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A randomized controlled trial to increase physical activity and reduce obesity in a predominantly African American group of women with mobility disabilities and severe obesity

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ABSTRACT

Objective. This randomized controlled trial tested a tailored, telephone-based physical activity coaching intervention for a predominantly African American group of women with severe obesity and mobility disability.

Methods. We recruited 92 clinic patients from the University of Illinois at Chicago Medical Center referred by their physicians during 2004–2007 and randomized participants to one of three groups – *awareness* (informational brochure, no coaching), *lower* support (phone coaching only) and *higher* support (phone coaching plus monthly exercise support group) – to determine the efficacy of a tailored coaching intervention on key health outcomes, which included body weight and body mass index, blood pressure, cholesterol, physical activity (barriers and self-reported activity), movement and mobility, general health, and social support.

Results. The *higher* support group had the greatest reduction in Body Mass Index (BMI) (7.4%) compared with a 0.2% and 1.6% increase in BMI for the *lower* support and *awareness* groups, respectively ($p < .01$). Both the *higher* and *lower* support groups had a greater increase in physical activity scores (39% and 30%, respectively) compared with a decline of 13% in the *awareness* group ($p < .05$).

Conclusion. Providing phone-based coaching and monthly in-person exercise support group sessions appear to be an effective approach for reducing body weight and increasing physical activity among severely obese, disabled adults residing in difficult social environments.

The lack of participation in beneficial exercise is a serious public health concern for all Americans (Haskell et al., 2007). This concern is even more problematic for people with disabilities, who are at much greater risk for developing significant health complications associated with a sedentary lifestyle (Turk, 2006; Rimmer et al., 1995; Van der PloeG et al., 2004). This population also faces a daunting array of barriers to participating in the physical and recreational activities necessary to maintain their health and wellness (Rimmer et al., 2004, 2000; Scelza et al., 2005; Stuifbergen et al., 1990). These barriers are associated with a higher prevalence of obesity among individuals with disabilities (Campbell et al., 2002), in part because functional and health limitations present greater difficulties for sustaining regular physical activity (Van Den Brink et al., 2005; Mayo et al., 2005; Haight et al., 2005). As expected, the challenges faced by disabled individuals become magnified when obesity is also present (Pain and Wiles, 2006).

Interventions that are culturally and environmentally sensitive to the specific needs of underserved populations (i.e., minorities with disabilities) are needed to promote physical activity in these populations (Jones and Sinclair 2008; Rimmer and Braddock, 1997; Rimmer et al., 2002a,b). Connecting health promotion programs with primary care may be considered an important strategy as obese, disabled individuals are over-represented and frequently seen in primary care practices (Stecker et al., 2006). Yet, primary care providers often lack resources to provide personalized exercise programs, which include time, reimbursement, and training in physical activity or behavior change counseling (King et al., 1998). Because of this problem, these providers typically identify the specific needs of their clients and refer them to the appropriate specialists (coordination of care) (Haskell et al., 2007; Brownson et al., 2001).

The proposed study uses this familiar *referral to a specialist* framework by providing physicians with a single source to which they can easily refer obese clients with mobility disabilities in need of an exercise program. The major aim was to determine the impact of the physician-referred Personalized Exercise Program (PEP) on increasing physical activity and improving health outcomes (i.e.,

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body weight, blood pressure, blood cholesterol) in a sample of obese adults with mobility disabilities. We evaluated two levels of intensity of a tailored coaching intervention (one requiring more time and resources) and compared them to an awareness control group to estimate the incremental benefit of more intensive support beyond regular telephone communication. We hypothesized that the two support groups would increase physical activity and key health outcomes compared to the awareness group.

Methods

Setting and population

We conducted the study at the University of Illinois at Chicago Medical Center, a large, academic, public university in the Midwest. We recruited patients from the outpatient Internal Medicine Clinic which provides primary care services. Approximately half of the visits to the center are by African American individuals.

Procedures

The study was approved by the Institutional Review Board at the medical center/university where the study was conducted. Enrollment occurred over a 24-month period between 2004 and 2007. Both resident and attending physicians identified prospective participants during routine clinical encounters.

