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Feasibility and outcomes of a multilevel place-based walking intervention for seniors: A pilot study

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ABSTRACT

This pilot study tested the feasibility and acceptability of a novel multilevel walking intervention for older adults in a continuing care retirement community (CCRC). The intervention included site-specific walking route maps, pedometers, and individualized goal setting. Pedometers were worn for self-monitoring and for the primary outcome (steps per day). Surveys at pre- and post-intervention assessed daily activities, benefits, barriers, route use, quality of life, and satisfaction. Steps per day were very low at baseline and increased significantly at post-test. The findings indicate that a multilevel site-specific intervention is feasible and acceptable for increasing steps among seniors living in a CCRC.

Introduction

Physical activity can prevent or reduce many common health problems among older adults, a population with very low activity levels (Agency for Healthcare Research and Quality and the Centers for Disease Control, June 2002; Lee and Park, 2006). In 2001–2002, only 21% of adults over the age of 65 years were regularly physically active (Federal Interagency Forum on Aging-Related Statistics, 2004). New data with objective measurement of physical activity indicate that the prevalence of meeting public health recommendations may be as low as 2.5% among adults over age 60 (Troiano et al., 2008). Walking is a prime target for interventions in this population because it is well accepted, inexpensive, can serve as a form of transportation, and is gentle on the body (Belza et al., 2004; Cunningham and Michael, 2004; US Department of Transportation, 2004; Wong et al., 2003). Even small amounts of walking can protect against loss of mobility (Simonsick et al., 2005). Frail and chronically ill older adults can particularly benefit from exercise via improved muscle mass, bone density and cardiovascular fitness, which can enhance mobility, functional independence, and reduce the risk of common complications of aging (Heath and Stuart, 2002).

Reviews of physical activity interventions for older adults suggest that some older adults prefer to exercise alone and some prefer groups, simple activity changes are easier to maintain than more complex ones, and lifestyle activities are just as effective as structured activity to improve health outcomes (Brawley et al., 2003; King, 2001; van der Bij et al., 2002). Walking is a type of activity that is consistent with all of the review's conclusions. However, it is important to consider the places where older adults reside and walk, because their characteristics can promote or deter walking and other activities (Owen et al., 2004).

Continuing care retirement communities (CCRCs; Harris-Kojetin et al., 2005) that provide both congregate-independent living and assisted living promote continued independence for the older adult population and offer a dwelling place that is more independent than skilled nursing settings (Joseph and Zimring, 2007; Mihalko and Wickley, 2003; Pruchno and Rose, 2000). While there was a 22% increase in skilled nursing facilities between 1991 and 1999, there was a 50% increase in assisted-living facilities (Mihalko and Wickley, 2003), and the population projected to live in these settings will likely grow. Thus, CCRCs will become an increasingly important setting for interventions to improve the health of seniors. Individuals living in such facilities are thought to be relatively inactive and more frail than community-dwelling older adults (Mihalko and Wickley, 2003). Some of these facilities may offer physical activity programs, but they are often understaffed and lack exercise equipment and

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supervised walking programs (Mihalko and Wickley, 2003). Moreover, the campus and facilities generally have not been designed to promote walking and are not always located in neighborhoods that provide safe and accessible walking opportunities.

To guide health interventions in specific settings, ecological models are needed. Ecological models emphasize the interaction among biological, psychological, behavioral, social, and environmental factors for individuals, social networks, families, neighborhoods, and communities (Sallis and Owen, 2002; Satariano and McAuley, 2003). Such models propose that interventions are most effective when they change influences at multiple levels. A unique contribution of ecological models is their focus on environmental factors in health behavior change, as many other models only focus on psychological and social factors (Sallis and Owen, 2002). Environments can shape behavior directly (e.g., an individual cannot walk to a store because there are no stores within walking distance from home) or indirectly via perceptions of the environment (e.g., a neighborhood may be safe relative to other neighborhoods but individuals may believe their area is unsafe and choose not to walk). The nesting of individually targeted behavior change models, such as social cognitive theory (Bandura, 2004), within ecological models can lead to the development of multilevel interventions that are tailored to specific individuals and populations in specific places.

