Should Physical Activity Programs Be Tailored When Older Adults Have Compromised Function?


The purpose of this study was to determine whether a walking program supplemented by tasks designed to challenge balance and mobility (WALK+) could improve physical function more than a traditional walking program (WALK) in older adults at risk for mobility disability. 31 community-dwelling older adults ($M \pm SD$ age $= 76 \pm 5$ yr; Short Physical Performance Battery [SPPB] score $= 8.4 \pm 1.7$) were randomized to treatment. Both interventions were 18 sessions (1 hr, $3 \times /wk$) and progressive in intensity and duration. Physical function was assessed using the SPPB and the 400-m-walk time. A subset of participants in the WALK group who had relatively lower baseline function showed only small improvement in their SPPB scores after the intervention ($0.3 \pm 0.5$), whereas a subset of participants in the WALK+ group with low baseline function showed substantial improvement in their SPPB scores ($2.2 \pm 0.7$). These preliminary data underscore the potential importance of tailoring interventions for older adults based on baseline levels of physical function.

**Keywords**: walking, exercise, frailty, mobility, balance

Regular physical activity is important in the disablement process because it improves cardiovascular function, muscle strength, and balance, which in turn might delay the onset of function limitations and mobility disability (The LIFE Study Investigators, 2006; Lord, Ward, Williams, & Strudwick, 1995; Nelson et al., 2004, 2007; U.S. Department of Health and Human Services, 1996). Mobility disability dramatically increases the risk of dependency (Hirvensalo, Rantanen, & Heikkinen, 2000), which is not surprising given the critical role of mobility in activities of daily living (Frank & Patla, 2003).

Walking is the most common mode of physical activity in older adults (Di Pietro, 2001; Eyler, Brownson, Bacak, & Housemann, 2003), but it has been suggested that traditional walking interventions lack the perceptual and decision-making complexity of real-world environments (Frank & Patla, 2003). Frank and Patla suggest a number of tasks that could be integrated into a walking program to challenge vision, balance, and mobility. In addition, although moderate-intensity
walking by itself can improve physical function (Buchner et al., 1997; Moore-Harrison, Speer, Johnson, & Cress, 2008), adding tasks that challenge specific functional capacities such as balance and strength might augment improvements in physical function and mobility. For that reason, multimodal exercise programs are recommended in guidelines for physical activity in older adults (Cress et al., 2005; Nelson et al., 2007; Paterson, Jones, & Rice, 2007) and have been used successfully to improve outcomes focused on physical function and mobility in older adults (Baker et al., 2007; The LIFE Study Investigators, 2006; Nelson et al., 2004).

A large number of studies conducted in older adults have compared different modes of exercise with a control, but few studies have been done comparing walking with an alternative or novel intervention. For example, Rooks, Kiel, Parsons, and Hayes (1997) showed that both resistance training and walking improved tests of static balance and stair-climbing speed. This study is notable because both interventions were entirely self-paced, in contrast to being highly structured. Li, Fisher, and Harmer (2005) reported that 16 weeks of “cobblestone” mat walking improved functional reach, static balance, chair stands, and 50-ft-walk speed and reduced blood pressure to a greater extent than conventional walking in adults age 60–92 years. Recently, Shigematsu et al. (2008) showed that a novel stepping intervention improved a number of lower extremity functional outcomes compared with a walking intervention. There is a gap, however, for studies that have compared a walking program with an exercise intervention that combines both walking and challenging balance and mobility tasks in older adults at risk for mobility disability.

