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Assessing physical and cognitive function of older adults in continuing care retirement communities: Who are we recruiting?

Abbie P. Wrights, MS¹, Christie W. Fain, BS¹, Michael E. Miller, PhD², W. Jack Rejeski, PhD¹, Jeff D. Williamson, MD³, and Anthony P. Marsh, PhD¹

¹ Department of Health and Exercise Science, Wake Forest University

² Department of Biostatistical Sciences, Wake Forest School of Medicine

³ Department of Gerontology and Geriatric Medicine, Wake Forest School of Medicine

Abstract

Purpose—In partnership with six Continuing Care Retirement Communities (CCRCs), the current study focused on the feasibility of recruiting a representative sample of residents and then assessing their functional health.

Material and Methods—With our guidance, each of the six CCRCs recruited a volunteer (V-Group) and random (R-Group) sample of independent living residents. We provided face-to-face training and ongoing remote electronic support to the CCRC staff on the testing battery and the web-based data entry system. The testing battery was consisted of demographic, physical function, and psychosocial assessments.

Results—After training, CCRC staff were receptive to the study goals and successfully used the data entry website. In the V-Group (N=189), 76% were already participating in CCRC wellness programs. We attempted to recruit a random, unbiased (R-Group) sample of 20% (n=105) of eligible residents; however, only 30 consented to be tested and 70% of this group (21/30) was also already participating in a wellness program. Mean age of all participants was 82.9 years. The V-Group had a higher Short Physical Performance Battery (SPPB) total score (least squares mean[SE], 9.4[0.2] vs 8.2[0.4], p=0.014) and SPPB gait speed component score (3.5[0.1] vs 3.0[0.2], p=0.007) and spent more time doing moderate-to-vigorous physical activity (300[21] vs 163[49] min/week, p=0.013) compared to the R-Group.

Implications—While it is feasible to recruit, assess and transmit data on residents' functional health in partnership with CCRCs, population validity was severely compromised. Attention needs to be given to the development of more effective methods to recruit less interested residents.

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Address Correspondence to: Anthony P. Marsh, PhD Wake Forest University, Health and Exercise Science Department PO Box 7868, Winston-Salem, NC 27109 Phone: 336-758-4643; Fax: 336-758-4680; marshap@wfu.edu.

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Keywords

Recruitment; Physical function assessment; Translational research; Older adults

Introduction

The number of adults in the United States over the age 65 increases by nearly six million persons annually, a growth rate that will accelerate over the next several decades. As of 2012, older adults represented 13.7% of the entire US population [1] and estimates suggest that by 2040, the population of older adults will increase to ~80 million [1]. The fastest growing segment consists of persons aged 85 and older—those at the highest risk for physical disability [1, 2].

Many older adults are now choosing to move into continuing care retirement communities (CCRCs) while they are still independent, in part to eliminate the burden of maintaining their own home, but primarily to reduce or eliminate uncertainty as to who and where their care will be provided near the end of life or should they become disabled [3-7]. CCRCs typically provide a broad range of social activities as well as comfort, security, and may allow older adults to stay independent for as long as possible [3, 4, 8]. Adequate physical and cognitive function are critical to maintaining residents' independence, particularly in the absence of a spouse or caregiver. When older adults are no longer able to perform basic and instrumental activities of daily living, CCRCs facilitate transition to assisted living or skilled nursing levels of care on the same property [3, 4, 8]. In fact, self-reported functional status is a predictor of change in level of care within a CCRC [9].

Given the growing importance of CCRCs as a residential choice for older adults, it is important to consider if the structure and services provided are favorable for promoting successful aging as compared to choosing to live independent in the community. Benjamin et al. [10] examined existing literature and identified a number of organizational barriers within long-term care facilities to physical activity including: 1) programs are often one size fits all and not tailored to the residents' needs [11], 2) lack of standardization regarding instructor qualifications [11], 3) family members expect residents to be "waited on" leading to a reduction of physical activity, e.g., overuse of wheelchairs [12], and 4) poor staffing ratios [13]. CCRCs are understudied compared to nursing homes in spite of the fact that they continue to gain in popularity as a long-term living option for older adults. There is a need to understand the functional characteristics of CCRC residents that might guide the development of the CCRC environment to enhance function and quality of life [4].

Despite these caveats, the greater oversight and community of caregivers in CCRCs provides a unique opportunity to track physical and cognitive function across time and ultimately develop and test interventions that target both physical and cognitive function relative to older adults residing in the community-at-large [14-18]. Such research is critical to identifying and overcoming barriers to the implementation of physical activity and promoting programs that are designed to sustain independence in CCRCs.