Consistent with ecological models, researchers have increasingly examined the importance of the built environment for promoting regular physical activity in older adults (Cunningham and Michael, 2004). Safe footpaths for walking, access to local facilities and services, presence of hills, absence of unattended dogs, enjoyable scenery, heavy traffic, and availability of sidewalks have been associated with physical activity in at least some groups of seniors (Cunningham and Michael, 2004; Li et al., 2005; Patterson and Chapman, 2004). The environment has also been related to the disablement process and depression among older populations (Clarke and George, 2005). For example, older adults with declining physical functioning were less able to perform daily instrumental activities when living in neighborhoods with limited land use mix (which refers to having a variety of uses in an area such as shops and residences; Clarke and George, 2005). In another study, older men living in more walkable neighborhoods had fewer depressive symptoms (Berke et al., 2007).

Researchers have called for better integration of individual and environment factors in physical activity interventions (Mihalko and Wickley, 2003; Satariano and McAuley, 2003; van der Bij et al., 2002) as well as better translation of research findings about environmental correlates into policy changes (Michael et al., 2006). While changes to the built environment can be expensive and take time to produce, such changes are permanent and affect the entire population. An alternative and less expensive interim strategy is to educate seniors about how to effectively overcome barriers and use available environmental resources that support physical activity.

Older adults' motivation and walking behavior may be influenced by actual access to and perceptions of safe walking routes (Giles-Corti and Donovan, 2002; Reed et al., 2004) Self-monitoring using pedometers can increase older adults' walking, and some studies have used motivational goals for accumulating steps such as 'walk across America' (Ogilvie et al., 2007), based on a social cognitive model of behavior change (Brawley et al., 2003). However, to our knowledge, there are no published studies of interventions to promote physical activity in CCRCs that simultaneously address individual, social, and environmental factors using a combination of principles from ecological models and social cognitive theory. This approach is supported by ecological models that predict multilevel interventions will be most effective in improving health behaviors, including physical activity (Satariano and McAuley, 2003). The purpose of this pilot study was to explore the feasibility and acceptability of such a novel place-based intervention. We hypothesized that older adults living in a CCRC would improve their amount of daily walking if they had better knowledge of places they could walk and individualized counseling sessions to teach specific physical activity self-management strategies.

Methods

Participants and setting

Adults over the age of 65 years were recruited from a CCRC for military veterans located near San Diego, CA. The facility has 400 beds and offers three levels of care—independent, assisted, and skilled nursing. Participants in this study were recruited from independent and assisted-living residences. Inclusion criteria were: not regularly physically active (less than 30 min three times per week), able to speak and write in English, score of less than 14 s on the Timed Up and Go Test (Shumway-Cook et al., 2000) that assesses risk of falls, no history of falls, and approval to participate from the site physician. Only one site was chosen for this feasibility study so that materials could be specifically tailored to the local environment. Although the site was on a hill, and participants noted this was a barrier to walking, there was an extensive walking path on site and stores and parks to walk to in the local neighborhood, making the site a feasible location for intervention. Fliers were posted around the CCRC to recruit potential participants. Interested site residents attended a study information meeting to obtain more details on the study, meet the researchers, determine eligibility, and sign consent forms if they wanted to participate and were eligible. The San Diego State University Institutional Review Board approved the study.

Study design

A pre-test post-test design was used. As this study aimed to test the feasibility of a new multilevel intervention, sample size calculations for effectiveness were not performed; all eligible volunteers were accepted into the study. At baseline, participants received pedometers and were instructed to wear them every day for the next week and not to change their usual activity levels (see Table 1). They also completed surveys at this time. One week after the baseline assessment (beginning of Week 1), the intervention began with a brief group education session, distribution of binders with all materials, and individual health counseling sessions with goal setting. At the beginning of Week 2, there was a second individual health counseling session with a new individualized goal for the final week. At the end of Week 2, participants' final step counts were recorded and a second survey was completed.