Participants

Eligibility criteria included: (a) age 18 and older; (b) self-reported mobility disability as having difficulty walking one block or more, or using an assistive device including a cane, walker, crutches or wheelchair; (c) BMI>27 kg/m^2; (d) receiving current primary care at the recruitment site; (e) sedentary behavior (no participation in regular physical activity over the past 6 months); and f) ability to communicate in English. Exclusion criteria included any individual who was not approved by his/her physician to participate in the study due to a limiting medical condition. We included a lower BMI (27 instead of 30) since many individuals with spinal cord injuries and other disabling conditions have BMI levels that underestimate the amount of excess body fat (Weaver et al., 2007).

Interventions and control

Awareness (control) and support (intervention) groups

Random assignment occurred by providing participants with a numbered brochure (1, 2, or 3) with their assigned group after they consented to be in the study. We randomly assigned participants to one of three groups: (a) an *Awareness* group that received a recommendation to exercise by their physician, an informational brochure on physical activity, and a toolkit for starting a physical activity program; (b) a *Personalized Exercise Program (PEP) with lower level support* that received a weekly telephone consultation with a health professional in order to plan and maintain a physical activity program, a toolkit, and a monthly newsletter; and (c) a *Personalized Exercise Program (PEP) with higher level support* that received the same intervention as the lower level support group, plus participation in a monthly onsite exercise support group designed to provide an environment for mutual support and encouragement. All participants received a toolkit containing a tracking device (pedometer), postcards to track daily movement and progress, safety precautions for physical activity, information on how to monitor heart rate during activity, healthy foods and water intake information, and contact information for the *National Center on Physical Activity and Disability* which has a toll-free number. Table 1 provides a summary of the intervention components for each group.

Table 1
Intervention groups and treatment conditions (University of Illinois at Chicago, 2005–2008)

Intervention components	Awareness (control)	Lower support	Higher support
Recommendation to exercise from physician	X	X	X
Informational brochure on exercise	X	X	X
Device for monitoring and tracking physical activity	X	X	X
Monthly newsletter		X	X
Telephone consultation to develop personalized exercise program (PEP)		X	X
Weekly telephone follow-up to monitor progress and overcome barriers		X	X
Opportunity to participate in monthly exercise support group			X

PEP coaching intervention model

The Personalized Exercise Program (PEP) coaching intervention model used in this study is shown in Fig. 1. It begins with problem identification and a needs assessment (left column) accomplished through a detailed assessment of the individual's health status, current activity level, needs and interests, personal and environmental barriers to physical activity, functional ability, and readiness to change. This assessment is used to prepare a personalized exercise program (middle column), which includes setting realistic goals, maintaining a positive focus, providing individualized communication and performance feedback, helping the participant overcome personal and environmental barriers, and establishing a dynamic program that allows adjustments to be made during the coaching intervention to support new interests, boredom or changes in health. If the participant is successful at increasing physical activity and achieves an improved health status, they are referred for long-term support (right column) to a community program (if they were exercising at home).

Lower and higher support intervention groups

The two treatment groups received counseling on initiating and sustaining increased physical activity. Each participant in the intervention groups received a weekly telephone consultation from a project staff member (a qualified fitness professional) to develop a Personalized Exercise Program (PEP), including physical activity goals and specific exercises and activities selected to match the participant's abilities and interests. Exercise recommendations included a combination of aerobic and resistance exercises (with a greater emphasis on aerobic exercise). The fitness professional used the baseline survey assessments to tailor the personalized exercise program to each participant's needs and preferences while addressing any identified barriers to participation (e.g., the participant does not know where to exercise or what types of exercises to do; no disposable income to join a health club; lack of transportation, etc.).

Higher support group only

In addition to the activities described above, participants in the *higher support group* participated in a monthly exercise support group. We designed the support group to (a) provide opportunities for support and encouragement, both from the group facilitator and fellow group members to continue engaging in physical activity; (b) learn more about exercise, nutrition and stress reduction; (c) discuss problems (barriers) to exercise adherence, as well as identify potential solutions to these barriers; and (d) participate in a variety of physical activities, such as walking with assistance, seated group exercises, and trying out accessible equipment. Each class lasted approximately 90 min.