The aim of the current study was twofold: 1) to assess the feasibility of recruiting and implementing a program to assess physical and cognitive function of CCRC residents in partnership with a group of CCRCs in the Southeast managed by a single entity; and 2), to assess the functional characteristics of a “typical” volunteer sample and a randomly selected sample of CCRC residents. As part of this endeavor, we examined the feasibility of training on-site staff in functional assessment methods and of collecting data remotely using a web-based data entry system.

Material and Methods

Overview

Participants in this study were recruited from six sites owned by the same entity; the demographic at each site was similar. Sites had an average of 107 independent living residents (range: 50-160), with a mean age of 83.7 ± 4.0 years (range: 77.8-86.7 years), were 71% female (range: 58-75%), <1% black, and had 1-2 wellness staff. Participants resided in the independent living sections of each CCRC, meaning they were able to live and function independently in their own home or apartment on CCRC property. To participate, a resident was required to meet just three inclusion criteria, 1) be able to stand without the assistance from another person, 2) not have been hospitalized in the past 2 weeks, and 3) be residing in independent living at the time of testing. The protocol was approved by the Wake Forest University (WFU) Baptist Medical Center Institutional Review Board and each participant provided written consent before participating.

Initially, we recruited residents using flyers posted in the CCRC and solicitation of the wellness or activity director at each site. This sample was considered a volunteer sample (V-Group). To account for some of the healthy volunteer effect associated with this form of recruitment [19] and to determine how a random sample might differ, we also approached a randomly generated sample of 20% of the residents at five of the six facilities (one site had a limited number of residents, many who had already participated in our V-group) for participation by using a list of independent living residents (R-Group). We excluded those residents already in the V-Group. Individualized letters were sent to each person identified for recruitment to the R-Group. The wellness or activity director at each site followed-up with each resident to answer any questions about the program and, if they were interested in participating, to schedule a testing visit.

Measures

The study assessment battery required approximately ninety minutes to complete and included self-report and performance-based measures. If the resident did not have time to complete the full battery or became fatigued, they were scheduled to return on a separate occasion to complete the remaining measures.

The WFU study staff member, a licensed American College of Sports Medicine Exercise Specialist, provided detailed training for the wellness or activity director of each CCRC on how to administer the testing battery to ensure all testing was conducted in a standardized manner across sites. Face-to-face training on the testing battery and data entry website

occurred at four of the six sites. We were unable to train on-site at two CCRCs due to travel logistics, so training was done via teleconference. During the training session, the WFU staff member explained the correct use of and protocol for all paper forms, computer tests, and physical function measures. The CCRC staff member completed practice sessions on all measures and detailed feedback was provided. During the data collection period at each site, the WFU staff member provided ongoing phone, email, or in person support to the CCRC staff member on an as needed basis. At the end of each day, the WFU staff member reviewed the database for completeness and errors. At the completion of testing at each site, each participant was sent a report of their physical function and cognitive test results. The CCRC staff member was encouraged to review this feedback sheet with the participant.

Self-report measures were used to obtain age, sex, race, cognitive status, depressive symptoms, physical activity participation, physical function, and presence of chronic disease for each participant. This information was collected using the web-based data collection system. The participant used a touch screen monitor to answer the standardized questionnaires that could be adapted for computer-based administration. Otherwise the information was collected using traditional pen and paper methods, e.g., cognition and physical function assessment, and then the data were input into the data collection system. Height and body mass and body mass index (BMI) was calculated. Cognition was assessed using the Folstein Mini-Mental State Exam (MMSE) [20] and depressive symptoms were assessed using the short form of the Center for Epidemiologic Studies Depression Scale (CES-D) [21]. The Community Health Activities Model Program for Seniors Questionnaire (CHAMPS) was used to assess self-reported moderate-to-vigorous physical activity (MVPA) [22]. Self-reported physical function was assessed with the Mobility Assessment Tool (MAT) [23], a 78 item computer based assessment of mobility using animated video clips, which cover a broad range of tasks. Each item is accompanied by an animated video clip together with the responses for that question (number of minutes, number of times, yes/no). The test was completed on a laptop and scores are saved to an exportable file. The time required to do the test with instructions from the examiner was ~30 min.

