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Developing Predictors of Long-Term Adherence to Exercise Among Older Veterans and Spouses

Candace S. Brown^{1,2,3}, Richard Sloane^{3,4}, Miriam C. Morey^{3,4,5}

¹University of North Carolina at Charlotte, USA

²Duke University, Durham, NC, USA

³Durham VA Health Care System, NC, USA

⁴Duke Center for the Study of Aging and Human Development, Durham, NC, USA

⁵Duke University School of Medicine, Durham, NC, USA

Abstract

Behavior change theory was used to explore predictors of long-term adherence (2 years) to exercise. A retrospective analysis of data from participants ($N = 97$) who reached a 6-month follow-up, which served as the baseline, was evaluated for completion of yearly follow-up surveys. Variables examined at baseline, which included age, race, gender, body mass index (BMI), and self-report of comorbidities, symptoms, physical function, and a Barriers Specific Self-Efficacy Scale, were examined with significance set at $p < .05$. Lower BMI (29.1 ± 5.1 vs. 31.6 ± 6.5 , $p = .047$) and higher self-efficacy to overcome environmental barriers ($p = .016$) and social isolation ($p = .05$) were associated with long-term adherence. Self-efficacy to overcome environmental and social barriers, such as inclement weather, access to exercise site, and opportunities for group-based exercise, should be addressed to promote long-term adherence to exercise among older adults.

Keywords

physical activity; adherence; aging; veterans; physical function

The benefits of regular physical activity (PA) are well established in older populations. It is recommended that older adults achieve at least 150 to 300 min of moderate intensity PA and 2 days of muscle-strengthening activities throughout the week. Older adults unable to do 150 min per week are encouraged to do as much as they can (U.S. Department of Health and Human Services, 2018). With only 54.0% and 23.2% of older adults achieving the recommended minutes of endurance and muscle-strengthening activities, respectively,

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Corresponding Author: Candace S. Brown, Department of Public Health Sciences, University of North Carolina, Charlotte, 9201 University City Blvd, CHHS 423C, Charlotte, NC 28223, USA. cbrow342@uncc.edu.

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behavioral research has attempted to understand factors related to PA adherence among older people (Centers for Disease Control and Prevention, 2015).

Behavior change theory for PA suggests that the initiation phase lasts about 6 months with 6 months serving as the benchmark for transition to maintenance (Prochaska & Di Clemente, 1982). Most PA research focuses on the initiation phase and does not extend beyond 1 year (Conn, Hafdahl, & Mehr, 2011). The literature suggests that 48% of older adults drop out within the first 6 months and barriers to PA within this timeframe have been previously described (Morey et al., 2002; Van Roie, Bautmans, Coudyzer, Boen, & Delecluse, 2015).

However, little research has examined factors of long-term adherence of PA past 1 year (Janssen, Dugan, Karavolos, Lynch, & Powell, 2014). To our knowledge, no one has explored predictors of long-term adherence (≥ 2 years) by examining characteristics of individuals already reaching the 6-month “maintenance” phase. The purpose of this study was to explore characteristics that might serve as potential predictors of long-term adherence (≥ 2 years) among participants in a supervised exercise program who had participated for at least 6 months.

Method

Training Program

Gerofit, an ongoing supervised exercise program for older veterans, was established at the Veterans Affairs Medical Center (VAMC), in Durham, NC, in 1986 (Peterson, Crowley, Sullivan & Morey, 2004). Older veterans are referred to Gerofit by their primary care provider and must have stable health and be able to function independently, physically, and cognitively, in a group setting. Spousal participation is encouraged to support program adherence. The program has served as a free clinical service, since 1986, with supervised exercise sessions offered 3 days per week year round. Participants are encouraged to stay in the program if they wish, but are moved to inactive status, that is, drop out, following 2 months of unexplained absence. Sessions are divided into two groups of approximately 60 to 75 participants. Program enrollment occurs on a rolling basis with all participants performing a battery of assessments upon enrollment, at 3 and 6 months, then annually (Morey et al., 2002). Exercise health professionals lead group exercise classes (e.g., Tai Chi, balance, and core strengthening) and monitor personalized aerobic and muscle strengthening activities directed at improving functional deficits identified by the assessments and meeting national PA guidelines. In addition to providing ongoing exercise guidance, each exercise prescription is individually tailored and updated following the functional assessment.