Preparatory phase (0–6 months)

The initial preparatory phase included clinical staff meetings and study advertisement, subject recruitment, clinical assessments (i.e.,

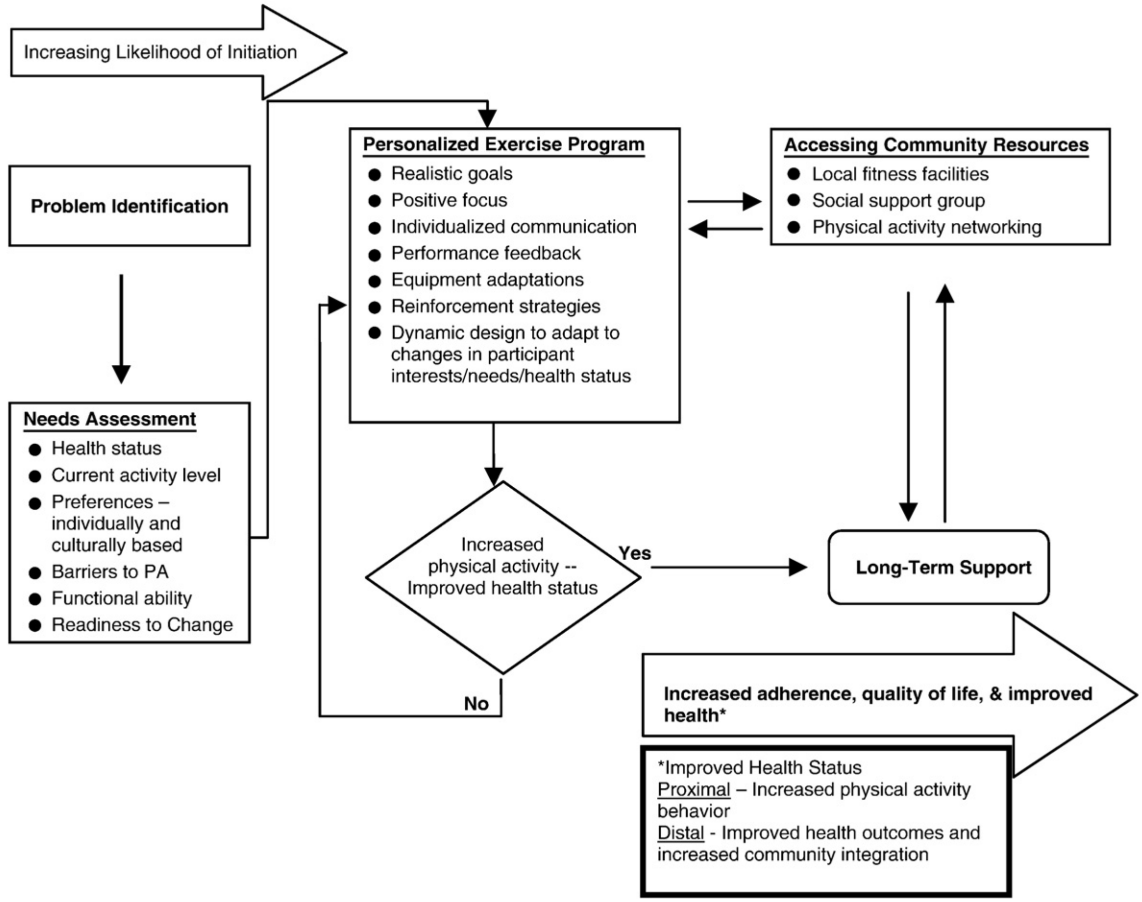

Fig. 1. PEP intervention model.

blood pressure and body weight), and phone assessments by project staff. Breakfast and lunch seminars were held to educate attending physicians and current residents about the study.

The PC trained project staff who were graduate assistants (GAs) on conducting telephone interviews to collect baseline and post-test data and to assist participants in using their pedometer. All subjects were provided with a toll-free telephone number that they could call if they had questions related to the intervention protocol. The GAs examined subject data with the PC and together developed a personalized exercise program (PEP) for each participant. A major emphasis of the preparatory phase was to remove any barriers noted by participants in the lower or higher support groups prior to starting the coaching intervention.

