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A Lifestyle Physical Activity Intervention for Caregivers of Persons With Alzheimer's Disease

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Background: The purpose of this pilot study was to examine the effects of lifestyle physical activity in caregivers (CGs) of persons with Alzheimer's disease. *Methods*: Fifteen CGs engaged in lifestyle physical activity during a 6-month, home-based health promotion program. Mean changes in self-reported physical activity were compared using repeated-measures analysis of variance. *Results*: Fifty percent of CGs increased total self-reported minutes and 42% increased total moderate minutes of physical activity from preintervention to postintervention; however, no CG engaged in vigorous physical activity and there were no significant improvements in self-reported physical activity for the total group. Hot summer weather, heavy noncaregiving responsibilities, heavy caregiving responsibilities, and feelings of anxiety, depressive symptoms, and fatigue were the most frequently identified physical activity barriers. *Conclusion*: Incorporating an individualized, home-based program of lifestyle physical activity appears feasible; however, attention needs to be given in the future to physical activity barriers identified by this select group of CGs.

Keywords: caregiver; physical activity; tailored intervention

Background

Nearly 25% of all caregivers (CGs) in the United States are providing care for persons with Alzheimer's disease (AD).[1] The progressive impairment of cognition and physical function and the development of a wide range of behavioral disturbances place emotional, physical, and financial demands on informal CGs.[1] Consequently, family members deal with a broad range of care-related issues over an extended period of time.

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The presence of CG stress and changes in their physical health have been well documented.[2] A large population-based study found that when adjusting for key sociodemographic and disease factors, CGs reporting emotional strain had mortality risks that were 63% higher than noncaregiving controls and CGs who were not strained.[3] The impact of strain on CGs' self-care has been theorized as a potential pathway to increased mortality. Caring for a person with AD is considered a chronic stressor because the average length of time care is provided ranges from 8 to 10 years.[4,5]

Existing family CG interventions have focused on care-related stressors and mental health outcomes. Few interventions have addressed the need for CG health promotion and improved physical health outcomes.[6] Effective interventions are needed to help CGs maintain optimal mental and physical health as they assume their familial and social roles with less risk to their own well-being.[7,8]

Recent literature suggests that increasing lifestyle physical activity is one of the most effective health promotion strategies, with benefits to both mental

and physical health and decreased mortality.[9,10] Studies indicate that older adults, including CGs of persons with AD, prefer physical activity programs of moderate intensity that are simple, convenient, inexpensive, and noncompetitive and that more effective interventions use cognitive/behavioral physical approaches as opposed to traditional physical activity prescriptions. Telephone interventions combined with home-based physical activity programs are both superior for long-term adherence and more preferred by users than class-based programs.[11,12]

In contrast to the many CG intervention studies that have addressed care-related issues, fewer physical activity randomized trials have been conducted with CGs of persons with AD. Existing studies were moderate-intensity, home-based physical activity telephone interventions.[12-15] These studies showed that CGs increased their total weekly physical activity levels and self-efficacy; however, they were primarily limited to postmenopausal Caucasian women. Less information is known about CG health promotion interventions in multicultural populations or in male CGs.[11,12] The purpose of this pilot study was to examine effects of a telephone-based lifestyle physical activity intervention in conjunction with standard education and support in a multicultural sample of male and female CGs of persons with AD. Pilot data were gathered in preparation for a randomized clinical trial (RO1 NR009543).

Methods

Study Design

This study tested a 6-month multicomponent health promotion intervention with the primary outcome being self-reported lifestyle physical activity in home-based primary CGs of persons with AD. The study used a pretest/multiple posttest design to examine the feasibility and preliminary efficacy of the enhancing physical activity (EPA) intervention. The EPA intervention builds on standard care-related education and support, provides a lifestyle physical activity intervention aimed toward increasing CG physical activity, and addresses common barriers to intervention participation. This type of intervention has been associated with increased physical activity and improved mental and physical health outcomes.[12,13,16] An individualized telephone-based health promotion approach was selected because (1) existing CG literature suggests that individual interventions have greater effect sizes than group interventions,[17,18] (2) home-based individual interventions are preferred by elderly persons participating in physical activity interventions,[11] and (3) a telephone-based format increases intervention accessibility and individualization and is flexible, feasible, well received, and equally as effective as onsite groups.[19-21]

Consistent with clinical trial design, this study had 1 primary outcome of weekly minutes spent on CG self-reported lifestyle physical activity.[22] Data were collected at baseline, at 3 months, and at 6 months. The Rush University Medical Center Institutional Review Board approved the study protocol, and each participant provided written informed consent.