Although the evidence is sparse the data suggest that older adults’ functional ability will influence their response to exercise training. For example, Gill et al. (2002) reported a significant beneficial effect in preventing functional decline using a home-based exercise program in a group of older adults with moderate frailty but no effect among those with severe frailty. In contrast, Chandler, Duncan, Kochersberger, and Studenski (1998) found that the impact of 10 weeks of resistance exercise on chair-rise performance was significant in participants who were more impaired. With respect to falls, a meta-analysis by Robertson, Campbell, Gardner, and Devlin (2002) showed that a subgroup of adults age >80 years who had experienced a fall benefited the most from a program of muscle strengthening and balance retraining. Recently, Faber, Bosscher, Chin, and van Wieringen (2006) showed that there were differential effects of two interventions, one based on mobility activities and one based on Tai Chi, such that frail older adults did not respond whereas prefrail older adults showed significant improvements in physical function. Similarly, Luukinen et al. (2006) reported that although exercise in very old adults (>85 years) appears to delay loss in mobility, this was not true in a subset of their sample with severe dysfunction in movement or activities of daily living. Therefore, it is not always the case that older adults with the lowest function have the greatest potential for improvement with exercise training, although this has been observed previously (Baker et al., 2007). Rather, those with very low function might have reached a point where their disability cannot be treated effectively with traditional exercise interventions (Gill et al.). More work is needed to identify exercise interventions that can improve physical function and mobility in older adults with low function.
To emphasize that older adults have unique and varied needs depending on their functional status and health, the American College of Sports Medicine published new guidelines for this segment of the population (Nelson et al., 2007). Adults over the age of 65 are encouraged to engage in moderately intense aerobic exercise for at least 30 min a day, 5 days a week, and to supplement this activity with balance exercises to reduce the incidence of falls (Nelson et al., 2007). Therefore, it would seem appropriate to design walking programs that include activities to challenge multiple domains such as mobility and balance, to better mimic the complexity of real-world settings that older adults encounter as they move about in their daily lives. Therefore, among older adults at risk for mobility disability, the purpose of this study was to test the hypothesis that a physical activity program supplemented by tasks designed to challenge mobility and balance (WALK+) would improve physical function to a greater extent than a traditional walking program (WALK).

**Methods**

**Participants**

We recruited participants from a database of older adults interested in clinical trials who (a) were 65–85 years of age, (b) were not participating in a regular physical activity program (i.e., any moderate or strenuous activity lasting ≥30 min/session, ≥3 days/week), (c) scored ≤10 on the Short Physical Performance Battery (SPPB; Guralnik et al., 1994), (d) scored ≥6 on the Pfeiffer Mental Status Scale (Pfeiffer, 1975), (e) had no progressive or debilitating conditions that would limit participation in exercise, and (f) had received their physician’s approval. Within this sample, we classified individuals as either low or high function based on their baseline SPPB score; low function was classified as an SPPB score of 3–8 and high function was classified as an SPPB score of 9–10. One of the goals of this exploratory study was to obtain data to estimate the effects of each intervention because there are no data in the literature that match the outcomes and interventions used in the current study. This study was approved by Wake Forest University’s institutional review board, and all participants signed an informed consent before their participation.

**Measures**

We had a two-person assessment team who were blinded to treatment and trained by the primary author on all outcomes. They completed most baseline and follow-up assessments. Occasionally a third individual helped collect the outcomes, and she was not blinded. We acknowledge this as a limitation of the study; however, any bias is mitigated by the fact that all outcomes were administered using prepared scripts. Furthermore, both the SPPB and the 400-m walk are objective measures of physical function, which reduces the potential for bias on the part of the assessor.

The SPPB (Guralnik et al., 1994) is a standardized measure of physical performance that assesses standing balance, usual gait velocity over a 4-m course, and the time to sit down and rise from a chair five times as quickly as possible.
Each task is scored on a scale of 0–4, 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 (Ferrucci et al., 2000; Guralnik, Ferrucci, Simonsick, Salive, & Wallace, 1995; Guralnik et al., 1994; The LIFE Study Investigators, 2006; Onder et al., 2002). Intraclass correlation coefficients for the SPPB range from .88 to .92 for measures made 1 week apart (Ostir, Volpato, Fried, Chaves, & Guralnik, 2002).

