Randomized Controlled Trial of Physical Activity Counseling for Older Primary Care Patients

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Background: Regular physical activity reduces the risk for chronic diseases among older adults. Older adults are likely to be seen by primary care clinicians who can play a role in promoting physical activity among their patients.

Design: In this randomized controlled trial (1998–2003; data analyzed 2004–2005), we compared the effects of brief advice to exercise from a clinician supplemented by telephone-based counseling by health educators (extended advice) to brief advice from a clinician alone (brief advice).

Setting/ Participants: A total of 100 primary care patients (63.2% female, 14.7% minority, mean age=68.5 years) participated in the trial.

Interventions: The extended-advice intervention consisted of clinician advice plus exercise counseling via telephone provided by research staff, and the brief advice condition consisted of clinician advice alone. Both interventions focused on promoting moderate-intensity physical activity.

Main Outcome Measures: Self-reported physical activity using the 7-Day Physical Activity Recall instrument and objective activity monitoring using Biotrainers were assessed at baseline, and at 3 and 6 months.

Results: Participants in the extended-advice arm reported significantly greater participation in moderate-intensity physical activity than the brief-advice group at 3 months (+57.69 minutes vs 12.45 minutes; 3.84 kcal/week vs 0.83 kcal/week) and 6 months (+62.84 minutes vs 16.60 minutes; 4.19 kcal/week vs 1.1 kcal/week). Objective activity monitoring also showed significantly increased physical activity among extended-advice versus brief-advice participants at both time points (+50.79 vs −11.11; +42.39 vs −24.18, respectively).

Conclusions: These data indicate that clinician advice with follow-up counseling can promote adoption of moderate-intensity physical activity among older, primary care patients.
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Introduction

Regular physical activity (PA) substantially reduces the risk for coronary heart disease, hypertension, obesity, diabetes, osteoporosis, and mental health disorders,[1] even when these activities are initiated by older adults.[2–5] Based on this evidence, *Healthy People 2010* guidelines recommend that all Americans engage in ≥30 minutes of moderate-intensity activity on ≥5 days per week, or ≥20 minutes of vigorous-intensity activity on ≥3 days per week.[6] However, only about 34% of adults achieved this level of PA in 2001.[7] Among older adults (aged 65 to 74 years) for whom the guidelines also apply, 16% meet *Healthy People 2010* guidelines for moderate-intensity activity, and 13% meet the criterion for vigorous-intensity activity.[6]

Physicians and other clinicians have the potential to play a key role in promoting increased PA. For example, adults in the United States visit a physician's office an average of three times per year, and more than half of these visits are to a primary care physician.[8] However, national data show that 31% of adults, aged ≥65, report receiving physician advice to increase their PA level.[9] In 2002, the U.S. Preventive Services Task Force (USPSTF) found insufficient evidence (an "I" recommendation) to recommend for or against behavioral counseling to promote PA in primary care settings,[10] because there was limited evidence for a sustained effect on PA, and also because of the mixed quality of the reviewed trials.[11] Trials included in this systematic

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review met the following inclusion criteria: (1) a primary care clinician performed some of the counseling intervention, (2) PA outcomes were reported, and (3) the study was of "good" or "fair" quality, per criteria developed by the USPSTF.[11] Of the six trials that compared an active intervention to a "usual care" control, three reported that the active intervention produced significantly increased PA outcomes after 6 to 24 months of follow-up, but all of the positive trials received a quality rating of only "fair" from the USPSTF.[11] Moreover, the single "good" quality trial reported no significant improvement in PA outcomes in the intervention group versus usual care.[11] Results from this study, the Physically Active for Life (PAL) trial conducted by the authors of the present paper,[12] are briefly discussed below. The Activity Counseling Trial (ACT), one of the two trials reviewed by the USPSTF that did not include a usual care group, demonstrated that more intensive interventions (physician advice, educational materials, and follow-up assistance or counseling versus advice plus materials only) improved PA outcomes, but only among women.[11,13]

The PAL trial tested the efficacy of primary care physician–delivered PA counseling on short-term (6 weeks) and long-term (8-month) outcomes in patients aged ≥50 and over.[12,14] The intervention included physician training in counseling skills,[15,16] assessment of patients' motivational readiness to adopt PA, physician-delivered counseling during a regular office visit, an exercise prescription based on motivational readiness, a theory-based[17,18] PA manual for patients, and a follow-up counseling visit with the patient's physician. When compared to a usual care condition, the intervention produced significant improvement in motivational readiness at 6 weeks, but these effects were not maintained at 8-month follow-up, and there were no significant effects of the intervention on measures of PA.