Study Participants

A convenience sample was recruited from the Rush Alzheimer's Disease Center. This site has a sample of well-characterized persons with AD and uses an integrated database to identify care receiver (CR)/CG dyads that meet key study inclusion criteria.

Eligibility included (1) CRs who (*a*) had a diagnosis of probable dementia (using the National Institute of Neurological and Communication Disorders and Stroke/Alzheimer's Disease and Related Diseases Association criteria) and (*b*) resided in the community and received assistance from a primary CG; and (2) CGs who were English-speaking, literate men and women of all ethnic and racial backgrounds who (*a*) were a spouse or other close family member of the person with AD (age ≥ 21 years), (*b*) lived with or close to the CR and provided ≥ 10 hours of care per week, (*c*) CG for at least 6 months, (*d*) cognitively intact as defined by ≤ 2 errors on a brief screening instrument, (*e*) had no major debilitating health problems that would prevent intervention participation, (*f*) had a telephone, and (*g*) were willing to increase physical activity. CGs were screened for acute medical conditions that might interfere with participation in moderate physical activity.[9,23]

Study Protocol

Participants were identified by using key identifiers and by screening potential dyads when they came into the Memory Clinic. Once the project coordinator confirmed eligibility and CGs expressed interest in study participation, a baseline home visit (60 to 90 minutes) was scheduled to obtain informed consent, administer

the CR Mini-Mental Status Examination (MMSE) if unavailable from clinical data, and administer the CG baseline assessment. A combination of telephone and in-home assessments were used to collect follow-up data at 3 and 6 months. In addition, an accelerometry-based activity monitor was used with CGs to objectively assess physical activity and determine agreement among 3 measures of physical activity: self-report, pedometer, and activity monitor.

Intervention Contact

A doctorally-prepared nurse interventionist provided all CG contact and support. The 6-month EPA intervention had 14 contacts over 6 months and was provided in-home and via telephone (totaling approximately 5 hours of intervention time). The intervention began with an in-home baseline intervention assessment and was followed by weekly telephone calls in months 1 and 2, bimonthly calls in months 3 and 4, and monthly calls in months 5 and 6. The EPA intervention consisted of an initial assessment to determine strategies for incorporating physical activities into CG's daily lives. Telephone counseling sessions (lasting approximately 20 minutes) were used to introduce intervention content, set long-term and short-term goals, report physical activity data, monitor progress, and help in getting over barriers. The length and nature of each call was recorded.

Intervention Content

The goal of the treatment intervention (EPA) was to build on CG standard information and support needs, help CGs increase lifestyle physical activity, and reduce common barriers to maintaining physical activity. Lifestyle physical activity is defined as any leisure, ongoing, or planned physical activity (eg, walking, gardening, stretching/flexibility).[24] This approach was selected because increasing lifestyle physical activity is concrete and has positive effects on mental and physical health and is feasible with elderly persons and takes account their health, preferences, and abilities.[24] Recent studies document feasibility and effectiveness in similar programs with the elderly and dementia family CGs.[10,12,13,25-27]

Theoretical support for the intervention was derived from self-efficacy theory, based on Bandura's social learning theory.[28,29] Self-efficacy theory (commonly used to understand changes in health behaviors and health outcomes) suggests that enhanced efficacy and outcome expectations with the EPA intervention would be associated with improved levels of self-efficacy and physical activity. Intervention sessions focused on (1) benefits and types of physical activity (eg, endurance, strength and balance, and flexibility) and how much activity to do; (2) safety issues; (3) developing a realistic plan for increasing physical activity, staying motivated, addressing barriers, and maintaining physical activity over time; (4) assessing intensity of physical activity; and (5) assessing progress.[9]

Teaching materials included the EPA customized manual, Rush manual for CGs, the exercise guide and video from the National Institute on Aging (NIA),[9,30] and the resources and information kit (RIK). The EPA manual included intervention objectives and content outlines and was used to structure content and individual telephone calls. All CGs received the Rush manual for CGs, a general manual of CG information. When CGs requested additional information concerning CG responsibilities, the interventionist provided copies of materials from the RIK, referred them to the Rush manual for CGs, or to the Alzheimer's Association Helpline. The RIK is a Microsoft Access database prepared by the investigative team that includes (1) printed educational materials about CG topics; (2) print/nonprint resources, such as books and Web sites; and (3) agency contacts.