For the 400-m walk, participants were timed while they walked 10 clockwise laps around a 40-m indoor course as quickly as possible without sitting, using an assistive device (including a cane), or the help of another person (Rolland et al., 2004). A script was used to provide identical instructions to all participants. The script was as follows: “You will be walking 10 complete laps around the course, about 1/4 mile. Please walk as quickly as you can, without running, at a pace you can maintain over the 10 laps. After you complete the 10 laps, I will tell you to stop.” On each lap the assessor offered standard encouragements (“Keep up the good work.” “You are going well.” “Looking good.” “Well done.” “Good job.”) and told the participant the number of laps completed and the number remaining. Participants were allowed to rest in place and given a maximum of 15 min to complete the 400-m walk.

At baseline, participants completed the informed consent; the SPPB; a self-administered questionnaire consisting of demographics, health history, and psychosocial questions; and a 400-m walk. After baseline testing, they were randomized using a table of random numbers to either the WALK (n = 15) or the WALK+ (n = 16) group. Follow-up testing was completed within a week after the completion of the intervention.

Participants in each group attended a 1-hr session, three times a week, at an indoor exercise facility. With only a few exceptions the intervention was completed in 6 weeks; in the event of a missed session (e.g., because of illness, vacation, or schedule conflict), a makeup session was scheduled so that all participants completed 18 sessions. Both intervention groups exercised in small groups at separate times of the day. Therefore, the WALK group did not see or interact with the members of the WALK+ group, nor did they observe any of the equipment used in the WALK+ intervention. The WALK and WALK+ groups were supervised at all times by a lead interventionist with ACSM exercise specialist certification. She was assisted by a graduate student and several undergraduate students with training in exercise science. Neither interventionist discussed the other intervention with participants, and participants were instructed to continue with their normal routine outside of the intervention sessions.

Both interventions were progressive in intensity and duration. Because of the varied functional abilities of our sample, a standardized progression for the walking program was not feasible. For example, at the start of the intervention not all participants could walk for 25 min either continuously or with rest stops, and not all participants could walk at or near a rating of perceived exertion (RPE) of 11–13. Therefore, in the first one or two sessions we assessed each participant’s
capabilities and then encouraged him or her to increase the duration and/or intensity over the course of the intervention. The goal was to reach or approach 25 min of continuous walking in the case of the WALK group or continuous walking interspersed with the “plus” component for the WALK+ intervention, walking at an intensity comparable to an RPE of 11–13. The interventionists played a key role in tracking each participant’s previous efforts and setting a goal for each subsequent exercise session.

WALK Intervention

Each participant walked two laps at a low intensity before walking for up to 25 min at a moderate-intensity walking pace—RPE of 11–13 on the Borg Scale (Borg, 1973). Heart rate, blood pressure, and RPE were recorded at the midexercise time point. After the walking bout, participants completed two laps at a slow walking pace and 20 min of stretching and flexibility exercises for major muscle groups.

WALK+ Intervention

Participants in the WALK+ followed a walking protocol similar to that of the WALK, but they were instructed to complete four obstacle stations as they encountered them along the track. The total time of the walk/obstacle session was a maximum of 25 min of which 8–10 min were devoted to the obstacle stations. After the walk/obstacle phase, participants completed two laps at a slower pace and 10 min of flexibility exercises. At the end of every week, an investigator (EC) evaluated each participant to determine mastery over a progression. Each participant was required to complete a minimum of three sessions at each progression. The same investigator (EC) observed each participant over two sessions. If participants could complete the progression with no apparent difficulty, assessed by speed and stability of movement, the investigator allowed them to progress to the next level. If participants did not feel they could confidently progress to the next level they were not required to do so.

Balance. Progression 1 (P1) balance testing consisted of standing on a square foam pad (AIREX, M-F Athletic, Cranston, RI) for 10 s with feet shoulder width apart. The participants were given the option of standing on one foot on the foam pad once they had mastered the first progression. This task was completed before each progression. Then the participants walked for 3 m between two lines that were approximately 6 in. apart. Progression 2 (P2) testing consisted of walking heel to toe on a line at a self-selected pace for a distance of 3 m. Progression 3 (P3) testing consisted of walking on a 3.25-m-long foam balance beam (AIREX, M-F Athletic). Progression 4 (P4) testing consisted of walking heel to toe on the foam balance beam. Progression 5 (P5) consisted of walking with the feet on separate foam balance beams approximately 0.5 m apart.