Table 1
Intervention overview

Baseline	Wear pedometers at usual level of activity Complete survey
Beginning of Week 1	Record baseline step count Receive intervention materials as a group Meet with individual health counselor Monitor steps for the week
Beginning of Week 2	Record step count from Week 1 Meet with individual health counselor Monitor steps for the week
End of Week 2	Record final step count from Week 2 Complete final survey

Intervention development

Development of the individual, social, and environmental interventions was based on literature reviews, focus groups with seniors, and pre-testing of written materials. The main novel component was improving perceptions of the environment for supporting walking by giving participants site-tailored walking route maps. Studies of walking routes with older adults have shown that length of routes, sidewalk quality, people along the route, signaled cross walks, safety from crime, scenery, and access to services are important features of preferred routes (Kealey et al., 2005; Lockett et al., 2005; Michael et al., 2006).

To isolate the best walking routes on and off site, several steps were taken. Maps of the area around the CCRC were first examined for identification of all potential walking destinations (such as parks and shops). Researchers then traveled to the area around the CCRC and visited the routes to systematically observe and code route characteristics using an adapted version of the Senior Walking and Environment Assessment Tool (SWEAT; Cunningham and Michael, 2004; Cunningham et al., 2005). The SWEAT is an observational tool for assessing the functionality (e.g., having sidewalks and other structures that support walking), safety, aesthetics, and destinations of street segments. It was adapted to assess the frequency of walking supports (e.g., shade, resting places) and barriers (busy streets) along continuous routes. Three destinations within a half mile of the CRCC were chosen and various routes to these destinations were then assessed. An additional route around the perimeter of the site campus was also assessed. Four walking routes were selected for recommendation to participants as they had the best functionality (few streets to cross, level sidewalks in good condition, places to rest), were safe (not isolated, safe crossings with adequate time to cross), and were aesthetically pleasing (greenery and attractive views, shade). Because the site was on a hill, all routes that led off site involved negotiating hills; however, on-site paths (including the site perimeter route) were level. Step counts for the routes were determined by three researchers (of varying height and fitness) walking the routes and averaging their counts. Participants were informed that the step counts were an estimate and they were encouraged to check their own step counts for the various routes.

To visually display the selected routes and serve as an environmental prompt for participants to walk, several types of maps were created. An overview poster was designed that showed a map of the local area with the four recommended routes highlighted and briefly described. Two of these routes were to local parks (and were 2500 and 1400 steps round trip) and one was to a local shopping plaza (1500 steps round trip). Foldable pocket-sized route cards were created for these three routes. The cards highlighted each route on a map and provided details such as amenities available (e.g., restrooms and drinking fountains) and step counts for the route. The fourth route involved a walking path around the perimeter of the facility (2000 steps around). As the facility lacked a usable map of its grounds, a map of the site was developed, highlighting the recommended perimeter route. Estimated step counts and amenities for each route were illustrated. In addition, step counts for common paths on site, such as from residential buildings to the dining hall, were provided. The materials were designed in a large font size (14 point or more) using simple but bright color schemes and photographs in order to appeal to the senior population.

Focus groups were undertaken prior to the intervention with the purpose of testing the materials that had been designed for the study. Two focus groups were conducted with eight and nine participants. Feedback from the focus groups was used to improve the design of the materials and refine other intervention components. Some themes that emerged from participants included: the importance of addressing motivation and 'laziness,' the barrier of navigating hills or grades (even slight inclines) when walking, the identification of additional appealing walking locations that were nearby, the suggestion of presenting photographs of seniors walking and places to walk rather than graphical designs, and that text should not be superimposed over graphics. Participants generally were aware of the local parks but did not walk there because of perceived lack of confidence and the hills. One major barrier to walking identified by participants was the ready availability of motorized transport around the site, including scooters or shuttle buses that were regularly used by residents in lieu of walking.