Strategies for increasing physical activity relied on fundamental self-management skills: short-term and long-term goal setting, self-monitoring or tracking of activity patterns, feedback and support from the interventionist, identifying barriers and practical solutions to overcome them, and identifying mechanisms of relapse prevention.[11,31-33] The goal of lifestyle physical activity was to let CGs find the right combination of activities that fit their needs, interests, and abilities (eg, walking or biking). An endurance/ aerobic physical activity focus was selected because of its most consistent association with improved physical health.[9] Experts also recommend that endurance activity should be supplemented with strength-building and flexibility exercise.[9] The NIA exercise guide and video were used to structure this activity.[9,30] The NIA guide reinforces information on physical activity benefits, safety, and relapse prevention and has a sample of strength/balance and stretching exercises. The 48-minute video provides routines that focus on strength/balance and stretching.[9,30]

CGs monitored their physical activity using a simple log. CGs also used pedometers to assist with

goal setting and encourage overall increases in activity (ie, taking stairs instead of elevators).[34] During their baseline visit, CGs were instructed on pedometer use and how to monitor their physical activity. They were asked not to change their physical activity levels for the first week to establish baseline physical activity. In keeping with self-efficacy theory, participants were asked to set short-term activity goals and not to change their routine physical activity until they had successfully met short-term goals and felt confident in their ability to achieve a more challenging goal in their routine. At every telephone contact they reported their activity using the FITT principle (frequency, intensity, time, and type of activity). Every effort was made to simplify the process of recording physical activity so as not to increase CG burden. Regularly scheduled telephone calls with the interventionist assisted CGs to set realistic short-term (ie, weekly) and long-terms goals (ie, 1 to 6 months) and to gradually increase their activity. In designing a feasible individualized program, consideration was given to baseline type of activity and CG capabilities/preferences and resources. The goal was to assist CGs to engage in moderate physical activity 30 minutes/day for most days of the week with the target goal of at least 150 minutes/week.[9] CGs were monitored to see how soon they reached their target goal.

The study treatment manual and regularly scheduled individual telephone calls addressed current and potential barriers to increasing physical activity. During individual telephone calls, CGs were able to identify their personal barriers, and the interventionist helped them develop practical solutions for overcoming specific challenges or obstacles.[31,32] Approaches for addressing personal barriers included to the following: (1) if the CG expressed limited time for physical activity because of care-related obligations (ie, CR wandering), CGs were encouraged to explore how they could incorporate increased physical activity into their own and the CR's day (ie, going for walks or doing the NIA video together, using respite care or adult day care to provide CGs free time to engage in physical activity); (2) CGs who identified time as a barrier were encouraged to engage in physical activity for shorter periods of time (ie, short 10-minute segments daily); (3) CGs who experienced depressive symptoms were encouraged to set realistic goals that could be accomplished, build in regular rewards for themselves, and monitor the effect of physical activity on their mood; and (4) persons with physical limitations were assisted to set realistic goals and identify physical activities that matched their abilities.

Content concerning basic care-related needs focused on (1) understanding dementia and safety issues, (2) providing CR personal care (eg, bathing, toileting), (3) approaching difficult behaviors, (4) managing CG stress, and (5) finding and using services supportive/respite care.[35-38] This care-related content helped CGs understand approaches to the most challenging caregiving situations.

Measurements

Physical activity. The 41-item Community Healthy Activities Model Program for Seniors (CHAMPS) Questionnaire was selected as the primary outcome because it was designed to assess changes in physical activity behavior with community-based older adults, and it has been shown to be sensitive to change with behavioral interventions.[24,39] This measure provides an extensive list of light, moderate, and vigorous physical activities and can determine frequency of physical activity by intensity (ie, all activity and moderate activity) and metabolic equivalents by physical activity intensity. Weekly time for lifestyle physical activity was recorded in minutes. Reliability and validity of this tool have been confirmed in community-based interventions with older adults and activity dimensions positively correlated with accelerometry.[9,39] Physical activity was assessed at baseline, at 3 months, and at 6 months.