Results from the PAL trial suggested that a more intensive primary care–based intervention was needed to promote sustained increases in PA among older adults. Experts have recommended models in which physicians provide advice and other members of the healthcare team provide more in-depth counseling, exercise supervision, and follow-up.[19–21] Concerns about the feasibility of asking primary care physicians to deliver counseling that was more intensive than the ≥20 minutes provided in the PAL trial, led to the current (PAL2) intervention being primarily delivered by a health educator trained in counseling techniques.[22–24] However, a brief physician advice component (approximately 1 to 3 minutes) was retained.

The primary goals of this trial were to assess the effects of brief healthcare provider advice alone (brief advice) compared to brief advice supplemented with PA counseling by a health educator (extended advice). The hypotheses were that older, sedentary patients who received extended advice (ExtAd) would report increased participation in moderate-intensity PA at 6 months versus those who received brief advice (BriefAd). It was expected that objective monitoring of PA would support self-reports of PA. Finally, it was hypothesized that ExtAd patients would report increased motivational readiness for PA at 6 months versus the comparison group.

Methods

Design

Physically Active for Life 2 (PAL2) was a randomized trial conducted in 1998–2003 with two groups: BriefAd and ExtAd.

Setting

Participants were adult patients at two hospital-based internal medicine practices affiliated with Brown Medical School (BMS) in Providence, Rhode Island. The first practice was staffed solely by eight general internists on the BMS faculty, while at the second practice each patient was initially seen by a medical student, intern, or internal medicine resident who was supervised by an "attending" internist on the BMS faculty. Participants gave written informed consent and the institutional review board representing Rhode Island Hospital approved the study (November 2, 1998).

Participants

To be eligible for study participation, individuals had to be inactive (≤60 minutes per week of moderate/vigorous activity), aged ≥60 years, able to live independently, and fully ambulatory. Participants had to be presenting for a nonurgent primary care appointment, and be able to read and write in English or Spanish. Recruitment took place over 24 months in 2000 to 2002.

Study staff approached consecutive patients in the waiting room of the two offices, and explained the study. Individuals who were interested in the study were screened for eligibility, and, if potentially eligible, they completed informed consent procedures, were given response cards for a subsequent phone survey, and were given an explanation about the Biotrainer accelerometer.

A total of 264 potential participants were screened, and 164 (62%) were ineligible. See Figure 1 for the reasons for ineligibility. New England Research Institute staff called participants to complete baseline measures, and the Biotrainer was sent by mail. Participants subsequently met with a research staff member to collect the Biotrainer.

Within approximately 2 weeks after they were recruited at the practice, participants were then seen a second time by their primary clinician. The office was compensated for this second visit, as it was outside of usual clinical care. Before the patient met with the clinician, study staff collected the Biotrainer, administered the 7-Day Physical Activity Recall (PAR) instrument, and measured the patients' height and weight. During this visit, clinicians provided brief PA counseling. Clinicians were provided with a chart prompt during these encounters, and they noted their adherence to the counseling protocol on the prompt. After receiving PA ad-