Delivery of intervention components

The multilevel intervention included several components: changing perceptions of the environment via tailored walking route maps, social support, pedometers and self-monitoring, and brief individually tailored counseling for goal setting and problem solving.

Changing perceptions of the environment

To encourage participants to view their local area as an excellent place to walk and to increase participant self-efficacy for walking, walking route maps were provided during Week 1 of the intervention. Researchers provided instructions on how to use the maps at the first group meeting. Participants were encouraged to use the maps to: help select safe routes for walking, help identify environmental barriers and supports to walking, and cue them to walk (by posting maps in visible spaces in their apartments). Maps were used during individual counseling meetings to guide selection of walking routes.

Social support

To enhance social support, study participants met weekly as a group on site during Week 1. Participants received all intervention materials and participated in an introductory session on the health benefits of physical activity, guidelines for safe walking, and overview of the intervention. The researchers planned on helping the residents form walking groups to try the routes together, but after a vote it became clear that the participants preferred to walk independently. It appeared this was the result of concerns that a group walk would be too fast or difficult for some and too slow or easy for others, even if two different groups were formed.

Pedometers and self-monitoring

Pedometers (further described in the measures section) were given to participants at the beginning of the intervention along with instructions about how to read step counts throughout the day. To help participants monitor their progress, they were encouraged to record their steps at the end of each day on a simple step log. Logs were returned to researchers during individual counseling sessions each week. To encourage increasing step counts, informational handouts provided average step counts for small distances around the residence, as well as suggestions of other places where participants could monitor their steps, such as while shopping, on-site outings, or running other errands.

Brief counseling for goal setting

To tailor the program to individuals' specific needs, participants met briefly (i.e., less than 10 min) one-on-one with trained health counselors during both intervention weeks in an on-site meeting space. During these sessions, feedback was given based on the participant's previous week's step counts from their step logs. The goal of increasing weekly steps by about 10% was discussed. Part of the environmental component of the intervention was to develop a specific plan, including when and where to walk based on the maps and step counts provided, to meet each individual's step goal. Participants were encouraged by their health counselor to consider which routes would be best for their needs (e.g., selecting a shorter versus longer route based on how far or how long they thought they could walk) and to post maps in places where they could serve as cues to walk. A step goal contract explicating the details of the goal was signed, and participants were verbally reinforced at each intervention visit for their efforts. Behavioral strategies taught to participants by their health counselor included using social support, changing personal environments to provide cues to walk (e.g., leaving walking shoes by the door), scheduling walks into the daily routine, the benefits of self-monitoring using the pedometers and step logs, and restarting walking after missing planned walks (i.e., relapse prevention).

Participants were encouraged to think about the personal benefits they would receive from walking and to solve problems of barriers to walking in the weekly individual counseling sessions. Handouts included information on potential benefits and barriers and possible solutions (e.g., if you think walking is too difficult, try starting off slowly such as by walking up and down your hallway). Several participants had chronic conditions that made it difficult to walk. Thus, specific handouts, addressing how to walk safely with COPD, arthritis, and chronic pain, were developed based on standard educational information from relevant organizations for each disorder. These condition-specific handouts were given to all participants at the beginning of the intervention.

Measures

Pedometer steps were the main outcome used to capture daily and weekly walking. These instruments have been shown to accurately measure steps in older adults (Farmer et al., 2006), though they may underestimate step counts in nursing-home residents with gait disorders and slow walking speeds (Cyarto et al., 2004). However, pedometers generally serve as an excellent measurement and intervention tool that is well accepted and sufficiently accurate for seniors without walking impairments; hence they were considered appropriate for the present study. The Accusplit AH120M9 pedometer (Pleasanton, CA) was chosen as it is based on DigiWalker technology, which has been found to be both reliable and accurate (Crouter et al., 2003) but has a larger display size, which enhances its utility with older adults. An important feature was the 7-day memory, which provided objective step data across 1 week. Seven-day weekly totals were recorded by the research team at the weekly individual sessions. Pedometer output was compared to participants' step logs but there were few discrepancies. Nonetheless, the step count from the pedometer memory was utilized as the outcome variable.