Activity monitor. The Mini Mitter (Model #GT7164; Mini Mitter, Bend, OR) accelerometry-based activity monitor was used with CGs to objectively assess physical activity and to determine agreement among 3 measures of physical activity: self-report, pedometer, and activity monitor.[40] Reliability and validity of activity monitors have been established with O_2 uptake, doubly labeled water techniques, metabolic equivalents, pedometer readings, walking, and self-reported physical activity diaries.[41-45]

The activity monitor is a small battery-operated electronic device clipped to a belt or waistline that provides an objective indicator of vertical plane accelerations. CGs wore the activity monitor for 10 days at baseline and 6 months so as to obtain 7 days of useable data. Data collection was initialized by an IBM-compatible computer and collected over 1-minute epochs for a 10-day period that coincided with periodic

self-report evaluations (CGs recorded when they put the monitor on and took it off).

Pedometer. Pedometers were used as a self-management tool to assist CGs with goal setting and as a measure of physical activity adherence. The Digi-Walker SW-200 pedometer (New Lifestyles, Inc; Lee's Summit, MO) is a waist-mounted device that responds to vertical accelerations of the hip and was used because it provides an accurate, objective, acceptable, and cost-effective method to measure lifestyle physical activity in the elderly.[46] Reliability and validity of this pedometer have been established. This pedometer provides a valid measure of total daily walking distance, is accurate on different walking surfaces, and has superior accuracy even at slower walking speeds.[47,48]

During the baseline intervention visit, CGs received instructions concerning placement/removal/resetting of the pedometer and recording daily steps. CGs were encouraged to wear the pedometer at all times during waking hours (except while showering, bathing, or swimming). CGs were instructed not to modify their usual activities for the first week to obtain a 1-week baseline score of accumulated daily steps. This baseline score of daily steps was used to establish short-term and long-term physical activity goals.

CG self-reported physical activity logs. CGs kept weekly logs documenting frequency, intensity, time, and type of physical activity and reported information from their logs during regularly scheduled telephone calls with the interventionist. The logs were used as a self-monitoring technique. Variation from the short-term and long-term goals (previously identified) was discussed with the CG to develop alternative strategies for achieving desired goals.

Interventionist log. For each telephone contact, the interventionist documented the following: time duration of calls, physical activity data, assessment of whether physical activity goals were met, difficulty CGs had in meeting goals, and barriers CGs faced in meeting physical activity goals.

Blood pressure. Procedures for blood pressure (BP) measurement followed American Heart Association Recommendations.[49] Resting BP was assessed in triplicate over a 5-minute period and automatically averaged, using an OMRON IntelliSense HEM-907 digital blood pressure monitor (Omron Healthcare, Inc; Vernon Hills, IL). This monitor allows for automatic cuff inflation and has the reliability and reproducibility of office BP measurements. Both systolic BP and diastolic BP readings were recorded at baseline and at 6 months.

Weight. Body weight was measured to the nearest 0.5 lb using the Health O Meter (Sunbeam Products; Bridgeview, IL) digital scale at baseline and at 6 months. CGs stood on the scale without shoes.

Statistical Considerations and Analyses

The study was designed to have 80% power for detecting an effect size of .89.[24,50] Demographic characteristics were tabulated using descriptive statistics or frequency distributions. Repeated-measures analysis of variance was used to examine changes in total physical activity minutes from baseline to 3 and 6 months. Paired *t* tests were used to compare changes in accelerometry, BP, and weight from baseline to 6 months. Correlational procedures were used to determine agreement among the 3 measures of physical activity used in this study. All analyses were performed using SAS Version 8 (SAS Institute, Inc; Cary, NC).[51]

Results

Fifteen community-based primary CGs of persons with AD were enrolled in the study over 2 months. Two CGs dropped out of the intervention: CG #1 because of care recipient death and CG #2 because of loss to follow-up. CG #1 participated in all follow-up data collection time points. Follow-up data were obtained from 14 CGs for a 93% retention rate.

