

## Physical function in sedentary and exercising older veterans as compared to national norms

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**Abstract**—We examined the associations between sedentary older veterans, those regularly involved in an outpatient exercise program and physical function. Sedentary and currently exercising older veterans performed a 30 s chair-stand test and 6 min walk test as part of an exercise program. Test results were then compared to national norms. The exercisers' test scores were not significantly different from the national averages. However, their mean 6 min walk score approached being significantly better than the national average ( $p = 0.095$ ). The sedentary group's scores were significantly lower ( $p \leq 0.05$ ) than the exercisers' scores and the national averages for both tests. In this cohort, older veterans who maintain a regular program of physical activity function at a level considered average or slightly above average compared to their age-matched peers, while sedentary veterans are significantly below average. Healthcare providers need to stress the importance of regular exercise to their older veteran patients.

**Key words:** aging, exercise, mobility, physical activity, physical function, sedentary, veterans.

### INTRODUCTION

Among older adults, regular physical activity positively affects an individual's ability to perform important daily tasks, such as rising from chairs and walking distances. The inability of older adults to perform such tasks can lead to reduced quality of life, injurious falls, greater dependence on caregivers, institutionalization, and premature mortality [1–3]. Exercise interventions have

focused on maintaining or improving functional mobility in hopes of delaying the onset of disability caused by sedentary behavior and/or chronic illnesses [4,5].

Veterans represent a segment of the population who may be at increased risk for mobility-related disorders and impaired functional status. The year 2000 Behavioral Risk Factor Surveillance Survey (BRFSS) was the first study wave to include a question regarding veteran status of the study participants. From these cross-sectional data, United States military veterans reported higher rates of chronic health conditions, such as arthritis and being overweight, than the general population. In addition, veterans had higher rates of both negative health behaviors and limitations in activities due to health [6].

A preponderance of evidence from the 1996 Veterans Health Study and the 1993 to 94 National Health Interview Survey shows that veterans utilizing (VA) Veterans

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**Abbreviations:** BRFSS = Behavioral Risk Factor Surveillance Survey, SD = standard deviation, VA = Department of Veterans Affairs, VAMC = Department of Veterans Affairs Medical Center.

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Affairs Medical Centers (VAMCs) have higher rates of self-reported poor health compared to the general population and veterans who do not use the VA for their healthcare [7,8].

Few published studies explore exercise interventions to improve the physical function of older veterans [9–11]. Veterans who use the VA facilities tend to be of lower socioeconomic status than the general population, and exercise interventions tend to be less effective among those of lower socioeconomic status [8,12]. Nevertheless, evidence suggests that older veterans can successfully participate in exercise interventions with promising results. Chandler and colleagues reported significant gains in functional mobility (measured by chair-rise performance, gait speed, transfers, and stair-climbing) among older veterans and other community-dwelling adults receiving a 10-week home-based strengthening intervention [13].

The VA in Durham, North Carolina, has Gerofit, an outpatient exercise program, for older veterans, established in 1986 [14]. Although the data derived from the Gerofit program are not based on a controlled clinical trial, numerous publications have reported positive changes among Gerofit program participants [10,15]. Program enrollment is ongoing, which places us in a unique position of being able to examine the functional mobility of older veterans who are newly enrolled (i.e., sedentary) and regular exercisers, and then compare them to recently published national norms [16]. Therefore, this exploratory study compared chair-stand and 6 min walk scores to national norms in a group of sedentary and regularly exercising older veterans.

## METHODS

### Participants

Participation in Gerofit is voluntary and enrollment is ongoing and continuous. VA healthcare providers refer participants, since Gerofit functions as an outpatient specialty referral clinic. Potential participants are informed of the requirement to provide their own transportation to exercise sessions, and so the large majority of participants are from Durham and surrounding areas. Before enrollment, all potential participants undergo an interview for risk and goal assessment, followed by a complete medical history and physical examination by a geriatrician. Exclusion from Gerofit is quite rare and is typically limited to those individuals with severe cogni-

tive impairment or serious mental health disorders precluding participation in a group setting.