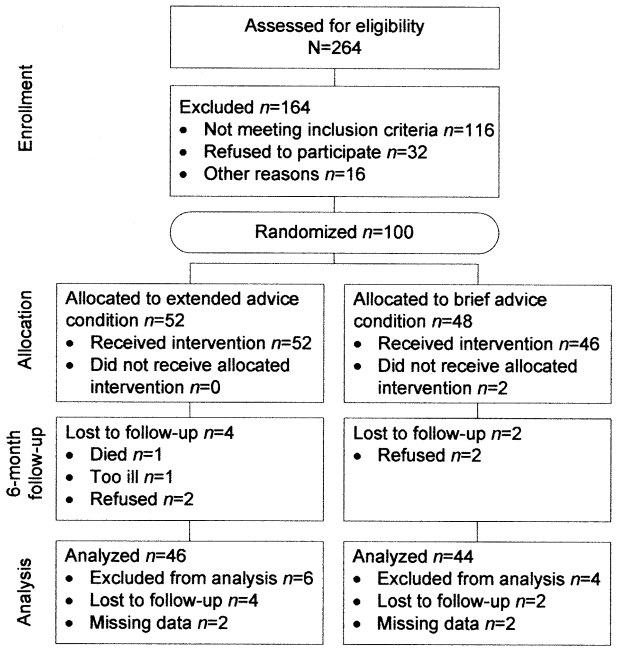

Figure 1. Overall study design.

vice, participants were randomized into the ExtAd or the BriefAd group. All participants returned for a face-to-face visit with research staff at 3 and 6 months after the initial visit, to complete the 7-Day PAR and to collect the Biotrainer that was previously mailed and worn by participants for 3 days.

Clinician Training

All clinicians at both practice sites received approximately 45 minutes of training on the general study design, study procedures, the American College of Sports Medicine/Centers for Disease Control and Prevention (ACSM/CDC) guidelines for PA participation[25] and the 5A's strategy for health behavior counseling used by the authors in previous trials (address the agenda, assess, advise, assist, and arrange for follow-up).[16,23] The training included a review of the chart prompt, a discussion of case examples, and a demonstration of the 5A's counseling techniques. The goal was made clear that, for each study patient, the clinician was to focus on advising the patient to become physically active, in accordance with the ACSM/CDC guidelines and assisting them to choose PA goals and address barriers. The expectation was that each clinician would deliver approximately 3 to 5 minutes of PA counseling.

Interventions

Participants randomized to the ExtAd group received (1) three face-to-face PA counseling sessions with a health educator at months 0, 1, and 3, lasting an average of 30 to 45 minutes; (2) PA prescriptions tailored to the participant's motivational readiness; (3) 12 PA counseling phone calls, that is, weekly for the first 3 months, and then every other week for the second 3 months, lasting an average of 10 to 15 minutes; and (4) 12 PA tip sheets sent by mail at the same time as the phone counseling calls. All counseling was tailored to the patient's stage of readiness to increase PA levels.[26] The face-to-face visits and phone calls followed specific scripts and protocols in keeping with motivational interviewing techniques, such as helping patients to identify problems and solutions, and addressing ambivalence by discussing the positive and negative aspects of becoming physically active.[27,28] In addition, the participant's conviction and confidence for achieving the ACSM/CDC PA goal were assessed, and the counseling was tailored appropriately.[22] The BriefAd group did not receive any additional counseling apart from the advice given by their clinician. They completed assessments similar to those completed by the ExtAd group.

Incentives

Participants were paid $10 to return to the practice to complete assessment visits at baseline, and at 3 and 6 months. ExtAd participants also received $10 for attending their second in-person counseling visit (1 month). Clinicians were compensated $35 for providing brief PA advice to participants at the specially scheduled study visit.

Measures

The main outcome measurements were the 7-Day PAR and Biotrainer monitoring at baseline, and 3 and 6 months. The 7-Day PAR data, as used in the current study, were expressed as minutes of activity each week that were at least moderate intensity.[29–31] The 7-Day PAR is a valid and reliable, interviewer-administered measure that was originally developed for the Stanford Five City Project.[32,33] This instrument has been shown to be sensitive to change in intervention studies promoting moderate-intensity activity.[30,31]

Biotrainers are accelerometers that measure counts of PA, and the data similarly are expressed as standard counts.[34,35] The data counts correlate highly with metabolic variables.[34] A Biotrainer was worn by participants in both groups for 3 days at baseline, and 3 and 6 months. The outcome measure was the weight-adjusted mean number of daily counts.

