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Effects of a Randomized Exercise Trial on Physical Activity, Psychological Distress and Quality of Life in Older Adults

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Abstract

Objective—Evidence suggests improvements in positive psychological health indices (e.g., self-esteem) may explain the relationship between physical activity and quality of life (QoL) in older adults. Less is known about the role of reductions in negative psychological health indices (e.g., depression). The present study examined the effects of changes in moderate-to-vigorous physical activity (MVPA) and psychological distress on change in QoL in older adults enrolled in an exercise program.

Methods—Older adults ($N=247$, $Mean=65.68\pm4.59$) participated in a six-month randomized exercise trial. Participants wore accelerometers and completed questionnaires to measure MVPA, psychological health, and QoL at baseline and post-intervention. Psychological distress was modeled as a latent factor comprised of anxiety, depression, sleep dysfunction, and stress. Structural models were used to examine the effects of changes in MVPA and distress on change in QoL.

Results—Increases in MVPA predicted reductions in distress from baseline to post-intervention ($B=-0.10$, $p=0.05$). In turn, reductions in distress predicted increases in QoL ($B=-0.51$, $p=0.001$). The indirect effect of MVPA on QoL through distress was also significant ($p=0.05$; 90% CI=0.005, 0.125).

Conclusions—Findings extend previous research on the mediators of the MVPA-QoL relationship in older adults, suggesting reductions in negative psychological health outcomes may also mediate this pathway.

Keywords

older adults; physical activity; psychological distress; quality of life

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1. Introduction

The demographic landscape of the United States (US) population has rapidly shifted over the past several decades, with adults now living longer than ever. By the year 2050, it is predicted that the number of adults over the age of 65 will increase by 40% [1]. However, these extended years are often accompanied by the onset of comorbid conditions, disability, and compromised quality of life (QoL)[2–4]. Defined as the affective evaluation of one's satisfaction with life [5], QoL has been frequently identified as a key component of healthy aging [6]. Specifically, adults with greater life satisfaction have demonstrated reduced risk of chronic illness and mortality [7,8], as well as improved mental and physical health status [9]. As such, maintaining QoL into advanced age has become an important public health concern.

Physical activity has consistently been associated with a number of health benefits in older adults, including improved QoL [9–11]. This construct is posited as a global, distal health outcome [12], with more proximal outcomes mediating the effects of behaviors on QoL. A number of empirical studies have supported this theoretical conceptualization through the examination of the effects of physical activity behavior on QoL. For example, Elavsky and colleagues [13] provided evidence that increases in physical activity, over a four-year period, were associated with improvements in self-efficacy, self-worth, and positive affect in older adults. Greater positive affect, in turn, was associated with greater satisfaction with life over the long-term period. More recent studies have corroborated these findings and suggest that other affective responses to exercise, such as mental health status, may also mediate the relationship between physical activity and global QoL [9,14–16]. Despite this growing body of evidence, our understanding of the mechanisms underlying the relationship between physical activity and QoL in older adults is incomplete.

To enhance our knowledge of such underlying pathways, it is important to note the clinical difference between increased positive and diminished negative affective states [17] such that despite their correlations these constructs are highly distinctive and therefore represented separately. For example, increased joy, confidence, and energy (e.g., positive affect) is markedly different from tempered anger, guilt, and fear (e.g., negative affect). Many of the conventional, pharmaceutical treatments for negative affect conditions such as depression and anxiety, while effective, are often costly and associated with a number of negative side effects (e.g., pain, increased fall risk, sleep disturbance). This has led to increased efforts by providers to identify and implement low-cost, effective methods for reducing negative affect in lieu of standard pharmaceutical treatments.