Table 1 displays CG demographic characteristics. The majority of participants were female, spouses, married, Caucasian, lived with their impaired family member, not employed/retired, and were on average 65.4 years old. Nearly half were from underserved, multicultural groups (African American and Hispanic). At baseline, CGs provided care for an average of 33 hours/week; and those who still worked outside the home (n = 6) reported working an average of 51 hours/week. CR baseline characteristics indicated the majority were female, 10 years older than the CGs on average, had moderate levels of cognitive impairment on the MMSE, and were in relatively good physical health.

Table 1. Baseline Demographic Characteristics (n = 15 Dyads)

Characteristics	Values[a]
CG gender	
Female	53%
Relationship to CR	
Spouse	67%
Parent	27%
Sibling	6%
CG marital status	
Married	73%
Widowed	13%
Divorced	7%
Never married	7%
CG race	
Caucasian	53%
African American	40%
Hispanic	7%
Living with CR	93%
CG employment	
Full-time	27%
Part-time	7%
Unemployed	7%
Retired	60%
CG age in years	65.4 ± 10.8
CG hours of care provided/week	33 ± 19.1
CG work hours/week (n = 6)	51 ± 26.7
CR gender	
Female	67%
CR age	75 ± 9.65
CR MMSE (n = 14)	14.9 ± 5.92
CR self-rated health (scale of 1-5)	2.9 ± 1.16

Abbreviations: CG, caregiver; CR, care receiver; MMSE, Mini-Mental Status Examination.

[a] Values are presented as mean ± standard deviation or percentage.

Physical Activity Outcomes

The goal was for persons to engage in moderate physical activity 30 minutes/day for most days of the week, with the target goal of at least 150 minutes/week. Table 2 summarizes CG physical activity at baseline, at 3 months, and at 6 months. CG baseline self-reported weekly minutes of all physical activity ranged from 55 to 630 minutes (mean = 205 ± 182), whereas moderate-intensity physical activity minutes/week was somewhat lower. Similar patterns were noted using the objective activity monitor. CG physical activity counts were highest for sedentary activities, followed by light and moderate physical activity. No CG had vigorous physical activity. Repeated-measures analysis of variance examined changes in total physical activity minutes from baseline to 3 and 6 months. Although there were no significant improvements in self-reported physical activity for the total group, further examination indicated that 50% of participants increased total self-reported physical activity minutes and that 42% increased total moderate minutes of physical activity from preintervention to postintervention. Objective physical activity monitoring data suggested similar trends. *t* Tests indicated significant decreases in waist-monitored light physical activities and moderate activities and no significant changes in vigorous activities.

Correlations Between Physical Activity Assessments

Baseline and 6-month Pearson correlation coefficients between different physical activity assessments were similar to those reported in the literature.[48,52] Moderate activity on the waist-worn activity monitor was significantly correlated with CHAMPS total physical activity minutes and total moderate minutes ($r = .70$ and .72, respectively; $P = \leq .01$); activity monitor kilocalories and light and moderate activity were significantly related to pedometer steps ($r = .58$ to .80; $P = \leq .05$); pedometer steps were significantly correlated with CHAMPS total physical activity minutes and total moderate minutes ($r = .59$ to .94; $P = \leq .05$).

Physiologic Outcomes

During the intervention, 86% of the CGs maintained BP below 130/80 mm Hg, 20% lost ≥ 10 lbs, and 67% maintained weight. Although BP and weight were not primary study outcomes, it is worth noting because of the strong association between physical inactivity and obesity on health outcomes and increased mortality.[9]

Intervention Implementation Outcomes

The intervention consisted of 1 baseline home visit and 13 telephone contacts over 6 months. Telephone contacts were approximately 20 minutes long. CGs verbalized weekly physical activity goals during telephone conversations and the majority wore pedometers (93%) and completed physical activity logs with no difficulty (80%). Nearly half of the CGs selected walking as their physical activity of choice. Only 25% of CGs were involved in moderate-intensity

Table 2. Summary of Caregiver Physical Activity at Baseline, at 3 Months, and at 6 Months[a]

Physical Activity (PA)	Baseline (n = 15)	3 Months (n = 12-14)	6 Months (n = 14)	*F*	DF	*P* Value[b]
CHAMPS						
All PA minutes	205 ± 182	161 ± 102	188 ± 97	1.20	2, 42	.31
Moderate minutes	164 ± 216	161 ± 145	95 ± 62	0.79	2, 42	.46
				t	DF	*P* Value[c]
Waist Actical						
kcal	4950 ± 2723		2358 ± 1838	−7.16	13	<.0001
Sedentary	7145 ± 1212		8515 ± 1090	5.29	13	.0001
Light activity	1866 ± 696		1122 ± 741	−4.55	13	.0005
Moderate activity	969 ± 657		395 ± 359	−6.77	13	<.0001
Vigorous activity	0		0.07 ± 0.26	1.00	13	.34

Abbreviations: DF, degrees of freedom; CHAMPS, Community Healthy Activities Model Program for Seniors Questionnaire.
[a] Values are presented as mean ± standard deviation.
[b] Analysis of variance.
[c] Paired *t* test.