Coaching intervention phase (6–12 months)

The PC served as the coach for this intervention and arranged a convenient weekly phone meeting time with each participant in the lower and higher support groups. Weekly support phone coaching addressed physical activity goals. The calls varied in length from 5 to 35 min depending on the participant's specific profile, which included current health issues, new or persistent barriers to physical activity participation, the week of the study period, availability of the participants, and level of guidance required by each participant. In addition, the higher support group received two to three additional calls each month to coordinate travel and remind participants of the date and time for the next support group meeting.

The coaching phone call began with questions that probed actions of physical activity (e.g., what type of physical activity the participant had planned that day or later in the week). The coach reviewed previously identified goals to see if they were achieved, and if not, determined what challenges or barriers were encountered. The coach provided attention to participants' fears or challenges with being physically active, provided solutions, and encouraged behavior change.

The coach led monthly support groups for the higher support participants and included a physical activity session followed by a group discussion on barriers to physical activity that participants were experiencing in their home or community.

Measures

Two graduate research assistants were trained to conduct all of the pre/post measures and were not involved in the intervention.

Biomedical. Height and weight were measured with an electronic wheelchair scale (Detecto) and BMI was computed as weight (kg) divided by height^2 (m). A research assistant took blood pressure measurements in the seated position following a standard protocol using a large cuff due to the size of the participants. A fasting lipid panel included total cholesterol, high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C).

Activity

Physical activity. *Physical Activity and Disability Scale (PADS).* The PADS (Rimmer et al., 2001) was developed and designed as a semi-structured interview in which respondents are asked about their physical activity behavior in the following areas: (1) exercise, (2) leisure-time physical activity, (3) indoor and outdoor household activity, (4) wheelchair ambulation (when appropriate), (5) employment-related activity, and (6) therapy-related activity. Each subscale is scored individually and an overall score between 0 and 100 is provided. The PADS has been shown to correlate significantly with peak oxygen uptake ($p<.01$) and is sensitive to pre-post changes in physical activity levels after specific exercise interventions.

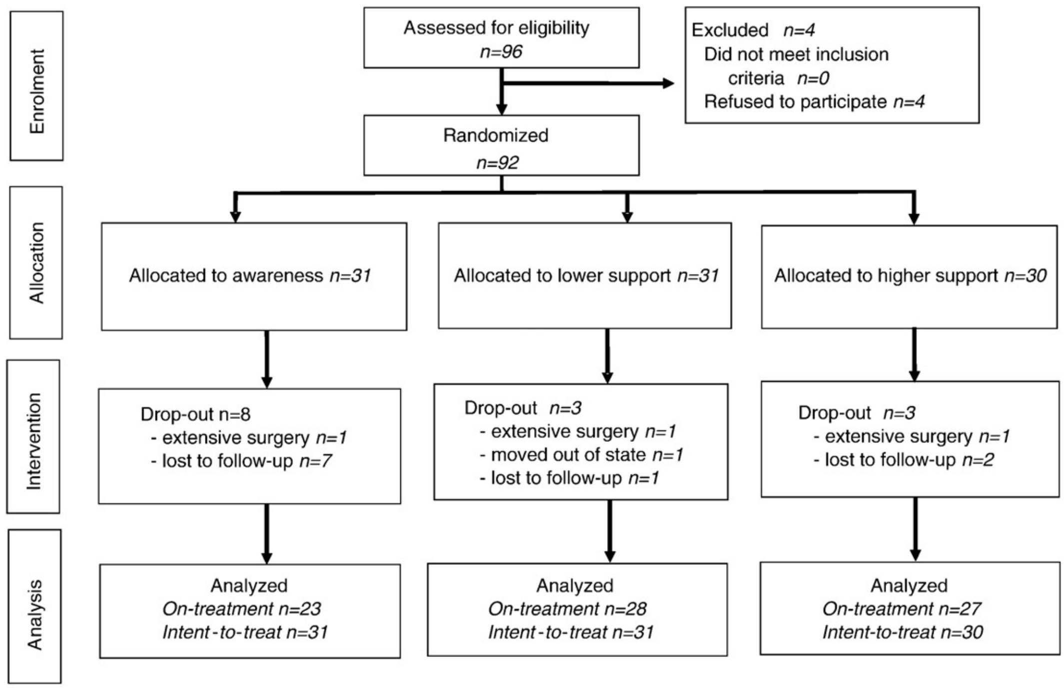

Fig. 2. Subject enrollment flowchart.