Sample.—The sample for this study was created from Gerofit participants ($n = 77$ veterans) and spouses ($n = 20$) who enrolled or were already active in the program between 2009 and 2016 when the functional assessment was instituted, and who reached the 6-month follow-up. Characteristics of the sample at 6 months served as the baseline predictors of adherence. Individuals completing assessments at 2 years or beyond were considered long-term adherers to exercise. All Gerofit participants provided written consent to have their clinical data entered into a research database for future investigations. The Durham VAMC

institutional review board reviewed and approved the protocol annually (MIRB# 02021/0027).

Measures

Gerofit staff collected demographic information including age, race, and gender from the medical record upon enrollment. All other information, including direct measure of body mass index (BMI), was collected as part of the routine assessment (6 months and annually thereafter).

Gerofit Comorbidities Index.—The Gerofit Comorbidities Index is a modified version of the functional subscales of the Older Americans Resource Survey (Fillenbaum, 1988). It consists of a checklist of 37 conditions and eight symptoms where a checked “yes” or “no” represents the presence or absence of the conditions and symptoms at the time of the survey.

Short Form Survey Physical Function Subscale.—The Short Form Survey (SF-36) Physical Function Subscale (PFS) is a 10-question survey which asks whether present health status limits ability to perform a variety of functional tasks ranging from vigorous exercise to bathing and dressing. Answers are scored on a Likert-type scale from 1 point (“Yes, limited a lot”) to 3 points (“No, not limited at all”) to obtain a total score (min = 0; max = 100) which is scaled to its relative range. A higher score equals better function. The PFS has excellent internal consistency with Cronbach’s alpha .90 (Bohannon & Depasquale, 2010).

Barriers Specific Self-Efficacy Scale.—The Barriers Specific Self-Efficacy Scale (BARSE) is a 13-item survey which assesses self-efficacy (i.e., confidence) to exercise three times a week when challenged by potential barriers. Each statement is scored on a 100-point percentage scale, with 0 indicating no confidence and 100, highly confident. When used in a study with older adults, internal consistency was excellent at $\alpha = .97-.98$ (McAuley et al., 2011). The 13 items were grouped into four discrete categories (Table 1): environmental, social, psychological, or personal barriers (Biedenweg et al., 2014; Schutzer & Graves, 2004; Stone & Baker, 2017).

Statistical Analysis

The data ($N = 97$) were analyzed using SAS (version 9.4) software system, using the level of significance threshold set at $p < .05$. Using their 6-month assessment data as baseline, participants were classified as long-term adherers if they completed a subsequent assessment at 2 years or beyond. Short-term adherers did not complete any assessments at 2 years or beyond. Factors were compared by adherence status (<2 years vs. 2+ years) using *t*-tests for continuous variables and chi-square tests for categorical variables. Characteristics of long-term adherers, regular versus sporadic, were examined.

Results

Reported results are presented in Table 2. There were 97 (77 veterans and 20 spouses) participants with ages ranging between 55 and 87 (mean age = 70.2 ± 8.6) years. Two-thirds of the sample (68%) met criteria as long-term adherers with years of participation ranging from 2 to 22 years. Only two of the 33 individuals meeting criteria as short-term participants

made it to a 12-month follow-up. The majority of study participants (51%) had a calculated BMI that was categorically obese; but long-term adherers had a slightly lower BMI ($p = .047$) than short-term adherers. There were no differences in physical function, and the number of comorbid conditions and symptoms by adherence status. Because the overall BARSE score was significant ($p = .033$), we evaluated each BARSE category separately. The ability to overcome environmental ($p = .016$) and social ($p = .05$) barriers was predictive of long-term adherence. Among long-term adherers, 38 performed all the annual assessments, 24 only missed one assessment, and four had irregular assessment patterns during the 7-year observation period. There were no significant differences in any of the examined predictors between those who did not miss any assessments and all others.