Indeed, there is robust literature documenting the effects of exercise training and physical activity on negative symptomology, such as depression, anxiety, sleep dysfunction, and perceived stress [18–24]. Specifically, findings across studies have provided evidence of moderate and consistent effects of physical activity on these negative health factors [24–26]. A recent meta-analysis has highlighted that some of the strongest effects of physical activity on psychological well-being in older adults have been on anxiety [27], suggesting that negative psychological health factors may play a more important role in older adults' QoL

than has been previously examined. Similarly, past work has demonstrated adverse effects on QoL resulting from sleep dysfunction, depression, and stress [28–30]. While this suggests that reductions in negative psychological health factors through exercise may lead to improved QoL in older adults, findings are inconclusive and the degree to which exercise may exert its influence on QoL through reductions in these symptoms is still unknown [31]. As such, studies examining the mediating effects of reductions in negative psychological health indices on the relationship between physical activity and QoL are warranted.

The purpose of the present study was to examine how changes in moderate-to-vigorous physical activity (MVPA), the level of physical activity recommended by the federal government [32], and psychological distress (e.g., anxiety, depression, sleep dysfunction, perceived stress) influenced changes in QoL in older adults across a six-month period. It was hypothesized that increases in MVPA across time would be significantly associated with decreases in psychological distress, which, in turn, would be associated with improvements in QoL. That is, any effects of MVPA on the more distal outcome of QoL would be indirect through reductions in psychological distress.

2. Materials and Methods

2.1 Participants & Study Design

Community-dwelling older adults (N=247) were recruited to participate in a 6-month, randomized controlled exercise trial using local media (e.g., newspaper, television, radio advertisements), a mailed flyer, the local university e-newsletter, and family/friend referral. Older adults were eligible to participate if they were aged 60-79 years, English speaking, right handed, local to the study location, low-active (i.e., engaged in 20+ minutes of moderate physical activity no more than 2 days per week during the previous 6 months), willing to be randomized, able to exercise without exacerbating preexisting conditions as determined by their physician, and not enrolled in another exercise program. The current trial was designed to examine the effects of exercise training on cognition and brain health. Participants were randomized to one of three exercise training programs: Dance (n=69), Walking (n=108), and Strengthening/Stretching/Stability (n=70). The walking group was comprised of a Walking only condition (n=54) and a Walking plus nutritional supplement condition (n=54). The Strengthening/Stretching/Stability group served as the active control condition. In a primary outcomes paper it was demonstrated that white matter (WM) integrity declined in all four conditions with the exception of WM in the fornix region which increased in the dance condition [33]. However, these changes in WM integrity were not associated with changes in processing speed. The present study represents a secondary analysis of behavioral and psychological outcomes collected at baseline and post-intervention (i.e., 6 months later).

Specific details of the trial and participant flow through the study have been previously published [33,34]. Briefly, all groups met at local campus recreation centers for approximately one hour three times per week for 24 weeks, and each session began with a warm-up consisting of light walking followed by stretching exercises targeting major muscle groups. All exercise sessions were led by trained exercise leaders and were progressive in nature such that the intensity (as assessed by Rating of Perceived Exertion; RPE) of exercise

increased within and across months. Individuals randomized to the Dance group completed social dancing similar to American and English folk line-dancing. Participants learned new dances each month that subsequently increased in intensity within months and across the overall intervention. Participants in the Walking group walked around a track and were encouraged to increase their heart rate from 50-60% of their maximal heart rate (as assessed via graded maximal exercise test) to 60-75% after 6 weeks. Those in the Strengthening/Stretching/Stability group completed 10-12 resistance-based exercises per day using exercise bands focused on improving strength and balance of all major muscle groups. Repetitions and sets increased within each month, and exercises became progressively more difficult over the intervention period. Adherence to the intervention, defined as the ratio of classes attended to total number of classes held, was quite good and did not significantly differ by group ($p=.843$): 77.4% in the Dance group; 76.9% in the Walking Group; 78.5% in the Strengthening/Stretching/Stability group. All methods and procedures were approved by the institutional review board (IRB) at the University of Illinois at Urbana-Champaign. All participants signed the IRB-approved written informed consent prior to enrollment in the study. The trial was registered with United States National Institutes of Health ClinicalTrials.gov (ID: NCT01472744; Fit & Active Seniors Trial).