Hurdles. P1 hurdles testing consisted of walking over five white lines ~1 m apart drawn on the track without stepping on the lines. P2 testing consisted of walking over six 6-in. hurdles placed ~1 m apart (db Manufacturing, Middleton, WI). P3 testing consisted of P2 plus walking over a 6-in. hurdle, ducking under a
4-ft hurdle, stepping over another 6-in. hurdle, and ducking under another 4-ft hurdle. P4 testing consisted of the same as P2 but walking laterally. P5 testing consisted of laterally traversing over the P3 obstacles while alternating directions—moving laterally stepping over hurdle, turning 180°, ducking under high hurdle, turning 180°, stepping a over hurdle, turning 180°, and ducking under the final high hurdle.

Cones. P1 cones testing consisted of walking over a crooked stick obstacle (db Manufacturing, Middleton, WI) placing one foot on each side of the stick, alternating feet and avoiding stepping on the stick. P2 testing consisted of zigzagging around six cones ~1 m apart. P3 testing consisted of walking through the P2 course carrying a dumbbell weight in each hand. P4 testing consisted of walking down and back over the crooked stick crossing feet over one another (i.e., grapevine maneuver). P5 testing consisted of doing P4 while carrying a dumbbell in each hand.

Walking Trails A and B. The Walking Trails task was a modification of a task described by Alexander, Ashton-Miller, Giordani, Guire, and Schultz (2005). In Trails A participants stepped on numerically ordered rubberized circular discs, numbered 1–25. The numbers were spread out, in order, about a step apart within a 2-m-wide by 4-m-long rectangle such that participants walked 12 circles down and 13 circles back. In Trails B participants walked from a number to a letter (1-A-2-B-3-C-4- . . . -L-13).

Data Analysis

Statistical analyses were performed using SPSS version 14.0 (SPSS Inc., Chicago). Analysis of covariance (ANCOVA) was used to examine group differences in the SPPB and 400-m-walk change scores, with the pretest scores being used as covariates in each analysis. To examine whether baseline levels of function moderated the treatment effect in these analyses, we constructed an interaction term by multiplying the baseline scores for function by group assignment. Because of the reduced power of testing interactions in linear models and the exploratory nature of this research, the alpha level for both interaction terms was set at the \( p < .10 \) level. We explored interpretation of significant interaction terms by creating a dichotomous variable for baseline function scores within our sample and crossing this variable with group assignment. The dichotomous variable for lower extremity function was created by assigning a 1 (low function) to individuals with a baseline SPPB score of 3–8 and 2 (high function) to individuals with a baseline SPPB score of 9–10.

Results

Ten male and 21 female community-dwelling older adults were recruited for this study. The mean (± SD) age of the participants was 76 ± 5 years (range 67–85), with a mean body-mass index (BMI) of 29 ± 5 kg/m² (range 19–39) and SPPB score of 8.4 ± 1.6 (range 3–10). There were no significant differences between the WALK and WALK+ group in any demographic or health measure at baseline (Table 1). One participant from the WALK group and 1 from the WALK+ group
dropped out of the study for reasons unrelated to the intervention (previously undocumented dementia and preexisting brain aneurism). Therefore, 29 individuals completed the interventions, 14 in the WALK group and 15 in the WALK+ group. There were no exercise- or testing-related adverse events.