Table 3. Summary of Physical Activities Performed by Caregivers

Activity	Percentage of Total Entries[a]
Walking	47
Yardwork/gardening	18
Physical labor/work/moving[b]	9
Housework	7
Aerobics/stationary bike/Curves/stair climbing[b]	7
Strength/calisthenics/sit ups/circuit training[b]	6
Dancing[b]	3
Stretching	2
Sports/softball[b]	0.4
Physical therapy with care receiver	0.6
Total entries	100

[a] Total number of activities reported by caregivers over 16 contacts = 237.
[b] Moderate physical activity = 25.4%.

Table 4. Barriers to Increasing Physical Activity[a]

Barriers identified by CGs	Percentage
Caregiving roles and responsibilities	
Heavy noncaregiving responsibilities	21
Heavy caregiving responsibilities	18
CG concerns	
Feeling anxious/down/tired	18
Physical health not good	13
No support from family/friends	5
Environmental	
Hot summer weather	24
Unsafe neighborhood	1

Abbreviation: CG, caregiver.
[a] Total number of barriers identified by caregiver over 16 contacts = 1104.

physical activity such as physical labor/work/moving, aerobics/stationary bike/Curves/stair climbing, strength training/calisthenics/sit ups/circuit training (see Table 3). Some successful approaches for increasing physical activity included combining activities (ie, walking to work, doing yard work), scheduling physical activity first thing in the morning, involving their CR in physical activity, and joining a formal exercise program.

Table 4 displays the 3 major physical activity barriers identified by CGs. Most frequently identified were caregiver roles and responsibilities, including noncaregiving and caregiving responsibilities; CG concerns, including feeling anxious/down/tired, impaired physical health, and absence of support; and environmental concerns, given the hot summer weather and unsafe neighborhoods. Qualitative barriers noted by the telephone interventionist included CR and CG issues: changes in health (ie, hospitalization, hip fracture, change in mobility, behavioral changes such as agitation, difficulty sleeping), CG life changes such as job changes and unemployment, CG apprehension concerning increasing physical activity (ie, reluctance to change behaviors/seek help, difficulty incorporating physical activity into their daily routine), and challenges with technology (ie, not wearing, losing, or breaking the pedometer; losing log book; or no VCR/DVD capabilities).

Intervention Evaluation

CG evaluation indicated that they learned some new information (1.22 ± 0.8; range 0-3) and were moderately positive about intervention methods (2.07 ± 0.7; range 0-3). Comments included positive responses concerning the EPA intervention binder and NIA exercise manual. Fewer CGs used the NIA video. Some older CGs found it challenging to set up the video. All but 1 CG successfully used the pedometer and all CGs wore the physical activity monitor for 10 days at baseline and at 6 months. A challenge for the interventionist was that it often took multiple attempts to reach CGs for telephone calls even when they were prescheduled.

Discussion

This pilot study focused on a major public health problem given the prevalence of AD and the toll that providing care takes on family CG mental and physical health.[3,4] The EPA intervention addressed important Healthy People 2010 physical health risk reduction objectives by proposing to increase the number of CGs who engage in light to moderate physical activity and participate in lifestyle physical activity.[9] This intervention is feasible for home-based CGs of persons with AD given the acceptability of their self-reporting physical activity, wearing the activity monitor and their pedometer for goal setting and monitoring, and maintaining daily physical activity logs. The intervention also addressed important CG barriers to increasing physical activity.[13,14]

Our intent was to gather information concerning a health promotion intervention involving a multicultural sample of CGs for persons with AD. We adequately recruited and retained 53% Caucasian and 40% African American participants. Several studies have demonstrated favorable health outcomes with respect to increased physical activity; however, they have been primarily limited to postmenopausal Caucasian women.[12,14,15] We did not find major differences with intervention implementation between African American and Caucasian participants but will examine these issues in a larger clinical trial.