2.2 Measures

2.2.1 Physical Activity—Physical activity was assessed using uni-axial monitoring Actigraph accelerometers (Actigraph, Pensacola, FL: model GT1M or GT3X) at baseline and post-intervention. Recent work has demonstrated comparable output of physical activity intensities among accelerometer models 7164, GT1M, and GT3X [35–37], making the use of two models acceptable. Participants were instructed to wear the accelerometer on their non-dominant hip for seven consecutive days during waking hours and record the time worn on a log sheet. Data retained for analyses met a wear time validation criterion of 10 hours of wear time per day for at least 3 days when scored with an interruption period of 60 minutes [38]. These data were subsequently downloaded as activity counts, which represent raw accelerations summed over a 60 second epoch length and subsequently processed into activity intensities in ActiLife software package (Version 6; Actigraph, Pensacola, FL) using older adult-specific cut-points as follows: sedentary (<50 counts/minute), light (50-1040 counts/minute), and moderate-to-vigorous physical activity (MVPA; 1041 counts/minute) [39]. Each minute of wear was classified as sedentary, light, or MVPA according to these intensity cut-points. Estimated average daily minutes spent in each intensity category were calculated by dividing the number of minutes spent in each category by the total number of valid days worn per participant.

2.2.2 Anxiety and Depression—The *Hospital Anxiety and Depression Scale* (HADS) was used to measure anxiety and depression [40]. Participants are asked to indicate how true each statement is on a 4-point Likert scale ranging from 1, “most of the time” to 4, “not at all.” An example of the HADS is, “Worrying thoughts go through my mind.” Negatively worded items are recoded, and two subscale scores are calculated through summation: anxiety and depression. Higher scores are indicative of greater anxiety and depression. A systematic review has found the HADS to be valid and reliable in assessing symptom severity for both anxious and depressed individuals [41]. The internal consistency of the

HADS in the present sample was adequate at both baseline and post-intervention ($\alpha=0.78$, 0.78 [anxiety]; $\alpha=0.70$, 0.72 [depression]).

2.2.3 Sleep Dysfunction—The daytime dysfunction component of the *Pittsburgh Sleep Quality Index (PSQI)* was used to assess sleep dysfunction [42], which has been associated with elevated anxiety and depressive symptoms, and impaired overall QoL [43]. PSQI was designed to assess subjective sleep quality during the previous month. Participants are asked to indicate the degree to which they have experienced trouble with sleep on a 4-point scale ranging from “not during the past month” to “three or more times a week.” Two items comprise the daytime dysfunction subscale including, for example, “During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?” Items are summed with higher scores indicative of greater daytime dysfunction. Internal consistency been established in both healthy control subjects and patients with sleep disorders [42] and was adequate at both baseline and post intervention in the current study ($\alpha=0.73$, 0.70).

2.2.4 Perceived Stress—The *Perceived Stress Scale (PSS)* was used to assess the degree to which varying life situations are considered stressful. Participants are asked to indicate how often they experience life events to be stressful on a 4-point Likert scale ranging from 0, “never” to 4, “very often.” An example of the PSS is, “In the last month, how often have you found that you could not cope with all the things that you had to do?” Positively worded items are recoded, and all 10 items are summed to create a total score. Higher scores are indicative of greater stress. Cohen and colleagues [44] reported that this scale was reliable across populations due to its simplistic nature and development for community samples of at least a junior high school education. The internal consistency of the PSS in the present sample was adequate at both baseline and post-intervention ($\alpha=0.88$, 0.87).