Difficulty with executing daily activities (e.g., walking one mile, going up and down stairs, walking several blocks) was measured with 14 self-reported items adapted from the Late Life Function and Disability Instrument: Function Component (Jette and Haley, 2002). Response options ranged from 1 (cannot do) to 5 (no difficulty). The items had high internal consistency (Cronbach's $\alpha = .94$ at both time points in the current sample). Difficulty with daily activities for those using a cane or walking device was similarly assessed using seven items and the same scale (Cronbach's $\alpha = .78$ and .86 in the current sample).

Quality of life was measured with three items from a previously developed scale (a portion of the SF-12; satisfaction with life as a whole, how much pain interferes with normal daily activities, and how often feel isolated from others; Ware et al., 1996). One additional item (overall rating of health compared to others) was from the National Health Interview Survey. Each item had a different scale but for all items higher numbers indicated lower quality of life (Cronbach's $\alpha = .74$ in the current sample). Benefits of walking were assessed with nine items (e.g., walking improves self-esteem, helps you meet new people, promotes weight loss, and decreases stress) on a scale of 1 (strongly disagree) to 5 (strongly agree; Cronbach's $\alpha = .96$; Hovell et al., 1989). Higher numbers indicated more benefits. Barriers to walking (e.g., lack of interest, lack of time, poor weather) were assessed with 13 items (Cronbach's $\alpha = .65$) on a scale of 1 (never) to 5 (very often; Calfas et al., 1994). Higher numbers indicated more barriers. Satisfaction with the intervention and frequency of route use were assessed through questions at post-test. Self-reported demographic variables included age, gender, length of time living at the residence, scooter ownership, body weight, and height.

Analysis

Descriptive statistics were computed. Pre–post changes were analyzed using paired samples *t*-tests. The alpha was set at .05, two tailed; however, because of the small sample and exploratory nature of this study, non-significant trends were examined.

Results

Main outcomes

A total of 12 individuals were recruited from fliers and completed each measurement point in the 3-week intervention study. Ten additional individuals who were initially recruited did not complete the study due to a variety of reasons, including health problems ($n = 1$), failure to attend study meetings ($n = 2$), time conflicts ($n = 2$), because they felt the program was not right for them ($n = 1$) or for unknown reasons ($n = 4$). Non-completers had lower baseline daily step counts ($M = 1736$, $SD = 1701$) than completers but the difference was not significant. Non-completers were younger ($M = 76.60$; $SD = 8.08$) than completers ($M = 81.79$; $SD = 6.70$) but not significantly. All non-completers were men.

Participants (see Table 2 for sample characteristics) had very low activity levels at baseline with a mean daily step count of 3020 ($SD = 1858$). Participants were also older (see Table 2) and overweight on average. Average daily pedometer steps increased between baseline ($M = 3020$; $SD = 1858$) and Week 1 ($M = 4314$; $SD = 2627$; $t(11) = -2.99$, $p = .012$) and Week 2 ($M = 4246$; $SD = 2331$; $t(11) = 3.42$, $p = .006$). Daily step counts between Weeks 1 and 2 were not significantly different ($p = .79$). All participants met their daily step goals (generally a 10% increase from baseline) in Week 1 while 50% met their step goals in Week 2.