Discussion

To our knowledge, we are the first to examine long-term adherence to exercise once individuals successfully transition beyond what is considered the initiation phase. To examine factors associated with long-term adherence to exercise, we used data from a longstanding exercise program. We expected that adherence would be associated with higher self-confidence and physical function, and a lower number of comorbidities. To our surprise, physical function and comorbidity were not associated with long-term adherence in contrast to what is often observed in the literature (Findorff, Wyman, & Gross, 2009; Morey et al., 2002). It is possible that because we established the baseline at 6 months, these factors were not associated with long-term adherence but are likely associated with retention or attrition during the initiation phase as has been reported previously (Cowper et. al, 1991). An innovation of our study was the use of the BARSE survey and its categories of barriers as potential predictors of adherence. Our results confirmed that high self-confidence to overcome environmental and social barriers is an important determinate of long-term adherence. In addition, in this sample of largely obese adults, having a slightly lower BMI made a difference.

The current findings had several limitations. The study was conducted on a veteran sample; and even though spousal participation is encouraged, few take advantage of this benefit. Since there were only 20 women (18 spouses and 2 veterans), we did not perform gender-specific analysis and therefore cannot generalize these findings to the general population. Another limitation is that we have no psychometric validation of the BARSE categories since this is the first study to separate them into categories.

While exploratory in nature, the novel idea to separate the categories, to potentially better identify barriers that have the most effect on self-efficacy, is likely important. Previous studies cite environment (Greenwood-Hickman, Renz, & Rosenberg, 2016; Mathews et al., 2010) as a perceived barrier to exercise among older adults. In this study, the technique of category separation led to identifying environmental and social barriers as most influential on the long-term adherence, thus supporting our perception of group support as an important factor. Although not statistically significant, and likely underpowered, psychological barriers tended to be lower among the long-term adherers and is worthy of additional research. We were underpowered to detect differences among the BARSE categories.

The fact that only two individuals reaching the 6-month follow-up went on to exercise through the 12-month assessment supports the validity of 6 months as a benchmark for maintenance. To our surprise, the usual predictors of adherence, such as age, race, comorbidity, and function, were not associated with long-term adherence, which suggests that these factors may be more associated with initiation of exercise rather than long-term adherence. Future research in this area using these variables as predictive models is warranted with a generalizable population. In addition, strategies to overcome environmental barriers, such as inclement weather, access to exercise location, and enhancing opportunities for group-based exercise, should be given greater consideration to promote long-term exercise adherence.

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Table 1.

Barriers Specific Self-Efficacy Scale Categorical Statements.

Environmental
The weather was very bad (hot, humid, rainy, cold).
It became difficult to get to the exercise location.
Social
I had to exercise alone.
An instructor does not offer me any encouragement.
Psychological
I was bored by the program or activity.
I was not interested in the activity.
I felt pain or discomfort when exercising.
It was not fun or enjoyable.
I didn't like the particular activity or program that I was involved in.
I felt self-conscious about my appearance when I exercised.
I was under personal stress of some kind.
Personal
I was on vacation.
My schedule conflicted with my exercise session.

Table 2.

Baseline Characteristics of Study Sample by Adherence Status.

Characteristics	All subjects	Short-term adherers	Long-term adherers	<i>p</i> -value
	<i>M (SD)</i> or % <i>N = 97</i>	<2 years <i>M (SD)</i> or % <i>N = 31</i>	2 years <i>M (SD)</i> or % <i>N = 66</i>	
Race, % White	63.9	61.3	65.2	.71
Sex, % Male	78.4	77.4	80.3	.74
Age (years)	70.2 (8.6)	69.5 (7.2)	70.5 (9.2)	.59
BMI	29.9 (5.7)	31.6 (6.5)	29.1 (5.1)	.047
No. of conditions	4.8 (2.9)	4.3 (2.5)	5.0 (3.0)	.28
No. of symptoms	2.8 (2.9)	2.8 (3.3)	2.7 (2.7)	.85
Physical Function (SF-36)	71.2 (22.3)	68.1 (23.5)	72.6 (21.8)	.37
BARSE Total	67.6 (25.8)	76.3 (20.7)	63.9 (27.0)	.033
BARSE Environmental	71.8 (25.5)	81.4 (19.4)	67.7 (26.7)	.016
BARSE Social	69.7 (29.7)	78.9 (27.4)	65.8 (30.0)	.05
BARSE Psychological	66.7 (27.8)	75.1 (22.8)	63.1 (29.1)	.055
BARSE Personal	64.6 (30.0)	71.4 (25.3)	61.7 (31.4)	.15

Note. BMI = body mass index; SF = Short Form Survey; BARSE = Barriers Specific Self-Efficacy Scale.