Barriers to physical activity. The Barriers to Physical Activity and Disability Survey (B-PADS) (Rimmer et al., 2000) assessed perceived barriers and facilitators to participation in physical activity. A split-half analysis revealed a coefficient alpha of .72. Subsequent work indicated that these measures correlate significantly with self-reported exercise.

ICF activity measure. The International Classification of Functioning, Disability and Health (ICF) Activity Measure (Velozo et al., 1999) is a self-report, computer adaptive measure of movement and daily life skills. The instrument consists of a 257-item bank representing 5 constructs: 1) mobility; 2) carrying, moving and manipulating objects; 3) walking and moving; 4) moving around using a wheelchair/scooter; and 5) self-care activities. Item calibrations of the instrument are well matched to that of the initial sample studied (within $0.9 \pm .74$ log equivalent units) and the bank shows a person-separation reliability of 0.96 (analogous to Cronbach's alpha), separating the sample into almost 5 statistically significant groups.

Psychosocial

General health. The Quality of Well-Being (QWB) Scale (Anderson et al., 1989) is a 31-item self-report instrument that combines preference-weighted measures of symptoms and functioning to provide a numeric point-in-time expression of well-being. The reliability and validity of the QWB has been documented with a variety of populations.

Social support. Social support was measured with an 11-item instrument adapted by Allen et al. (2001) called the CARDIA-2. The scale has been validated in previous research involving persons with coronary heart disease and carotid artery arteriosclerosis.

Statistical analysis

Baseline characteristics were compared using *F*-test (for continuous variables) or chi-square test (for categorical data) to identify differences in demographic characteristics among the three intervention groups (higher support, lower support, and awareness) groups. Generalized linear mixed models (GLMMs) were used to test the intervention effects on biomedical (body weight, BMI, blood pressure, and cholesterol), activity (PADS, B-PADS, ICF activity measure), and psychosocial (general health, social support) outcomes over time. Mixed models permit data to exhibit correlation and nonconstant variability and are superior for handling unbalanced research designs and missing data, enabling us to include all participants (intent-to-treat approach) in our statistical analysis. Significance was established at an alpha level of .05. Sample size estimates were based on a 10% pre-post increase in physical activity score. All statistical analyses were performed using SAS 9.1 statistical software (SAS Inc., Cary, NC). Because the majority of subjects were women (95%), we also conducted a separate analysis with women only and the results were similar with and without men. Data presented in this paper thus include all subjects.

Results

A total of 96 subjects completed the screening and consent process (see Fig. 2). Of these participants, 92 were randomly assigned to one of three treatment groups: awareness ($n = 31$), lower support ($n = 31$), and higher support ($n = 30$). Table 2 provides the demographics by group. The majority of participants (*M* age = 58.8 years) were severely obese (*M* BMI = 46.7 kg/m^2), African American (87%), and female (94.6%). Most participants indicated their highest level of education as

Table 2
Sample demographics (University of Illinois at Chicago, 2005–2008)

Baseline characteristics	Awareness (N = 31)	Lower support (N = 31)	Higher support (N = 30)	p value**
Age [year, mean (SD)]	58.7 (12.2)	58.6 (12.0)	59.1 (10.7)	0.98
BMI [kg/m^2, mean (SD)]	43.6 (10.9)	48.4 (10.7)	51.5 (12.1)	0.10
Gender [female, N (%)]	29 (94%)	29 (94%)	29 (97%)	0.83
Ethnicity [African American, N (%)]	26 (84%)	28 (90%)	26 (87%)	0.42
Education [high school or less, N (%)]	19 (61%)	20 (65%)	23 (77%)	0.62
Use of wheelchair [N (%)]	19 (61%)	20 (65%)	20 (67%)	0.64
Mobility functioning* [mean (SD)]	1.66 (0.34)	1.52 (0.35)	1.60 (0.39)	0.44

* Mobility Functioning Scale: 1 = have no difficulty with mobility; 2 = have some difficulty with mobility; 3 = have a lot of difficulty with mobility.
** *F*-test for continuous variables and Chi-square test for categorical variables.