A median split of age was performed. The oldest seniors (83 years old and greater) had lower mean step counts at all measurement points than younger seniors ($<$age 83, see Table 3) though there were no significant differences The percent increase in daily steps was higher for the older group (53% versus 30%). Older seniors continued to increase their daily step counts each week of the intervention while younger seniors had a decrease in daily step counts between Week 1 and 2. Males had non-significantly higher step counts than females (see Table 3). While females' daily step counts continued to increase during each week of the intervention, males' step counts decreased between Weeks 1 and 2. Seniors who were overweight (BMI 25 or above) had non-significantly lower daily step counts at all time points (see Table 3). While seniors who were normal weight continued to increase their steps each week of the intervention, overweight seniors had a decrease in steps between Weeks 1 and 2. Individuals who owned scooters had lower step counts at all time points (see Table 3). Daily step counts were significantly higher for non-owners than owners during Weeks 2 and 3.

Secondary outcomes

No changes were observed in the perceived benefits of walking (M Baseline = 4.04, SD = .43; M Week 2 = 4.17, SD = .58, $p = .37$), reported barriers to walking (M baseline = 1.89, SD = .52; M Week 2 = 1.69, SD = .42, $p = .37$), or quality of life scores (M baseline = 1.90, SD = .51; M Week 2 = 1.81, SD = .47 $p = .53$ with lower scores indicating higher quality of life). Ability to engage in daily activities with less difficulty showed a trend toward improvement (M Baseline = 2.34, SD = 1.03; M Week 2 = 2.56, SD = 1.07, $p = .16$ with higher scores indicating less difficulty).

Self-reports indicated that participants used the selected walking routes, though most increases were around their residence rather than on the routes in the neighborhood. At baseline, five residents did not walk around the residence at all in the past week and of the seven who did, three walked three or more times per week. At follow-up, only three reported not walking on their residence in the past week and of the nine who did walk around their residence, seven walked three or more times per week. The most used off-site walking route was to a large local park. Participants ($N = 3$) who used this route rated it as easy, pleasant, safe, and enjoyable, with a low traffic speed. Compared to the other routes, this destination was on the least-trafficked roads and involved navigating a less-steep hill.

Table 2
Participant characteristics ($N = 12$)

Characteristic	Mean	SD	Range
Age (years)	83.56	5.97	74–92
Time lived here (years)	3.42	2.11	0–6
BMI	28.47	6.21	20.2–39.5
Characteristic	**Percent (%)**		
Male	50		
Overweight (BMI >25)	67		
Own scooter	33		
Below age 80	33		

Satisfaction with the intervention

Satisfaction with the intervention was high overall ($M = 1.36$, SD = .67, where 1 = very much satisfied and 4 = not at all satisfied). Nine of the 12 participants indicated they planned to continue walking at their current level or higher. Three of the 12 participants reported being very much confident they could continue to increase their steps on their own while five reported feeling somewhat confident in being able to do so (overall $M = 2.09$; SD = .94 where 1 = very much confident while 4 = not at all confident).

Discussion

The results of this pilot study indicated that a brief multilevel place-based walking intervention is a promising method for promoting walking among seniors who live in CCRCs. Combining site-tailored maps and materials with brief weekly individualized goal setting led to a 41% increase in average daily steps after 2 weeks. Evidence from the physical activity and aging literature indicates that movement from a sedentary lifestyle to doing some activity, even if below recommendations, can improve health in a dose–response manner (Nelson et al., 2007).

Older adults in this study averaged just over 3000 steps/day before intervention. For comparison purposes, Tudor-Locke and Bassett (2004) found that healthy older adults averaged approximately 6500 steps/day (Tudor-Locke et al., 2002) but many older adults fell into the 3500–5000 steps/day range (Tudor-Locke and Myers, 2001). Thus, participants in this study were very inactive. However, the goal of 10,000 steps/day, often recommended for good health in adults, may be too high for older adults and there is no consensus on a step count recommendation for older adults (Tudor-Locke and Bassett, 2004). The individually tailored 10% step goal used in this program, with gradual increases in step