2.2.5 Quality of Life—The *Satisfaction with Life Scale (SWLS)* was used to measure QoL. SWLS is a 5-item scale developed to measure global satisfaction with life in a variety of age groups [5]. Participants are asked to indicate the degree to which they agree with statements about their life satisfaction on a 7-point Likert scale ranging from 1, “strongly disagree” to 7, “strongly agree.” An example of the SWLS is, “If I could live my life over, I would change almost nothing.” Items are summed to create a total score with higher scores indicative of greater global life satisfaction. Several reviews have indicated sensitivity and adequate internal reliability and validity across several populations and exercise interventions [5,45]. The internal consistency of the SWLS in the present sample was adequate at both baseline and post-intervention ($\alpha=0.89$, 0.87).

Data Analytic Procedure

Confirmatory Factor Analysis & Latent Change Score Model

All analyses were conducted in Mplus version 7.4 [46]. We initially assessed the structural validity of a single factor latent structure with no additional parameter constraints using confirmatory factor analysis (CFA) with full information maximum likelihood (FIML) estimation [47]. This factor, psychological distress, was composed of anxiety, depression,

sleep dysfunction, and perceived stress. The extent of missing data ranged from 0% (anxiety, depression, daytime dysfunction, satisfaction with life) to 2.4% (MVPA) at baseline. At 6 months, missing data ranged from 14.6% (perceived stress, daytime dysfunction) to 15% (anxiety, depression, satisfaction with life, MVPA). Data were treated as missing at random and addressed with FIML estimation that uses all available information without imputation [47,48] and is the current recommended practice for handling attrition in longitudinal analysis [49].

We then conducted a series of latent change score models (LCSMs) to examine changes in MVPA, the latent psychological distress factor, and QoL over the course of the 6-month intervention period [50] also estimated via FIML. LCSMs estimate both individual differences in cross-sectional measures and longitudinal change. Unlike raw score differences, latent change score models explicitly estimate measurement and latent error. Change in distress was calculated as a second-order latent variable comprised of baseline and 6-month latent variables. Each baseline and 6-month latent variable was created from four manifest indicators from the HADS, PSQI, and PSS. Equal variance was specified across the four manifest indicators as well as across time. MVPA and QoL measures were standardized to baseline values (i.e., defined as z-scores). Changes in MVPA and QoL were then modeled as standardized latent change over time.

Structural Model Specification

Latent change in MVPA and QoL were then submitted to the same model to test our hypothesis that the effect of increasing MVPA on improved QoL was mediated by reductions in psychological distress. This analysis approach is appropriate for testing hypothesized, theoretically-based relationships among constructs across defined periods of time. The hypothesized path model tested and included (1) a path from change in average daily MVPA to change in distress; (2) a path from change in distress to change in QoL and; (3) an indirect path from change in MVPA to change in QoL, through change in psychological distress. To test the true indirect effect of MVPA through distress, we then added a direct path from change in MVPA to change in QoL. This path, combined with the mediation test and indirect path from change in MVPA to change in QoL, allows us to explore the role of change in psychological distress as a mediator of the overarching relationship rather than a concurrent, parallel outcome. The model was then saturated with potential covariates, including group assignment, age, sex, and education. Initially, the present study examined treatment group differences; however, preliminary analyses indicated no significant time by group effects on SWLS. Thus, the sample was collapsed and group assignment was included in the model as a covariate only. This analysis now secondarily examines the relationship between MVPA and QoL across all groups. To examine the directionality of effects (i.e., prevalence of physical activity preceding change in psychological distress), an alternative model that reversed the path between MVPA and distress was also tested. If the alternative model fit is worse than the hypothesized path model and the reverse effects are non-significant, then the directionality of the hypothesized effects can be interpreted with greater confidence. To minimize possible bias from the smaller sample size, all models were bootstrapped (5000 draws) with bias-correction to produce 90% confidence intervals of unstandardized effects [51].