Lower extremity physical function was assessed using the Short Physical Performance Battery (SPPB) is a standardized measure that assesses standing balance, usual gait velocity over a 4-m course, and the time to sit down and rise from a chair 5 times as quickly as possible [24]. Each task is scored on a scale of 0 to 4, with 0 indicating the inability to complete the task and 1-4 indicating the level of performance. The total SPPB score ranging from 0 (lowest function) to 12 (highest function) was calculated by adding the scores for the three components. The SPPB scale predicts institutionalization, hospital admission, mortality, and disability and is widely used to identify older individuals with compromised levels of lower extremity function who are “at-risk for mobility disability” [24-27]. Intraclass correlation coefficients for the SPPB range from 0.88 to 0.92 for measures made 1 week apart [28].

The 400-m Walk Test (400MWT) is a modified version of a self-paced walk test that was developed by Newman and colleagues [29]. Participants were timed while they walked 10 clockwise laps around a 40-m indoor course as quickly as possible without sitting or the help

of another person. Participants were allowed to rest in place and were given a maximum of 15 min to complete the 400-m walk.

Finally, grip strength was assessed using a Jamar hand held dynamometer. Grip strength was not tested if the participant had any recent flare-up of pain or arthritis or if they had any surgery on their hands or wrists in the past three months. Two trials were performed on both the left and right hand. The participant was given one practice trial and then was instructed to squeeze as hard as they could and keep squeezing until they were instructed to stop. Maximum grip strength was recorded in kilograms and the best performance was used to assess grip strength.

Means and proportions were used to summarize the demographic characteristics, as well as the physical, and psychological function of the V- and R-Group. We used general linear models for continuous outcomes with Group and Site as fixed effects, testing first for an interaction between Group and Site. If the interaction term was not significant, it was removed, so that only main effects were included in the model. Chi-squared tests were used for categorical variables to perform simple comparisons between the V- and R-Groups on these characteristics.

Results

We tested 189 independent living residents in the V-Group across the six sites (Table 1). For the R-Group, we contacted a total of 130 residents across 5 sites from a randomly generated list of persons, excluding those already in the V-Group, to obtain 105 eligible residents. Reasons for ineligibility included: no longer functioning independently (n=7), in hospital (n=2), recently deceased (n=3), plans to move away (n=9), or moved to an assisted living environment (n=4). Of the 105 eligible residents, 30 consented to be tested; a 29% success rate. Although five of the six sites were represented in our R-group, there was considerable heterogeneity in the percentages of randomly selected residents who agreed to participate across the sites ranging from 7% to 53% (Table 1). The 75 residents who declined did so for several reasons including chronic disease burden (8/75, 11%) and caregiver burden (3/75, 4%), but the overwhelming reason (64/75, 85%) was that they were unmotivated to participate as assessed with answers such as “not interested”, “don't need it”, or “don't want to be bothered”.

The V-Group had a mean age of 83.0 years and 69.8% were women, while the R-Group had a mean age of 82.3 years and 63.3% were women. Both groups were, on average, overweight, with mean BMI's of 26.1 and 27.3, for the V-Group and R-Group, respectively. At the time of testing, 76% of participants in the V-group regularly participated in some form of structured physical activity program, whereas in the R-Group, 70% participated in a physical activity program. The physical function and psychological health outcomes are shown in Table 2 and 3. The groups did not differ with respect to depressive symptoms based on the CES-D score. The R-Group had a significantly lower score on the SPPB total score compared to the V-Group. Both groups had a mean total SPPB score of less than 10, putting them at greater risk of developing mobility disability. The R-Group also had a lower score on the usual gait speed component of the SPPB which is scored 0-4. Interestingly,

there was no difference in 400MWT gait speed which is measured as m/sec. Both groups of residents had significantly compromised lower extremity strength as evidenced by their performance on the chair stand component of the SPPB with lower scores indicating poorer functional status [30]. In the V-Group, 4 residents did not attempt the 400MWT and 19 failed to complete the walk. In the R-Group, 6 residents did not attempt the walk but no resident who attempted to walk failed. There were no significant differences between the V-Group and R-Group in right side grip strength.

The CHAMPS data showed that the V-Group spent significantly more time in MVPA compared with the R-Group. We observed that some participants were reporting very high frequencies of MVPA per week. We excluded individuals who reported >20 on the frequency response (V-Group: n=11, R-Group: n=3) and repeated the analyses. The main effect of Group became significant for frequency of MVPA (least squares mean ($\pm$ SE): V-Group = 6.5 (0.4) vs. R-Group = 4.1 (0.9), $p=.02$) and remained significant for minutes of MVPA (V-Group = 269.11 (19.8) vs. R-Group = 117.2 (45.6), $p=.003$).