Subjects for this study were newly enrolled or active male participants in the Gerofit program ( $N = 44$ ). Written consent for functional testing was obtained from all participants as part of an ongoing longitudinal study of program outcomes. This study is reviewed and approved yearly by the Durham VAMC Institutional Review Board.

Participants classified as “exercisers” were enrolled in Gerofit for a minimum of 6 months and attended an average of at least two exercise sessions per week. Newly enrolled participants (sedentary group) were generally inactive or not regularly active prior to being referred to Gerofit by their healthcare provider. For all newly enrolled participants, current activity levels are discussed at the baseline interview and assessment.

The attrition rate for the Gerofit program is approximately 50 percent after 6 months of participation. Gerofit does not currently systematically track participants who have “dropped out” of the program. However, in a previous study of VA patients who enrolled in the Gerofit program at its inception, Cowper et al. reported that 47 percent of the group (20 out of 43 participants) had dropped out of the program within 1 year [17].

Through a mail-in questionnaire, the following reasons for attrition were the most commonly cited by the former participants:

- Poor health (47%).
- Parking difficulties at the VA (47%).
- Time/scheduling conflicts (20%).
- Caring for ill family member/friend (13%) [17].

Additionally, previous studies have found no baseline differences in the presence of chronic diseases (heart disease, diabetes), presence of cancer, smoking status, or aerobic fitness between those who regularly participated in Gerofit for the first 6 months and those who were not regular participants and/or dropped out in the first 6 months [15].

### Gerofit Program

The Gerofit program meets 3 days a week, with participants exercising for 60 to 90 minutes per session. A typical exercise session consists of 10 minutes of warm-up exercises, 20 to 40 minutes of aerobic exercise, 15 to 20 minutes of strengthening exercises, and 20 minutes of floor exercises designed to focus on musculoskeletal strengthening, flexibility, balance, and coordination.

Each participant's exercise prescription is written and adapted from this general program based on chronic and acute conditions, the participant's functional strengths and weaknesses, and the participant's personal exercise goals.

### Functional Mobility

For this study we examined two physical performance tests, the 30 s chair stand and the 6 min walk distance. The protocols used were those described by Rikli and Jones and are the same used for the derivation of the national norms [16,18]. When compared to Gerofit participants, the men in the validation group were very similar in age (validation group  $72.6 \pm 6.6$  years vs. Gerofit group  $72.9 \pm 6.9$  years) and height (validation group  $177.0 \pm 7.4$  cm vs. Gerofit group  $177.7 \pm 7.4$  cm), were somewhat less heavy (validation group  $83.1 \pm 16.6$  kg vs. Gerofit group  $89.1 \pm 16.3$  kg), and were community-dwelling older adults, as are Gerofit participants.

The 30 s chair stand is a proxy measure of lower-body strength, where each person performs as many full chair stands as possible in 30 s. The 30 s chair stand has been shown to be reliable and has been validated against the leg-press test, which is the gold standard measure for lower-body strength. Rikli and Jones reported an intraclass reliability correlation of 0.89 for the 30 s chair stand and a criterion validity correlation of 0.77 with the one-repetition maximum leg-press test [18]. The unit of measurement is the number of full stands performed in 30 s.

The 6 min walk is a measure of cardiorespiratory endurance and has been validated against treadmill tests of cardiorespiratory endurance (time to attainment of 85% maximum heart rate), with a criterion validity correlation of 0.78. The 6 min walk test has also shown excellent intraclass reliability, with a reported correlation of 0.94 [19]. For this test, each person walks as far as possible in 6 min on a preselected course thoroughly explained prior to the start of the test. The tester informs the individual of each elapsed minute and time remaining. At the end of the 6 min, the individual continues walking at a slower pace for 2 to 3 min to allow for a proper cooldown period. The unit of measurement is the number of yards walked during the 6 min time period.