Multiple indices were used to detect the goodness of model fit including the normal theory weighted chi-square statistic (non-significant p-value), the root mean square error of approximation (RMSEA; <0.06), the comparative fit index (CFI; >0.95) [52], the Tucker-Lewis Index (TLI; >0.95) [53], and the standardized root mean residual (SRMR; <0.08).

Results

Participant characteristics are described in Table 1 and a descriptive summary of MVPA, psychological distress, and QoL is included in Table 2.

Estimated as correlated latent change scores, MVPA increased (mean = 0.27, $p < 0.001$) and latent psychological distress decreased (mean = -.14, $p = 0.001$), whereas QoL (mean = 0.13, $p = 0.58$) remained the same over the course of the intervention. However, individuals significantly varied in the magnitude of change in each of these constructs. Confirmatory factor analyses revealed a good fit of the psychological distress latent factor to the data: baseline ($\chi^2 = 8.275(2)$, $p = .016$, RMSEA = .113 [90% CI = .041, .197], CFI = .979, TLI = .938, SRMR = .025), and at 6 months ($\chi^2 = 8.163(2)$, $p = .017$, RMSEA = .121 [90% CI = .044, .212], CFI = .966, TLI = .897, SRMR = .032). Standardized factor loadings and their corresponding residuals at each time point are shown in Figure 1. For clarity, correlations between pre- and post-manifest indicators are not pictured.

The psychological distress latent change score model with metric invariance provided an excellent fit to the data, ($\chi^2 = 26.066(24)$, $p = .350$, RMSEA = .019 [90% CI = .000, .056], CFI = .997, TLI = .997, SRMR = .032). The hypothesized path analysis testing the effects of changes in MVPA and psychological distress on change in QoL also had an excellent fit ($\chi^2 = 62.099(53)$, $p = .184$, RMSEA = .026 [90% CI = .000, .050], CFI = .992, TLI = .990, SRMR = .037). The model and standardized estimates are shown in Figure 2.

Overall, individuals with greater increases in average daily MVPA over the 6-month intervention reported significant reductions in psychological distress from baseline to 6 months ($B = -.10$, $p = 0.05$). In turn, individuals with greater reductions in distress reported significantly greater improvements in levels of QoL from baseline to 6 months ($B = -.51$, $p = 0.001$). The direct path from change in MVPA to change in QoL was non-significant ($p = .28$). However, analyses indicated reductions in psychological distress mediated the benefits of increased MVPA on QoL [indirect effect = 0.05; bias-corrected bootstrapped 90% CI = .005, .125]. Upon saturating the model with covariates and group assignment, none were significant and therefore all were dropped from the final model. The path analysis of the alternative model indicated a good, but worse, fit to the data ($\chi^2 = 73.276(53)$, $p = .034$, RMSEA = .039 [90% CI = .011, .060], CFI = .982, TLI = .978, SRMR = .038). All paths in the alternative model were non-significant ($ps > 0.16$), further highlighting the direction of the hypothesized path.

Discussion

The purpose of this study was to examine how changes in physical activity and psychological distress influenced changes in QoL over the course of a 6-month exercise intervention for older adults. Although there is a large body of evidence supporting the

beneficial influence of physical activity on QoL [6-9], this study is the first, to our knowledge, to explore the mediating effect of psychological distress on this relationship. Consistent with the definition of QoL as a global and distal psychological construct [5,12], the effect of increases in MVPA on QoL were indirect through reductions in a more proximal affective construct – psychological distress. Specifically, greater increases in MVPA over the course of the intervention were associated with greater reductions in psychological distress which, in turn, were significantly associated with improvements in QoL. Overall, these findings specify the direction of changes in physical activity, psychological distress, and QoL in older adults, and statistically disentangle the order of such relationships within the context of an exercise intervention.