There were no significant differences between the WALK and WALK+ group in any outcome measure at baseline (Table 1). In the ANCOVA examining change scores in SPPB, there was a significant group main effect, \( F(1, 25) = 4.73, p = .039 \). Paired \( t \) tests (two tailed) conducted within each group on the baseline and follow-up SPPB score showed that both groups increased their SPPB score after the intervention, but only the WALK+ group difference was statistically significant, WALK 8.1 ± 1.4 to 8.8 ± 2.0, \( t(13) = -1.93, p = .075 \), WALK+ 8.7 ± 1.8 to

### Table 1 Baseline Characteristics Including Physical-Function Outcome Measures of the Participants

<table>
<thead>
<tr>
<th>Variable</th>
<th>WALK</th>
<th>WALK+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of participants</td>
<td>15</td>
<td>16</td>
<td>31</td>
</tr>
<tr>
<td>Age, years</td>
<td>77.3 (5.1)</td>
<td>74.4 (5.2)</td>
<td>75.8 (5.3)</td>
</tr>
<tr>
<td>Number of men/women</td>
<td>5/10</td>
<td>5/11</td>
<td>10/21</td>
</tr>
<tr>
<td>Height, cm</td>
<td>161.4 (10.3)</td>
<td>163.6 (9.2)</td>
<td>162.6 (9.6)</td>
</tr>
<tr>
<td>Body mass, kg</td>
<td>78.1 (14.1)</td>
<td>74.1 (17.7)</td>
<td>76.0 (15.9)</td>
</tr>
<tr>
<td>Body-mass index, kg/m²</td>
<td>29.9 (4.6)</td>
<td>27.9 (6.1)</td>
<td>28.7 (5.0)</td>
</tr>
<tr>
<td>Ethnicity, ( n ) (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>14 (93)</td>
<td>12 (75)</td>
<td>26 (84)</td>
</tr>
<tr>
<td>African American</td>
<td>1 (7)</td>
<td>4 (25)</td>
<td>5 (16)</td>
</tr>
<tr>
<td>Education, ( n ) (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;high school</td>
<td>7 (47)</td>
<td>6 (38)</td>
<td>13 (42)</td>
</tr>
<tr>
<td>&gt;college</td>
<td>7 (47)</td>
<td>7 (44)</td>
<td>14 (45)</td>
</tr>
<tr>
<td>Marital status, ( n ) (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>married</td>
<td>9 (60)</td>
<td>8 (50)</td>
<td>17 (55)</td>
</tr>
<tr>
<td>widowed</td>
<td>4 (27)</td>
<td>6 (38)</td>
<td>10 (33)</td>
</tr>
<tr>
<td>divorced</td>
<td>2 (13)</td>
<td>1 (6)</td>
<td>3 (9)</td>
</tr>
<tr>
<td>never married</td>
<td>0</td>
<td>1 (6)</td>
<td>1 (3)</td>
</tr>
<tr>
<td>living alone</td>
<td>4 (27)</td>
<td>5 (31)</td>
<td>9 (29)</td>
</tr>
<tr>
<td>Comorbidities, ( n ) (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>diabetes</td>
<td>3 (20)</td>
<td>3 (19)</td>
<td>6 (19)</td>
</tr>
<tr>
<td>hypertension</td>
<td>10 (67)</td>
<td>13 (81)</td>
<td>23 (74)</td>
</tr>
<tr>
<td>COPD</td>
<td>2 (13)</td>
<td>2 (13)</td>
<td>4 (13)</td>
</tr>
<tr>
<td>arthritis</td>
<td>11 (73)</td>
<td>11 (69)</td>
<td>22 (71)</td>
</tr>
<tr>
<td>SPPB (0–12)</td>
<td>8.2 ± 1.5</td>
<td>8.7 ± 1.8</td>
<td></td>
</tr>
<tr>
<td>400-m walk (s)</td>
<td>403.4 ± 124.2</td>
<td>372.0 ± 115.0</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* COPD = chronic obstructive pulmonary disease; SPPB = Short Physical Performance Battery. Data are \( M (SD) \) unless otherwise noted. There were no significant differences between the groups at baseline.
10.0 ± 1.4, t(14) = −3.57, p = .003. Interpretation of this main effect is qualified by a significant interaction term, F(1, 25) = 3.59, p = .07. Recall that to accommodate interpretation of significant interaction terms we created a dichotomous variable for function, relative to our sample (low vs. high), and crossed this with the treatment variable (W ALK vs. W ALK+); these cell means can be found in Table 2. Follow-up tests revealed that this interaction resulted from differences in the SPPB change scores between individuals with low baseline function assigned to either the W ALK or W ALK+ intervention, F(1, 12) = 5.38, p = .039. The estimated means suggest that participants with low baseline function assigned to the WALK group showed only small improvement in their SPPB score after the intervention, whereas those with low baseline function assigned to the WALK+ group showed substantial improvement in their SPPB score. There was no significant difference between the WALK and WALK+ groups in change scores for the 400-m-walk data, F(1, 25) = 2.11, p = .16.