Discussion

Our motivation for this study was twofold: 1) to determine the feasibility of creating an infrastructure for collecting key physical and cognitive function data on independent living residents in a group of CCRCs, as a first step toward developing a sustainable model of functional assessment in this environment and 2) to recruit and then assess the functional characteristics of a “typical” volunteer sample and a randomly selected sample of participants. While our partnership with the CCRCs in assessing and transmitting data related to the functional health of their residents was successful, recruiting a representative sample met with limited success. Future research is needed on the development of innovative recruitment strategies in order to increase the population validity of data collected in this environment. One potential strategy that was raised in our discussions with the CCRC directors was to initiate data collection upon entry for new residents and test annually such that assessment becomes an integral part of the CCRC experience. The implementation of such a procedure might well increase older adults’ awareness of their functional health status and be used to tailor programming for residents.

Several additional observations merit comment. First, we attempted to maximize our chances of recruiting a representative sample of older adults in the CCRC setting by having broad inclusion criteria and few exclusions. In other words, we strived to involve residents who rarely participated in physical activity and those who had low function. We are well aware that, as in a community based setting [31], there are many potential barriers to physical activity participation in CCRCs despite multiple caregivers and the relative ease of accessibility to wellness facilities [32]. Although, the benefits of physical activity for health promotion and disease prevention [33] including reduction in fall risk [34] and mobility disability [35], enhanced mood and general well-being [36], and maintaining independent living status [32] are well documented, Kruger and colleagues estimate that just 26.1% of community dwelling older adults are regularly active [32]. Despite the abundance of opportunities provided in the CCRCs for physical activity, we found that just 41% (43/105) of the randomly selected participants were active.

Our second observation, consistent with extant research in assisted living and nursing facilities [37-39], was that the recruitment of older adults residing in an independent living setting is a challenge [40]. Potential reasons for the difficulty associated with recruiting a representative sample of older adults from CCRCs including the presence of physical and cognitive barriers [41] and a general skepticism towards research from residents, residents' families, and CCRC staff [37, 42]. Our V-group was heavily biased towards the most physically active residents with over 76% already participating in some form of activity program. This may have been a result of recruitment efforts initiated by the CCRC wellness directors; that is, they interact more frequently with these residents. Our attempt to recruit a random and unbiased sample to overcome the healthy volunteer effect met with limited success as only 29% (30/105) of the targeted residents agreed to undergo functional assessment. Also, of this 29%, 70% (21/30) participated in wellness programming. Thus, our total sample (N=219) was heavily weighted with the most physically active residents resulting in a 75% participation rate in wellness at their place of residence. In spite of the fact that the majority of residents in both the V- and R-Groups were active, there were significant differences in lower extremity function between the two groups. The V-group, on average, scored 1.2 points higher on the SPPB total score and 0.5 points higher on the SPPB gait speed component. Previous research has noted that a change of as little as 0.27 on the SPPB is meaningful and a change of 0.99 or greater is significant [43, 44]. Although not statistically different, the 0.06 m/s difference in 400-m walk gait speed is considered a small meaningful difference [44].

The better physical function of the V-Group might be explained by the higher self-reported minutes of MVPA of the V-Group compared to the R-Group. When we excluded individuals who reported very high frequency of MVPA, the V-Group reported 269 minutes of MVPA on average, far exceeding the guidelines for older adults of at least 150 min/week of MVPA [45]. In contrast, the R-Group reported 117.2 minutes of MVPA, less than the current recommendations. The self-reported estimate of the V-Group, while consistent with a report of 288 min/week for adults >70 yrs by Tucker and colleagues [46], is likely an over-estimate, since Tucker and colleagues reported that data derived from accelerometry on their sample provided an estimate of only 45 min/week of MVPA. Regardless, even though both groups were weighted towards the most active residents, the V-Group was higher functioning than the R-Group.