Table 3
Outcome measures by intervention group at pre- and post-intervention (University of Illinois at Chicago, 2005–2008)

Outcome variable	Awareness (N=23)			Lower support (N=28)			Higher support (N=27)		
	Pre	Post	p value*	Pre	Post	p value*	Pre	Post	p value*
Biomedical									
Body weight (kg)	118.9	120.5	0.89	129.3	128.2	0.89	135.8	125.6	<0.01
BMI (kg/m^2)	43.6	44.3	0.85	48.5	48.6	0.97	51.5	47.7	<0.01
Systolic blood pressure (mm Hg)	130.1	137.2	0.13	132.8	126.6	0.18	130.4	132.8	0.16
Diastolic blood pressure (mm Hg)	72.6	71.8	0.80	73.0	69.0	0.15	75.0	74.2	0.74
Cholesterol (mg/dl)	182.3	175.9	0.77	191.2	179.0	0.56	160.4	164.3	0.21
HDL-C	49.7	42.8	0.23	53.3	46.3	0.14	46.0	43.1	0.22
LDL-C	112.3	114.0	0.93	123.2	115.9	0.74	100.3	96.9	0.06
Physical activity									
PADS score[a]	18.89	16.41	0.15	26.81	34.81	0.04	27.31	38.02	0.02
B-PADS score[b]	6.44	11.00	0.09	6.32	5.11	0.21	5.29	4.81	0.50
Mobility limitation score[c]	1.66	1.79	0.25	1.52	1.58	0.52	1.60	1.62	0.91
Psychosocial									
General health[d]	2.25	2.00	0.66	2.37	2.45	0.79	2.18	2.25	0.24
Social support[e]	1.30	1.22	0.45	1.30	1.28	0.70	1.31	1.25	0.42

* Paired t-test. 8 subjects in the awareness group and 3 subjects in both lower and higher support groups did not have 6-month post-intervention data due to drop-out.
[a] Higher score indicates greater amount of physical activity.
[b] Higher score indicates more barriers to physical activity.
[c] Higher score indicates more difficulty in mobility.
[d] Higher score indicates better health.
[e] Higher score indicates higher social support.

completing high school or less (67%), and 19.3% had some college education. There were no differences at baseline in demographics and the number of chronic/secondary conditions between groups or in their mobility functioning level as measured by the ICF Mobility Functioning Scale.

Biomedical, activity and psychosocial outcomes

Table 3 shows the results of outcome measures by intervention group at pre- and post-intervention. Participants in the higher support group showed a significant reduction in body weight (7.5%, $p<.01$) and BMI (7.4%, $p<.01$) after the 6-month intervention phase, while the body weight and BMI of the lower support and awareness groups did not change significantly (0.2% and 1.6% increase, respectively). There were no notable trends in blood pressures and cholesterol levels in all three groups. Both the higher and lower support groups demonstrated significant increases in physical activity scores (39% and 30% respectively, $p<.05$ for both pre-post comparisons) during the intervention phases, while the awareness group showed a slight but non-significant decline over the 6-month period (13%). Compared to the other two groups, the awareness group also illustrated a notable increase in mobility limitation score and a considerable but non-significant decline in general health. In contrast, participants in both lower and higher support groups reported a slight improvement in general health, but the changes were also not significant. All three groups reported a slight decrease in social support that was not significant, with the awareness group demonstrating the greatest post-intervention decline.

We further analyzed our longitudinal data (including all subjects regardless of drop-out) using mixed models by controlling age, gender, ethnicity, and baseline barriers to exercise score on each outcome variable (Table 4). There was a significant ($p<.001$) negative time effect on body weight and BMI and a significant ($p<.05$) positive time effect on physical activity level, suggesting that overall the body weight declined and physical activity increased over time, particularly in both support groups. There were also significant time × group interaction effects between the awareness and higher support groups on body weight, BMI, physical activity and barriers to physical activity scores. Compared to the awareness group, the higher support group had a greater reduction in body weight over time ($p=.006$). The higher support group also had a significantly greater increase in physical activity ($p=.043$) and reported a decline in the number of barriers to physical activity ($p=.011$) compared to the awareness group. The overall interaction effects between the awareness and lower support groups were not significant. There were no adverse events reported for any participants involved in the study.