To calculate estimates of effect sizes (ES) for the SPPB and 400-m walk, we used the estimated marginal means (i.e., least-squares means), obtained from an ANCOVA on change scores that controlled for baseline score. For the SPPB change scores, the least-squares means were 0.6 for WALK and 1.4 for WALK+, indicating improvement in lower extremity function, with a common SD of 1.3. The ES was .6, which is moderate. For the 400-m-walk change scores, the least-squares means were −13.5 s for WALK and −17.8 s for WALK+, indicating a faster walk time, with a common SD of 26.4 s. The ES was .2, which is low.

Given the exploratory nature of this study, we also examined changes in the three components of the SPPB, using an ANCOVA that controlled for baseline differences between the groups, and used the change score as the outcome. Recall that each component of the SPPB is scored 0–4. There was a significant difference between the WALK and WALK+ groups in balance change score, raw M ± SD for WALK and WALK+ of 0.1 ± 0.6 and 0.3 ± 0.9, respectively, F(1, 26) = 6.02, p = .021. There were no significant group differences for change scores for gait speed (0.4 ± 0.6 vs. 0.4 ± 0.5) or chair rises (0.3 ± 1.0 vs. 0.6 ± 1.0), but the trends in the means indicate improvement in both of these components for both groups.

### Table 2 Estimated Marginal Means and Standard Errors for Change in Short Physical Performance Battery (SPPB) and 400-m-Walk Time

<table>
<thead>
<tr>
<th>Baseline function</th>
<th>Group</th>
<th>Change in SPPB</th>
<th>Change in 400-m walk (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low(^b)</td>
<td>WALK, n = 10</td>
<td>0.3 (0.5)</td>
<td>−9.6 (8.5)</td>
</tr>
<tr>
<td></td>
<td>WALK+, n = 5</td>
<td>2.2 (0.7)</td>
<td>−33.8 (11.5)</td>
</tr>
<tr>
<td>High</td>
<td>WALK, n = 4</td>
<td>1.4 (0.7)</td>
<td>−22.6 (13.3)</td>
</tr>
<tr>
<td></td>
<td>WALK+, n = 10</td>
<td>1.0 (0.5)</td>
<td>−10.0 (8.2)</td>
</tr>
</tbody>
</table>

\(^a\)Baseline Function × Group interaction was significant, p = .046. \(^b\)Significant difference between WALK and WALK+ for low in change in SPPB, p = .039.
Discussion

This study compared the effects of a walking program that integrated complex tasks designed to challenge mobility and balance (WALK+) with a traditional walking program (WALK) on physical functioning in older adults with compromised lower extremity function. There was evidence from the SPPB scores that participants with lower physical function at baseline benefited more from the WALK+ program than the WALK program. This was not true for older adults with higher levels of baseline function; although the results did not exceed conventional levels of statistical significance, there was a trend for the higher functioning older adults to benefit more from WALK than WALK+. Although these findings are limited by the small number of participants in the study, which reduced the power to detect differences between groups, they do suggest that tailoring treatment might be particularly important in older adult populations. This finding is consistent with the recent guidelines published by Nelson et al. (2007). In particular, older adults with low function might need to improve balance and mobility skills first to subsequently reap the benefits of a standard walking program.