### National Normative Data

Normative data for the 30 s chair stand and the 6 min walk have been published recently. The norms are reported as percentiles, where the fiftieth percentile would equal the

mean, or national average, and are also reported as age and sex-matched individuals ranging from ages 60 to 94, divided into 5-year groups [16]. For this study, because of sample size limitations, we compared our sedentary and exercising Gerofit participants to the entire cohort used to develop the normative data for men. The normative sample is nationally representative of community-dwelling older adults, and the validation and description of the normative data have been published previously [16,18].

### Data Analysis

Physical characteristics and test scores are reported as mean  $\pm$  standard deviation (SD). We performed a one-sample *t*-test comparison using the SAS Process *T*-Test (SAS Institute, Cary, NC)  $H_0$  (null hypothesis) = "national norm" statement to compare single mean national averages to Gerofit sedentary and exerciser group participants' mean test scores. Independent *t*-tests determined significant mean differences between sedentary and exerciser groups. Significance was set at  $p \leq 0.05$ . We performed all statistical analyses with SAS version 8E software.

## RESULTS

The physical characteristics of the older veterans in this study are described in **Table 1**. No significant differences exist between the sedentary and exerciser groups in any of the physical variables, although the sedentary group mean weight difference of  $\pm 3.5$  kg compared to the exercisers is clinically significant [20]. **Table 2** displays the 30 s chair-stand and 6 min walk scores for the combined, sedentary, and exerciser groups compared to the national norms. The combined group was statistically lower ( $p \leq 0.05$ ) than the national averages for both the 30 s chair stand and the 6 min walk, as was the sedentary group to a greater extent. However, the exerciser group was not significantly different from the national norms in either test. In fact, the exercisers' 6 min walk mean score approached being statistically higher than the national norm ( $p = 0.095$ ).

## DISCUSSION

This study provides evidence that older veterans who engage in a regular program of exercise maintain a level of physical functioning that is at or above the age norm.

**Table 1.**Physical characteristics of men enrolled in Gerofit program (mean  $\pm$  SD).

Characteristic	Combined	Sedentary	Exerciser
<i>N</i>	44	21	23
Age (yr)	72.9 $\pm$ 6.9	73.3 $\pm$ 6.7	72.6 $\pm$ 7.2
Height (cm)	177.7 $\pm$ 7.4	178.5 $\pm$ 7.9	176.9 $\pm$ 7.1
Weight (kg)	89.1 $\pm$ 16.3	91.0 $\pm$ 15.6	87.5 $\pm$ 17.1
BMI (kg/m <sup>2</sup> )	28.2 $\pm$ 4.5	28.5 $\pm$ 4.6	27.8 $\pm$ 4.6
<i>N</i> = number	SD = standard deviation		

**Table 2.**Scores for 30 s chair-stand test and 6 min walk national average and combined, sedentary, and exercising veterans (mean  $\pm$  SD).

Group	<i>N</i>	30 s Chair Stand (No. of Stands)	6 Min Walk (yd)
National Average	2,135	14.2 $\pm$ 4.6	587.0 $\pm$ 130.0
Combined	44	12.5 $\pm$ 5.2*	561.8 $\pm$ 153.1*
Sedentary	21	10.5 $\pm$ 5.5*†	486.2 $\pm$ 151.7*†
Exercisers	23	14.3 $\pm$ 4.3	630.8 $\pm$ 120.3
*Significantly different from national average ( $p \leq 0.05$ ).		†Significantly different from exercisers ( $p \leq 0.05$ ).	<i>N</i> = number

Conversely, sedentary veterans function significantly below the norm. To our knowledge, this study is the first to compare the association of fitness status and functional mobility in older veterans. Veterans are known to have higher rates of some chronic health conditions and deficient health behaviors (higher rates of current smokers, former smokers, and overweight) than nonveterans [6]. A recent analysis of the BRFSS data, which was limited to men over age 70 (unpublished data), found that approximately 30 percent of inactive older veterans reported a significantly higher prevalence of diabetes and had significantly higher body mass indexes than those veterans reporting being at least irregularly active ( $p \leq 0.05$ ). Additionally, more inactive older veterans reported having poor overall health than active older veterans ( $p \leq 0.05$ ). Thus, a sedentary lifestyle is associated with many levels of poor health in older veterans.