Participants' stage of motivational readiness for PA was assessed using a reliable and valid five-item measure.[36,37] It was revised to incorporate the guidelines on moderate-intensity PA. The instrument classifies individuals into one of five stages: precontemplation (individuals who do no PA and do not intend to start); contemplation (those who do not participate in PA but intend to start); preparation (those who participate in some PA but not regularly); action (those who currently participate in regular activity but have done so for <6 months); and maintenance (those who participate in regular physical activity for ≥ 6 months). For this study, regular PA was defined as ≥ 30 minutes of moderate-intensity exercise on <5 days per week.

Finally, all participants were asked to evaluate their satisfaction with the study. Participants in the ExtAd group were also asked to evaluate the usefulness and acceptability of intervention components (e.g., counseling telephone calls). These evaluations were obtained using Likert scales ranging from 1 to 5 or 1 to 3. For example, for the question on satisfaction with study participation, the response scale had one to five items ranging from 1 = "not at all satisfied" to 5 = "very satisfied."

Analyses

The baseline comparability of the two groups was assessed on all randomized participants ($n=100$) using chi-square analysis of demographic variables (gender, race, education, income, marital status, employment status, satisfaction with health care, and medical conditions). Age and body mass index (BMI) at baseline were compared using the t-test procedure. Any differences found were adjusted in the final analyses of the outcome variables. Preliminary analysis also compared baseline demographic variables between participants lost to follow-up (at 3 and 6 months) with participants who completed the study.

Intention-to-treat analysis of PA outcomes was performed on all randomized participants ($n=48$ BriefAd; $n=52$ ExtAd), adjusting for baseline values and employment status. Seven participants (BriefAd=4, ExtAd=3) did not provide data on employment and were excluded from the analyses. Analyses were conducted using the last observation carried forward approach for missing observations. Missing Biotrainer values were replaced using the last-value carried forward method. (Missing data in determining 6-month change: $n=11$ [7-Day PAR outcomes]; $n=12$ [motivational readiness]; and $n=25$ [Biotrainer]). PA outcomes (7-Day PAR and Biotrainer accelerometer data) were compared across groups at baseline, and at 3-month and 6-month follow-ups. To examine the effects of the intervention on PA outcomes, the crude mean change in scores at 3 months and 6 months were compared by group using t-tests. Analysis of covariance was performed to compare the adjusted mean change in PA scores at 3 months and 6 months (adjusted for employment status and baseline PA scores). (Similar results were found when analyses were conducted without controlling for baseline values. Analyses were also repeated to examine seasonal effects [patients randomized in spring/summer vs fall/winter]: there were no significant effects.) Further analyses to rule out possible interaction between group and baseline PA scores were performed using general linear models with an interaction term.

Motivational readiness outcomes were categorized as four stages: precontemplation, contemplation, preparation, and action (no participant was expected to be in maintenance at baseline or at 3 months). The crude effect of the intervention on motivational stage of readiness (at 3 months and 6 months) was assessed using the chi-square procedure to compare those who progressed, regressed, or had no change in stage over time. Logistic regression (controlling for employment status) was performed to estimate the adjusted intervention effects on motivational readiness (progression vs nonprogression).

Results

Clinician Characteristics

Although 140 healthcare clinicians received training, recruitment was very slow and difficult at the student/intern/resident-staffed clinic, and only 16 participants were recruited at that site. The remaining participants were recruited from the practice staffed almost exclusively by physicians. Patients were recruited from the panels of nine providers (55% were male, five were general internists, one was a physician's assistant, and three were internal medical residents). The physicians had been in practice for a mean of 6.2 years (standard deviation [SD]=3.1).

Participant Characteristics

The randomized sample consisted of 100 participants with a mean age of 68.5 years (SD=7.16) (Table 1). A majority were women (63.2%, $n=60$, 5=missing); white (85.3%, $n=81$, 5=missing); and married (54.3%, $n=51$, 6=missing). Fifty-two participants were randomized to the ExtAd group, and 48 to the BriefAd condition. Chi-square and t-test analyses showed no significant group differences in baseline demographic characteristics except for employment.

