejeski WJ, Reboussin BA, et al.: Physical activity, functional limitations, and disability in older adults. *Journal of the American Geriatrics Society.* 2000, *48:*1264–1272.

(3) Ware Jr. JE: The status of health assessment 1994. *Annual Review of Public Health.* 1995, *16:*327–354

(4) Diener E, Emmons R, Larsen R, et al.: The Satisfaction With Life Scale. *Journal of Personality Assessment.* 1985, *49:*71–75.

(5) Stewart AL, King AC: Evaluating the efficacy of physical activity for influencing quality of life outcomes in older adults. *Annals of Behavioral Medicine.* 1991, *13:*108–116.

(6) McAuley E, Elavsky S: Physical activity, aging, and quality of life: Implications for measurement. In Zhu W, Chodzko-Zajko W (eds), *Measurement Issues in Aging and Physical Activity.* Champaign, IL: Human Kinetics, 2006.

(7) McAuley E, Konopack JF, Motl RW, Rosengren K, Morris KS: Measuring disability and function in older women: Psychometric properties of the late-life function and disability instrument. *Journals of Gerontology Series A: Biological Sciences and Medical Sciences.* 2005, *60:*901–909.

(8) Washburn RA, Smith KW, Jette AM, Janney CA: The Physical Activity Scale for the Elderly (PASE):Development and evaluation. *Journal of Clinical Epidemiology.* 1993, *46:*153–162.

(9) Stewart AL, Mills KM, King AC, et al.: Champs Physical Activity Questionnaire for Older Adults: Outcomes for interventions. *Medicine & Science in Sports & Exercise.* 2001, *33:*1126–1141.

(10) McAuley E: Self-efficacy and the maintenance of exercise participation in older adults. *Journal of Behavioral Medicine.* 1993, *16:*103–113.

(11) McAuley E, Courneya K, Lettunich J: Effects of acute and long-term exercise on self-efficacy responses in sedentary, middle-aged males and females. *The Gerontologist.* 1991, *31:*534–542.

(12) Haley SM, Jette AM, Coster WJ, et al.: Late life function and disability instrument: II. Development and evaluation of the function component. *Journals of Gerontology Series A: Biological Sciences & Medical Sciences.* 2002, *57:*M217–M222.

(13) Ware JE, Kosinski M, Keller SD: A 12-item short-form health survey: Construction of scales and preliminary tests of reliability and validity. *Medical Care.* 1996, *34:*220–233.

(14) Ware J, Kosinski M, Keller SD: *The SF-36 Physical and Mental Health Summary Scales: A User's Manual*. Boston: Health Institute, New England Medical Center, 1994.

(15) Cohen S, Kamarck T, Mermelstein R: A global measure of perceived stress. *Journal of Health and Social Behavior.* 1983, *24:*385–396.

(16) Muthén LK, Muthén BO: *Mplus.* Los Angeles: Author.

(17) Anderson JC, Gerbing DW: Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin.* 1988, *103:*411–423.

(18) Hu L, Bentler PM: Cutoff criteria for fit indices in covariance structure analysis: Conventional versus new alternatives. *Structural Equation Modeling.* 1999, *6:*1–55.

(19) Bandura A: *Self-Efficacy: The Exercise of Control.* New York: Freeman, 1997.

(20) McAuley E, Katula J: Physical activity interventions in the elderly: Influence on physical health and psychological function.

Annual Review of Gerontology and Geriatrics. 1998, *18:*111–154.

(21) Rejeski WJ, Mihalko SL: Physical activity and quality of life in older adults. *Journals of Gerontology.* 2001, *56A:*23–35.

(22) Seeman T, Chen XG: Risk and protective factors for physical functioning in older adults with and without chronic conditions: Macarthur studies of successful aging. *Journals of Gerontology Series B: Psychological Sciences & Social Sciences.* 2002, *57:*S135–S144.

(23) Seeman TE, Unger JB, McAvay G, et al.: Self-efficacy beliefs and perceived declines in functional ability: Macarthur studies of successful aging. *Journal of Gerontology: Psychological Sciences.* 1999, *54B:*214–222.