The third observation, and the one that concerned us the most, was the reasons given by those residents in the R-group who were unwilling to participate ("not interested", "don't need it", "don't want to be bothered"). Interestingly, Chen and colleagues, in a study of six long term care facilities, found that a lack of sufficient understanding about the health benefits of physical activity is a significant barrier to participation [39]. They suggested that the attitude of "physical activity does not help" can be modified through educational interventions [39]. However, a more targeted or tailored culturally appropriate strategy may be needed. For example, Kreuter and colleagues [47] suggested that to enhance the perceived relevance of a health issue for a specific group, evidence of its impact on that group should be presented in a way to raise awareness, concern, and/or perceived vulnerability by making it clear that the health issue affects individuals just like the target group. Perhaps those who did not participate in our study did not believe that their physical

function was at risk and therefore, did not see our study as meaningful to them. Or perhaps they did not value their physical function as highly. It is clear that educating residents about their current level of physical function can be an important first step in the re-engineering of beliefs about the benefits of physical activity [38]. Similarly, helping older adults make the connections between present behaviors and future outcomes has been suggested as an important step in raising awareness of health behavior [47, 48]. Future studies should incorporate focus groups of CCRC residents to better define the importance of physical activity and function as contributors to quality of life. Interestingly, previous work has shown that older adults can perceive themselves to be aging very successfully based on the criteria that they value, but these criteria can be quite different than those developed by researchers [49-52]. For example, studies on perceptions of successful aging have shown that older adults place high importance on psychosocial components such as a positive attitude and adaptability and relatively little emphasis on physiological components such as longevity, absence of disease and disability, function, and independence [53, 54].

Other strategies to improve recruitment of a representative sample include monetary incentives and face-to-face meetings with individuals or small groups to answer questions and address concerns about the research, and the use of peer recruitment by those who have completed data collection (snowball sampling) [40, 55]. In particular, some residents in our study expressed concerns about whether the information we were collecting would be used to determine transitions within the CCRC, a very stressful life event for residents [56]. We assured them that this was not the purpose of our study, but these concerns highlight that mistrust of research and issues of privacy and confidentiality should be important considerations for researchers working in the CCRC environment [40]. Anecdotally, in previous studies, we have used informational presentations to groups and peer recruitment in the CCRC setting and found these methods to be ineffective at attracting the broader community of residents. Finally, Lovato and colleagues [57] stated that “while retired individuals do have some discretionary time, it is a misconception that they have an abundance of available time”. It may be the case that those residents choosing not to participate simply found other offerings at the CCRC more appealing or important.

A fourth observation is that strong partnerships between researchers and staff provide new opportunities for improving success of wellness in this environment [37, 58]. Mihalko and colleagues [38] documented that within 21 long term care facilities, only 2 employed dedicated wellness directors and that in most cases planning and promotion of physical activity programs was left to the general activity directors or nurses [10, 38]. One of the most common organizational barriers to physical activity promotion and research in an institutionalized setting is a lack of enthusiasm on behalf of the staff [42]. This is a result of the actual time and workload demands already placed on the CCRC staff as well as the legitimate concerns of management and staff that the project will lead to an increase in unreimbursed workload [10, 37]. However, through training, communication, and ongoing support, the CCRC staff were able to efficiently administer the study measures and enter the data into the web-based data entry system. This allowed the investigative team to access and check the data and to provide both the CCRC staff and each participant with feedback in a timely manner without the burden of having to travel throughout the Southeast.

In summary, through training of CCRC staff, and their receptivity towards research, it is feasible to build a working partnership enabling successful administering of functional assessment measures in a network of CCRCs. Researchers and CCRCs must develop better methods for recruitment of representative samples of residents. Finally, while partnership between researchers and CCRC staff is feasible, a more long-term approach is needed to create a sustainable model. Considerable time and effort were invested in this short-term project and we would anticipate that long-term partnerships would be more demanding. Therefore it is essential that research partnerships add value to the quality of life of residents and add value to the business by differentiating the company in the marketplace, improving the retention of residents, and reducing the transition from independent living to assisted living.

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Table 1

Number of V-group participants tested at each CCRC and recruitment efforts to recruit the R-group that represented 20% of the independent living residents not already in the V-Group.

	V-Group	R-Group		
CCRC	Number of residents tested	Number of contacts attempted to obtain 20% sample	Number of eligible residents	Number of residents tested
1	40	26	18	7 (39%)
2	24	Did not use site due to small remaining sample size		
3	27	22	17	9 (53%)
4	44	20	18	5 (28%)
5	46	36	29	2 (7%)
6	8	26	23	7 (30%)
Total	189	130	105	30 (29%)

Table 2

Demographic characteristics and unadjusted physical function and psychological health outcomes of the volunteer (V-Group) and random (R-Group) samples.