Participants of Gerofit classified as exercisers performed at a level that would be considered at minimum "average," i.e., at or above the fiftieth percentile, for their age in both the number of chair stands completed and the distance walked in 6 min. The exercisers performed a mean of approximately 14 chair stands, which places their national normative score at the fiftieth percentile for the 70 to 74 age group. Even more notable, their mean distance walked of 631 yd in 6 min is at approximately the sixtieth percentile of the national norms for the same age group. A walking distance of less than 360 yd would

place an individual at risk for loss of functional mobility, according to criterion performance scores developed by Rikli and Jones [21]. An "average" score allows an individual to perform daily tasks at a level well below their peak capabilities. As such, daily tasks can be carried out without undue fatigue.

Gerofit participants classified as sedentary scored significantly below the national average for lower-body strength and cardiorespiratory endurance. Their average test scores placed them at approximately the fifteenth percentile for lower-body strength and the tenth percentile for cardiorespiratory endurance. The American College of Sports Medicine reports that a person who is 60+ years old in the tenth percentile for cardiorespiratory endurance has a peak  $\dot{V}O_2$  (peak volume of oxygen utilized per unit of body weight) of 23.0 mL/kg/min [22]. Based on these data, the average sedentary veteran in his early 70s is near the minimum threshold of cardiorespiratory endurance (18 to 20 mL/kg/min) that allows an individual to function without limitations or dependency for some activities of daily living [16,23,24].

The sedentary group's lower-body strength is poor enough to warrant concern if these results can be generalized to the older veteran population. Guralnik et al. reported that 22 percent of older adults were not able to perform the required number of five chair stands for the Established Populations for Epidemiologic Studies test battery [25]. Similarly, in our sedentary group, approximately

20 percent were not able to perform at least five chair stands. Guralnik et al. also found that poor lower-limb functioning was predictive of nursing home placement and mortality [25]. It is plausible that Guralnik et al. findings extend to older veterans and that engaging in a regular program of exercise can help improve lower-body strength and lower-limb function and, in turn reduce the risk of institutionalization and mortality. In fact, the Gerofit program has shown a significant impact on the 10-year mortality of participants who regularly participate in the program for a minimum of 6 months compared to those who drop out in the same time period [15].

Future studies warrant examining the effect of exercise on function, disability, institutionalization, and mortality, with suitable representative samples of the general older veteran population in a nonclinical setting. Notwithstanding, healthcare providers need to be vigilant in recommending that their older veteran patients engage in a regular program of physical activity to battle the deleterious effects of a sedentary lifestyle.

This study addresses the important role of regular exercise in maintaining the physical function of older veterans. Several limitations to this study need to be brought forward for the reader. First, we were not able to control for several independent variables known to be associated with functional mobility. Namely, chronic and acute illnesses and levels of disability were not available at the time of these analyses. Future studies should attempt to control for these variables to ascertain the independent association between regular exercise and functional mobility in older veterans. Second, the participants of Gerofit are provider-referred, and selection bias could be an issue with these data. Third, these results are not from a randomized controlled study. Because of this, we have no control or cohort from which to compare our data and results. However, the use of observational data such as these is beneficial to the medical and research community, as evidenced by several previous Gerofit publications [10,15,26]. Fourth, these data do not necessarily represent the national older veteran population and should not be interpreted as such. In fact, veterans receiving care at VA facilities, such as those enrolled in Gerofit, have more medical conditions and are in poorer health than non-VA veterans [8]. Last, our sample size may not adequately eliminate Type II errors when the data are interpreted. It is highly plausible that a more robust sample size would have shown more insight into these analyses.

## CONCLUSION

Within this sample, older sedentary veterans' functional mobility is significantly below the national average for lower-body strength and cardiorespiratory endurance. Older veterans within this sample who regularly engage in a comprehensive exercise program for a minimum of 6 months are functioning at or slightly above the national average for lower-body strength and cardiorespiratory endurance. These data support the beneficial effects of exercise on physical functioning in older veterans. Clinicians are encouraged to promote a regular, long-term program of exercise to their sedentary older patients.

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