The primary outcome was to determine if CGs could increase their self-reported weekly minutes of physical activity. The goal was for CGs to increase or maintain physical activity for at least 30 minutes/day most days of the week (150 minutes/week). Although there were no significant improvements in self-reported physical activity for the total group, 50% of participants went from underactive to active, and 6% who were initially active maintained their physical activity throughout the intervention. Perhaps CG baseline self-reported weekly minutes of moderate intensity physical activity was somewhat skewed by more active participants in this small sample, suggesting that either our selection criteria did not screen out these CGs or social desirability affected their baseline scores. Careful attention needs to be given to physical activity inclusion/exclusion criteria (ie, persons reporting low levels of physical activity on screening but exceeding weekly minutes of physical activity using CHAMPS baseline assessment).

We are perplexed by the significant decline of physical activity as noted with the waist-worn activity monitor. The pilot study was conducted during an unseasonably warm summer. Other barriers focused on caregiving roles and responsibilities (burden), potential effects of this burden, environmental concerns, and CGs' reluctance to change their behaviors and/or seek help. Each of these barriers likely also contributed toward this decrease in physical activity. These findings will help us better target these barriers in a larger clinical trial.

This study is unique in that we addressed both CG and physical activity issues simultaneously, something that has been done in few other intervention studies.[12,13,15,16] We identified 3 major health promotion barriers: heavy caregiving and noncaregiving roles and responsibilities, CG concerns regarding their mental and physical health and absence of support from others, and environmental concerns, which are similar to those commonly noted by others.[11,13,16] Given the number of barriers identified, more individualized attention and strategies for overcoming barriers need to be considered. The interventionist addressed barriers during each telephone session using information-sharing, problem-solving, and supportive methods. To deal with care-related issues, CGs were referred to supplemental caregiving materials in the treatment manual, community resources, and information about arranging for their care recipient to attend adult day care or receive respite care. One CG found that until she made arrangements for respite care, left the house and participated in a structured physical activity program, she was unable to increase her physical activity. To deal with physical activity–related barriers, the interventionist reviewed information in the treatment manual, assisted CGs to set short-term and long-term goals, reviewed weekly

log book information, engaged in problem-solving approaches, and supported CGs as they combined caregiving responsibilities with increasing physical activity as a behavioral change. This process was labor intensive for the interventionist, but problem solving and strategizing to overcome barriers was critical for CGs to learn how to incorporate physical activity into their daily lives. These data underscore the importance of incorporating caregiving responsibilities as a key element to assuring CGs' success in increasing their own physical activity.

Study Limitations

Tailoring the intervention to meet individual CG needs strengthened our study; however, there are several potential limitations to our findings. The sample size was small, making it difficult to generalize our findings to other CG populations. The 6-month intervention was relatively short and should be replicated with longer-term follow-up. We also did not include a control group. Finally, our inclusion/exclusion criteria did not adequately rule out CGs who were already physically active at recommended levels.

Conclusion

This is the first study to examine the effects of a telephone-based lifestyle physical activity intervention in conjunction with standard caregiving education and support in a multicultural sample of male and female CGs of persons with AD. This study builds on the few existing CG intervention studies that address the need for CG health promotion and improved physical health outcomes.[6] Furthermore, this study is unique in that we have included a multicultural population of CGs; it also builds on the recommendations for tailoring interventions to meet age-specific needs of the target population.[53] We have shown that lifestyle physical activity can be applied to CGs of persons with AD and that the EPA intervention can lead to measurable increases in physical activity in at least half of these CGs. We currently have a randomized clinical trial in process that tests a lifestyle physical activity intervention versus a standard caregiving intervention. This intervention focuses on helping CGs develop an individual plan for increasing their physical activity. This study includes a larger sample size, assesses CGs preintervention and postintervention, and examines the extent to which CGs will increase their physical activity. It is anticipated that this targeted intervention will have a more positive effect on CG outcomes than the existing generalized CG stress reduction interventions and the few interventions that have targeted CR outcomes.[6,17,18,20] A larger sample will enable us to further evaluate CG groups for differences by gender, racial/ethnic groups, level of strain, and mental and physical health.

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