Table 3
Step counts by selected demographic variables

Variable (N)	Baseline mean step count (SD)	Week 1 mean step count (SD)	Week 2 mean step count (SD)
Gender			
Male (6)	3418 (1717)	5036 (2982)	4813 (2606)
Female (6)	2623 (2066)	3591 (2243)	3679 (2096)
Age			
Below 83 (6)	3299 (1855)	4718 (3031)	4293 (2287)
83 And above (6)	2741 (1992)	3910 (2366)	4200 (2593)
Weight status			
Normal weight (4)	3341 (1541)	4621 (1066)	4946 (1075)
Overweight (8)	2860 (2078)	4160 (3205)	3896 (2761)
Own scooter			
No (8)	3589 (1912)	5328 (2581)*	5187 (2095)**
Yes (4)	1883 (1244)	2286 (1236)	2364 (1612)

* $p = 05$.
** $p = 04$.

counts based on site-specific maps, may be a more suitable step goal for frailer older adult populations.

Several variables contributed to participants' ability to increase their step counts, including being younger, male, of normal weight, and not owning a scooter. However, women, older seniors, and scooter owners were better able to sustain gains in step count improvements, suggesting that these less-active populations can still change their walking behavior with a multilevel intervention. An important finding was that individuals who owned scooters (but were able to walk without the aide of a scooter) had lower step counts at Week 1 and 2 than non-owners. Electric scooters may encourage sedentariness among older owners and present findings suggest the need for further evaluation of the potential health impacts of scooters. These patterns must be interpreted with caution as the sample size was small and standard deviations were large.

Site-tailored maps and individualized goal setting were feasible to use in this population and well liked. Participants preferred to walk around the residence rather than off-site in their local neighborhood, suggesting that it is best for older adults to start a walking program close to home where they feel more comfortable. A longer intervention could assist participants in gradually expanding walking to off-site routes. On the other hand, despite the study being located on a hill, which residents perceived as a barrier to walking, the intervention helped some seniors overcome this barrier and enjoy walking outside of their residence to local parks and shopping centers. The most used off-site route was rated as very easy, low in traffic volume and noise, and pleasant. The favored route was the least hilly and involved navigating smaller roads with less traffic than the other routes. This suggests that older adults are particularly sensitive to traffic in selecting walking routes; hence traffic calming around CCRCs should be evaluated as a method to increase walking.

Study limitations included the uncontrolled quasi-experimental design, brief intervention, and small sample size. Only 55% of those initially interested completed the study. The reasons for dropout were unknown for several of the initial participants as contact was lost. Loss of contact resulted because researchers did not obtain participants' phone numbers to remind them about study meetings. An administrator at the site had agreed to remind participants, but this method was not effective. Thus, it is likely many participants forgot to attend meetings. Future studies should collect phone numbers of participants and routinely remind them by phone in advance of study meetings. Strengths of the study included use of a novel multilevel intervention that was tailored to the environment, individualized to each participant's needs, and developed with the input of focus groups. Another strength was the objective measure of walking.

Overall, the present study supported the potential effectiveness for targeted multilevel walking interventions among CCRC residents. Next steps include long-term studies with more rigorous study designs, such as randomized controlled field trials, to evaluate multilevel walking interventions in CCRCs. Such studies should be conducted in a variety of site types (e.g., small- and large-sized facilities, campus style versus residential buildings only, and/or walkable versus less-walkable local areas) to determine whether such variations interact with the intervention, helping to inform researchers of ideal facility and campus designs for active older adults. Studies are needed that are powered to detect significant differences between treatment conditions. Adherence to the walking intervention needs to be monitored and techniques to improve adherence evaluated, such as calling participants the day before study meetings to remind them to attend. Encouraging study participants to advocate for environmental changes on site as well as in the local area could promote maintenance of walking behavior and encourage more older adults to walk. Finally, measures of the activity environments of CCRCs and local areas are needed to determine which site features are most conducive to promoting active lifestyles. Such findings can inform the design of new CCRCs to be more supportive of walking. Multilevel interventions tailored to the place of residence show promise for improving the walking behaviors of older adults and the current study is a small but significant step forward in developing more effective interventions.

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