Mean (SD) Range	V-Group (N=189)	R-Group (N=30)
Age (years)	83.0 (5.5) 65.0-97.0	82.3 (5.6) 70.0-92.0
Sex (N, % female)	132, 69.8%	19, 63.3%
BMI (kg/m ²)	26.2 (4.5) 17.5-45.5	26.9 (4.6) 21.0-37.5
CESD (0-60)	4.5 (4.6) 0-24	5.3 (6.3) 0-23
MMSE (0-30)	28.0 (2.9) 16-30	26.8 (3.3) 16-30
CHAMPS frequency of MVPA per week	7.0 ± 5.9 0-25.0	6.4 ± 7.4 0-32.0
CHAMPS minutes of MVPA per week	270.6 ± 276.1 0-1695.0	186.0 ± 211.4 0-1005.0
400m gait speed (m/s)	1.08 (0.28) 0.28-1.79	1.07 (0.27) 0.55-1.51
% Failure of 400m walk	10.1% (N=19)	0.0% (N=0)
Did not attempt 400 m walk	2.1% N=4	20.0% N=6
Left grip strength (kg)	20.4 (9.1) 2-48	21.8 (8.7) 2-40
Right grip strength (kg)	22.7 (9.7) 2-70	24.1 (8.2) 6-42
SPPB total (0-12)	9.2 (2.6) 1-12	8.6 (2.7) 1-12
SPPB balance (0-4)	3.4 (1.0) 0-4	3.4 (0.9) 0-4
SPPB gait speed (0-4)	3.6 (0.8) 0-4	3.1 (1.0) 1-4
SPPB chair stand (0-4)	2.3 (1.5) 0-4	2.2 (1.4) 0-4

Notes: BMI: Body Mass Index; CES-D: Center for Epidemiologic Studies Depression Scale; MMSE: Folstein Mini Mental State Examination; CHAMPS: Community Healthy Activities Model Program for Seniors; MVPA: Moderate-to-Vigorous Physical Activity; SPPB: Short Physical Performance Battery

Table 3

Least Squares Means $\pm$ SE for the demographic characteristics, physical function, and psychological health outcomes of the volunteer (V-Group) and random (R-Group) samples.

LS Means (SE)	V-Group (N=189)	R-Group (N=30)	<i>p</i> Value Main Effect of Group with No Group $\times$ Site Interaction Term in Model	<i>p</i> Value Group $\times$ Site Interaction
Age (years) ^a	83.1 (0.47)	82.6 (1.0)	.672	.720
Sex (N, % female)	132, 69.8%	19, 63.3%	.526 [*]	
BMI (kg/m ²) ^a	26.1 (0.4)	27.3 (0.8)	.190	.791
CESD (0-60) ^a	4.4 (0.4) [^]	5.4 (0.9) [^]	.306	.530
MMSE (0-30) ^a	27.9 (0.2)	27.1 (0.5)	.194	.638
CHAMPS frequency of MVPA per week	9.0 (0.9)	5.9 (2.1)	.181	.091
CHAMPS minutes of MVPA per week	300.8 (21.5)	163.2 (49.6)	.013	.825
400m gait speed (m/s) ^a	1.12 (0.02)	1.06 (0.05)	.321	.549
% Failure of 400m walk	10.1% (N=19)	0.0% (N=0)	.138 [*]	
Did not attempt 400 m walk	2.1% N=4	20.0% N=6		
Right grip strength (kg) ^a	23.3 (0.8)	23.8 (1.8)	.811	.179
SPPB total (0-12) ^a	9.4 (0.2)	8.2 (0.4)	.014	.353
SPPB balance (0-4) ^a	3.5 (0.1)	3.3 (0.2)	.305	.840
SPPB gait speed (0-4) ^a	3.5 (0.1) [^]	3.0 (0.2) [^]	.007	.062
SPPB chair stand (0-4) ^a	2.4 (0.1)	1.9 (0.2)	.100	.554

Notes: BMI: Body Mass Index; CES-D: Center for Epidemiologic Studies Depression Scale; MMSE: Folstein Mini Mental State Examination; CHAMPS: Community Healthy Activities Model Program for Seniors; MVPA: Moderate-to-Vigorous Physical Activity; SPPB: Short Physical Performance Battery

^aContinuous variables were analyzed with general linear models with group and site as fixed factors.

^{*} Chi-Square exact significance value (2-sided)

[^] When outlying data for two participants from the R-Group Site 6 were removed, the interaction term was not significant. Interaction p-values represent the test without these participants. LS Means in the table are with these two participants omitted and the interaction term removed from the model. The LS Means (SE) with these two participants included and no interaction term are identical to those in the table: CES-D (4.4 (0.4) and 5.4 (0.9)), SPPB gait speed (3.5 (0.1) and 3.0 (0.2)), for the V-Group and R-Group, respectively.