Although several studies suggest that frail older adults might derive limited or no benefit from an exercise program (Faber et al., 2006; Gill et al., 2002; Luukinen et al., 2006), the older adults with very low function did benefit from a program of walking combined with balance and mobility tasks. It is important to acknowledge that the program we implemented might not be applicable to older adults who cannot walk short distances or who have SPPB scores of 0–2. In particular, very frail older adults might be at increased risk for falls in the absence of adequate intervention-staff supervision, which might, in some cases, involve one-on-one interaction. This is likely a reality of any intervention that focuses on mobility and balance in very frail individuals.

The concept of tailoring an intervention to the needs of an individual or a particular subgroup is not new (Brawley, Rejeski, & King, 2003; Heath & Stuart, 2002; King, Carl, Birkel, & Haskell, 1988; Singh, 2002). The stepped approach of the levels at three of the four stations and the individualized prescription of the walking program that we used in this study are consistent with this practice. The data suggest that the balance and mobility challenges offered by the four stations were important to the improvement of the subsample of low-functioning older adults. It is worth mentioning that although two thirds of the 15 participants reached the fifth (highest) level of the hurdles-and-cones stations, only 1 individual reached the fifth progression of the balance station by the end of 18 sessions. Six individuals did not progress beyond the third progression at the balance station, and 2 individuals only made the third progression on the hurdles-and-cone stations. Anecdotally, the Walking Trails A/B station was very taxing for most participants, who appeared to have difficulty maintaining stability while planning their next movement.

The trends in the 400-m-walk data are interesting in that less time was spent walking in the WALK+ intervention because participants had to integrate the four stations within the fixed 25-min time period of the intervention. Overall, the within-group trends observed suggest that the walking component of both the WALK and WALK+ interventions was effective. However, the ES related to the difference between the groups in 400-m-walk change scores was low (.2). The low-functioning
participants in the WALK+ intervention did appear to benefit in spite of the reduced time spent on the cardiovascular component of the intervention. Preserving the ability to walk 400 m is important for a wide variety of daily and social activities that only require walking this modest distance (Hadley, 2007). Losing the ability to walk 400 m forces an older adult to either resort to compensatory strategies that might pose social or financial burdens or to restrict the scope of their daily lives.

Relative to changes in SPPB, the lower functioning participants in the WALK+ condition experienced the most change (M = 2.2 points), whereas the lower functioning participants in the WALK condition experienced the least change (M = 0.3 points). Perera, Mody, Woodman, and Studenski (2006) examined the magnitude of meaningful change in several measures of lower extremity function and concluded that a 0.5-point change in SPPB score is a small meaningful change and a 1-point change can be considered substantial. The changes we observed in the SPPB are encouraging given the short duration of the intervention. Overall, the ES related to the difference between the groups in SPPB change scores was moderate (.6).

The analyses of the three components of the SPPB are consistent with the fact that the stations included in the WALK+ intervention place a premium on an individual’s ability to maintain stability. The data suggest that the balance component of the SPPB improved more in the WALK+ group than in the WALK group. The improvement in balance might also be responsible for the trend observed in the chair stands. It is important to recognize that all three components of the SPPB showed trends for improvement after the interventions. An interesting question is whether a similar result would have occurred by simply completing the four stations without any walking component.

The changes observed in the SPPB are important because this outcome is predictive of disability, mortality, and institutionalization (Guralnik et al., 1994). Our data show that the SPPB might be useful in discriminating between older adults in need of tailored interventions and those needing only to increase their level of physical activity. This might be useful for physicians in clinical decision making about physical activity for older patients. In addition, it is encouraging that the WALK+ intervention appeared to offer measurable advantages over a standard walking program, a comparison that is more rigorous than one using a nonexercise control. Finally, the results and conclusions of this study should be viewed in the context of several limitations. The primary limitation was the small sample size, which reduced the power to detect differences between the groups. Second, we did not stratify the randomization by baseline function. Finally, as discussed previously, an unblinded investigator assisted with some outcome assessments, which introduced the potential for bias. Additional research is needed to replicate these findings using larger samples, to study long-term interventions, and to determine whether the benefits demonstrated here translate to other forms of functioning such as the performance of activities of daily living.

References