The observed path from MVPA to psychological distress is consistent with past research in older adults demonstrating reductions in negative symptomology within the context of an exercise intervention [18,21,26]. For example, a review of the use of exercise as a treatment for depression found significant benefits of exercise training for providing antidepressant effects in both middle-aged and older adults compared with control groups [19]. The authors also found a significant relationship between increased exercise and reduced anxiety sensitivity and reactivity to stress. Exercise trials have also been effective for reducing daytime dysfunction and poor sleep quality in older adults [22]. Findings in the present study not only corroborate this work, but also provide evidence that reductions in psychological distress through exercise training may also influence QoL.

This has significant implications for implementing physical activity recommendations at the clinical level for older adults in an effort to improve well-being without the use of medications or other more costly, standard treatments. Indeed, Barbour & Blumenthal [54] found physical activity to be more effective than wait-list or social contact controls and antidepressant medications. The current findings suggest that physical activity may not only be effective in reducing negative symptomology (e.g., depressive and anxiety symptoms), but also may improve global QoL. Importantly, providers may recommend daily walking over medication, an option that is low in both risk and cost but high in psychological reward.

Previous research has suggested generally positive psychological factors, such as self-efficacy, self-esteem, and positive affect, influence older adults' appraisals of satisfaction with life and mediate the relationship between physical activity and QoL [12,13]. Global QoL is defined as preponderance of positive affect over negative affect [55], and our findings suggest that reductions in negative psychological factors (e.g., depression, anxiety, sleep dysfunction, perceived stress) may also influence older adults' perceptions of life satisfaction and explain physical activity's effects on QoL. Further, reductions in negative psychological factors may provide enough influence to improve perceptions of QoL in the absence of improvements in positive psychological factors. Importantly, such physical activity programs may be leveraged to simply help individuals feel “less bad” for overall improvements in QoL. However, more research testing psychological distress in concert with positive psychological factors, such as self-efficacy, self-esteem, and positive affect, is needed to further understand the independent contribution of reductions in distress through exercise training on improvements in QoL.

Of further interest is the consistency of these findings across exercise conditions. Our findings suggest that a variety of exercise modalities (e.g., aerobic walking, dance, anaerobic stretching and strengthening) may have the capacity of eliciting enough of an influence on psychological distress to benefit QoL. However, reductions in psychological distress in the current study were explained by increases in MVPA. Thus, those individuals who increased their aerobic activity (e.g., accelerometer-derived MVPA) reported benefits to their psychological health and QoL. While a majority of the evidence for exercise benefits on mental well-being in older adults is comprised of aerobic interventions, there is work suggesting alternative exercise modes such as yoga or dance may provide similar reductions in negative symptomology such as anxiety and depression [56,57]. Similarly, strength training in adults has also been associated with improvements in mood states [57]. It may serve older adult populations to further explore the influence of not only alternative exercise modalities, but also intensities (e.g., substituting light physical activity for sedentary behavior), rather than focusing primarily on MVPA. Future work should continue to investigate if differential effects of exercise mode, intensity, and frequency exist for influencing psychological distress and subsequently QoL in older adults.

Future research is also warranted to explore the potential utility of different delivery platforms, such as DVD-delivery or web streaming, allowing researchers to target those individuals who are unable to attend regular physician's appointments and/or participate in a traditional center-based program. Notably, these individuals may be most in need of health intervention due to disability, social isolation, and/or clinical levels of depression/anxiety. A previous home-based (i.e., non-social) program has demonstrated the ability to improve positive affect in older adults [58] while another found decreased negative symptomology after controlling for group support [59], suggesting that the physical activity stimulus may be sufficient for benefiting mental health. However, more work is warranted to determine the additional influence of social environments on these constructs.

This study has several strengths. First, the conceptualization of psychological distress as a latent construct is a unique approach that allowed for identification of like factors that worked in concert to exert influence on QoL. Past research has primarily examined these factors independently [60–62], and while these are indeed separate constructs with meaningful distinctions between them, it has been suggested that common causes, and therefore common targets for interventions, may underlie them [63]. Thus, examining them in tandem in the context of an exercise intervention is worthwhile. Second, the present findings highlight the important role of psychological distress in the relationship between physical activity and QoL in older adults, and provide insight into the relationship between exercise training and healthy aging in later life. Further, we believe this to be the first study, to our knowledge, to explore the role of psychological distress in the association between physical activity and QoL in older adults. Finally, MVPA was measured using accelerometers, an objective, reliable method for capturing physical activity data.