Table 4
Mixed models[a] on outcome measures by group, time, and group time interaction (University of Illinois at Chicago, 2005–2008)

Outcome variable	Time			Group[b] (higher)			Group[b] (lower)			Time × group[b] (higher)			Time × group[b] (lower)		
	B	SE	P	B	SE	P	B	SE	P	B	SE	P	B	SE	P
Body weight	−11.46	1.46	<.01	18.16	17.68	0.39	3.57	18.49	0.85	−12.32	1.99	0.01	−6.79	4.98	0.09
BMI	−1.87	0.25	<.01	3.78	3.04	0.28	1.64	3.18	0.61	−2	0.33	0.01	−1.08	0.98	0.10
Systolic blood pressure	5.98	3.35	0.17	−7.03	6.68	0.50	21.63	18.47	0.09	−2.45	2.37	0.69	−14.44	12.31	0.07
Diastolic blood pressure	0.93	1.44	0.72	−0.91	1.13	0.89	3.08	2.54	0.60	−1.96	1.24	0.62	−4.31	3.54	0.23
Cholesterol	−8.17	7.46	0.56	−11.19	17.25	0.78	19.72	17.42	0.57	11.48	10.26	0.61	1.82	9.63	0.92
HDL	−3.85	2.74	0.43	1.2	1.59	0.93	10.98	10.59	0.33	−0.4	1.36	0.96	−3.13	3.75	0.63
LDL	−11.77	10.77	0.42	−18.45	16.64	0.65	5.6	5.11	0.87	−15.98	14.65	0.49	−6.97	5.77	0.72
PADS score	8.85	3.64	0.03	1.68	1.77	0.87	3.22	3.25	0.72	10.79	3.17	0.04	3.59	3.28	0.49
B-PADS score	−0.61	0.54	0.41	−4.65	1.24	0.06	−1.15	0.99	0.48	−5.11	1.65	0.01	−0.22	0.23	0.82
Mobility limitation score	−0.03	1.98	0.70	−0.16	0.14	0.44	−0.21	0.20	0.23	−0.15	0.14	0.22	−0.11	0.09	0.28
General health	0.26	0.22	0.27	0.33	0.31	0.65	0.29	0.32	0.58	0.26	0.25	0.62	0.13	0.11	0.68
Social support	−0.03	1.76	0.57	0.08	0.15	0.56	0.02	0.11	0.86	0.08	0.12	0.44	0.01	0.09	0.93

[a] Model controlled for age, gender, ethnicity, education, and baseline B-PADS score.
[b] Awareness group as reference group.

Discussion

The results of this study demonstrated that a physician-referred, telephone-based coaching program (PEP) increased physical activity and reduced body weight in an at-risk, highly vulnerable population with severe obesity (*M* BMI above 46 kg/m^2) and mobility disability.

Improvements in physical activity (lower and higher support groups), mobility and reduction in body weight and BMI (higher support group only) were very encouraging. The lack of improvement in weight among participants in the lower support group (with telephone-based communication but no in-person contact) may reflect the need for higher intensity interventions for this challenging population. It is plausible that the extra coaching time and *in-person* support sessions may have had a greater effect on behavior change than we had anticipated. Other studies have demonstrated at least short-term benefits of distance counseling (Eakin et al., 2007); however, these individuals typically have less challenging personal, economic, and social factors.

While we detected no significant changes in other clinical parameters, such as blood pressure and cholesterol, we recognize that chronic conditions may likely improve from weight loss and physical activity maintenance. In general, there is a reduction in cardiovascular risk factors from weight reduction, which may be estimated by unit of weight lost (Anderson and Konz, 2001). For example, a weight reduction of 5 kg would be expected to reduce systolic blood pressure by ~4–5 mm Hg (Neter et al., 2003). However, both blood pressure and cholesterol level outcomes depend on medication intensity and adherence of prescribed therapies, which were not assessed in the study. Furthermore, there is little evidence available to explore these relationships among individuals with this severe level of obesity.

One advantage in the present study is the connection of resources with primary care providers, where obese individuals with disabilities are over-represented. Many individuals with obesity *and* disability still face prejudice and resentment from not only society, but also clinical staff and therefore need some type of external support (Pain and Wiles, 2006). While it may be impractical to successfully educate providers on appropriate physical activity recommendations for those with disabilities, a method of referring such complex patients to the appropriate professional might be justified.

A second advantage of the present study is the attention provided to the common, complex barriers to physical activity. A major focus of the intervention was to reduce self-reported barriers to exercise by identifying ways that participants could become more physically active based on available resources in their home or community. The process of helping participants overcome certain barriers was to deliver tailored messages. By assessing a combination of factors, including the person's physical activity profile, health and mobility limitations, and barriers to exercise, a program was more effectively implemented that met each person's specific needs, interests, and circumstances.

Through discussion of potential activities and goals, and working in support groups, participants from the *higher support* group learned both the importance of taking ownership for healthy behavioral change, and supporting other group members to accomplish this purpose. Despite participants' low readiness to change, the project staff provided guidance for them to become proactive in making small behavioral changes in their daily lives. Furthermore, during the support group sessions (higher support group only), they were encouraged to support each other experiencing similar challenges throughout the month. In many instances, participants noted that the coaching call was the only positive call received that week.

One major limitation of this study is the short-term evaluation period of 6 months. The maintenance of weight reduction and positive health behaviors beyond 6 months is often problematic (Jeffery et al., 2000). A number of contributing factors may lead to regaining weight and decreased physical activity, including lack of continuous motivation, lack of social support, and others (Jeffery et al., 2000; Walcott-McQuigg et al., 2002; Verheijden et al., 2005; Wing and Jeffery, 1999; Perri et al., 1989). Successful health promotion programs will require sustainable processes that may account for changes in functional status anticipated for those severely obese with disability. This will be a formidable challenge, as obese individuals without any disability often do not maintain healthy behaviors and regain lost weight. Strategies that capitalize on distance forms of support (telephone, Internet) may be beneficial. Also, more precise measures of physical activity (e.g., accelerometers) may be important in terms of allowing participants to better understand energy expenditure (kcal min^{-1}) resulting from physical activity. Pedometers measure distance moved but do not provide an estimate of intensity or kcal expended.

A couple of factors must be considered when developing an effective physical activity intervention for obese adults with mobility disabilities. First, the individual's level of functioning and the *person–environment* contextual factors associated with the targeted activity or behavior are critical elements that must be addressed in the intervention plan (Rimmer, 2001; Rejeski et al., 2003; Turk et al., 2001; Wilber et al., 2002; Kemp, 2005; Heller et al., 2002). Unfortunately, few health professionals consider the interactions between the *person* and *environment* in developing such plans, which may substantially contribute to non-compliance or very low compliance/adherence to the recommended program. A major strength of person-centered programming is being able to develop recommendations for the individual within the context of his/her environment in order to achieve targeted goals and outcomes. Second, health promotion programs and materials must be customized to address the unique needs and concerns of the individual user (Brug et al., 2003). Findings from adherence and motivational research suggest that participation in physical activity is far more likely when the program is tailored to the specific needs of each person. The challenge from a public health perspective is developing an effective and efficient method for making individualized, personalized physical activity programs widely available.

Conclusions

Promotion of health-enhancing physical activity for people with mobility disabilities through a person-centered telephone-based intervention offers an effective method for (a) sustaining interventions over an extended length of time; (b) minimizing transportation difficulties of getting to a facility-based intervention; and (c) providing assistance (i.e., telephone-based coaching) at a convenient time of the day for the individual. Presenting content through this form of communication also allows for adaptation of content to personal learning styles and facilitates communication for persons with lower levels of literacy.

There is a critical need to develop cost-effective health promotion interventions for obese adults with mobility disabilities that are contextually relevant and culturally sensitive. The effectiveness of telephone-based tailored coaching for promoting more healthful physical activity behaviors among people with mobility disabilities is a promising alternative to reach people in remote communities where access to parks, recreation facilities, etc. may be limited or unavailable. In the present study, however, a higher level of support including in-person contact was necessary to reduce body weight. Additional research is needed to further evaluate the long-term cost-effectiveness of a tailored support system for individuals with severe mobility disabilities and extreme obesity who reside in challenging social environments.

Conflict of interest statement

The authors declare that there are no conflicts of interest.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.ypmed.2009.02.008.

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