However, there are a number of limitations that should be considered when interpreting the data. The present sample was primarily female, Caucasian, and highly educated, limiting the generalizability of the findings. However, the present sample had a generally healthy psychological health profile and still demonstrated positive effects suggesting exercise may

be beneficial for reducing negative symptomology and improving QoL in those without clinical psychological diagnoses. Future researchers would benefit from targeting more diverse individuals, both demographically and psychologically, to determine if the results found herein can be replicated. Additionally, we did not test the mediating effect of psychological distress independently of positive affect constructs such as self-efficacy and self-esteem. However, Rejeski and Mihalko [12] have noted it is near impossible for researchers to simultaneously examine all of the dimensions that have now become associated with QoL in older adults. As such, there may indeed be other factors not included in this study that relate and work in concert to mediate the physical activity-QoL relationship. More work defining the psychological distress construct, as well as its contrasting positive factors and other potential mediators of this association, is warranted.

In conclusion, these findings provide promising preliminary support for the role of psychological distress as a mediator between physical activity and QoL in older adults. Notably, MVPA may be a useful modality for future work aimed at targeting those individuals most in need of health intervention. As the demographic landscape of the United States continues to shift and individuals progressively age, the number of adults living with the consequences of older adulthood and worsening QoL will continue to increase, thus making it imperative to understand the mechanisms by which healthy lifestyle behaviors can preserve older adults' QoL.

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Figure 1. Standardized factor loadings and residuals

A1=Pre-Anxiety; A2=Post-Anxiety; D1=Pre-Depression; D2=Post-Depression; S1=Pre-Stress; S2=Post-Stress; DD1=Pre-Daytime Dysfunction; DD2=Post-Daytime Dysfunction

Coefficients reported herein are standardized loadings and residuals.

All *ps* significant at $< .001$

Figure 2. Hypothesized structural model of indirect effect of changes in MVPA on QoL via reductions in psychological distress

^aSignificant indirect effect of MVPA on QoL [indirect effect = 0.05; bias-corrected bootstrapped 90% CI=.005, .125]. Coefficients reported herein are unstandardized estimates.

* significant at $p=.05$

** significant at $p=.001$

Table 1**Sample characteristics**

	N (%)	
	M	± SD
Age (years)	65.39	± 4.56
Female	169	(68.4)
Body Mass Index (kg/m ²)	30.98	± 5.58
Race		
White	207	(83.8)
African American	32	(13.0)
Asian	8	(3.2)
Education		
Non-college graduate	102	(41.3)
College graduate	145	(58.7)
Marital Status		
Married	146	(59.1)
Partnered	6	(2.4)
Single	30	(12.1)
Divorced/Separated	36	(14.6)
Widowed	29	(11.7)

M = Mean, SD = Standard Deviation

Table 2
Pre- and post-intervention values for physical activity, psychological distress, and quality of life

	Baseline (<i>n</i> =247)		Month 6 (<i>n</i> =210)	
	M	± SD	M	± SD
MVPA (min) ^a	45.45	± 30.49	55.30	± 28.51
Psychological Distress				
Anxiety ^a	4.02	± 2.88	3.42	± 2.73
Depression	4.17	± 3.08	3.74	± 2.87
Daytime Dysfunction	0.80	± 0.65	0.76	± 0.66
Stress ^a	11.96	± 6.11	10.57	± 5.83
Satisfaction with Life	25.21	± 6.71	25.99	± 6.08

M = Mean, SD = Standard Deviation

^aDenotes significant time effect, all *p* < 0.02