Six participants dropped out after randomization (four from the ExtAd group and two from the BriefAd group) due to illness ($n=1$), refusal to continue with the study ($n=4$), and death ($n=1$). We compared the dropouts with the retained sample on demographic characteristics using chi-square analyses and t-tests; there were no significant group differences. We also compared the randomized sample ($n=100$) to the group that provided data at baseline and the 6-month assessments ($n=90$; six dropouts plus four participants who did not provide complete data) on demographic characteristics and found no significant group differences.

Intention to Treat

At 3 months, using the 7-Day PAR data, the ExtAd group ($n=49$) reported an increase of 3.85 (SD=0.89) weekly kilocalorie expenditure in moderate-intensity PA versus an increase of 0.83 (SD=0.94) in the BriefAd group ($n=44$, F=5.20, $p=0.03$) (unadjusted mean values appear in Table 2, and adjusted mean change values in Table 3). At 6 months, the effects were sustained: the increase from baseline levels was 4.19 (SD=0.81) in the ExtAd group versus 1.11 (SD=0.85) in the BriefAd group (F=6.62, $p<0.05$).

Analyses were repeated for reported minutes of moderate-intensity PA. At 3 months, the ExtAd group reported an increase of 57.69 minutes per week (SD=13.38) versus an increase of 12.45 minutes (SD=14.15) in the BriefAd group (F=5.20, $p=0.03$). At 6 months, the ExtAd group reported an increase of 62.84 minutes (SD=12.12) versus 16.60 minutes (SD=12.81) in the BriefAd group (F=6.62, $p=0.01$).

Analyses of 3-day activity counts via objective activity monitoring (adjusted for weight) at 3 months, revealed an increase of 50.79 (SD=20.40) in the ExtAd group versus a decrease of 11.11 (SD=21.13) in the BriefAd group (F=4.27, $p=0.04$). At 6 months, there was an increase of 42.39 (SD=16.28) from baseline values for the ExtAd group versus a decrease of 24.18 (SD=16.86, F=7.76, $p<0.01$) in the BriefAd group.

Table 1. Demographics for randomized participant sample (n = 100)

Demographic	Total (n = 100) Frequency (%)	Brief advice (n = 48) Frequency (%)	Extended advice (n = 52) Frequency (%)	p value (alpha = 0.05)
Gender				
Male	35 (36.4)	18 (39.1)	17 (34.7)	
Female (5 missing)	60 (63.2)	28 (60.9)	32 (65.3)	0.65
Race/ethnicity				
White	81 (85.3)	39 (84.8)	42 (85.7)	
Black/other (5 missing)	14 (14.7)	7 (15.2)	7 (14.3)	0.89
Education				
High school or less	40 (42.1)	22 (47.8)	18 (36.7)	
College/more (5 missing)	55 (57.9)	24 (52.2)	31 (63.3)	0.27
Income (monthly) ($)				
≤1000	15 (24.2)	9 (25.0)	6 (23.1)	
1001–2500	17 (27.4)	8 (22.2)	9 (34.6)	
>2500 (38 ref/dk/missing)	30 (48.4)	19 (52.8)	11 (42.3)	0.55
Marital status				
Married	51 (54.3)	22 (47.8)	29 (60.4)	
Prior/never (6 missing)	43 (45.7)	24 (52.2)	19 (39.6)	0.22
Employment status				
Employed	28 (30.1)	19 (43.2)	9 (18.4)	
Unemployed/retired (7 missing)	65 (69.9)	25 (56.8)	40 (81.6)	**0.01***
Satisfied with health care				
Excellent	56 (59.6)	26 (57.8)	30 (61.2)	
Very good	25 (26.6)	14 (31.1)	11 (22.4)	
Good/fair (6 missing)	13 (13.8)	5 (11.1)	8 (16.3)	0.56
Medical conditions				
Heart attack/angina	20 (20.0)	8 (16.7)	12 (23.0)	0.42
Peripheral vascular	16 (16.0)	9 (18.8)	7 (13.5)	0.47
High blood pressure	55 (55.0)	23 (47.9)	32 (61.5)	0.17
Diabetes	12 (12.0)	8 (16.7)	4 (7.7)	0.17
Stroke	3 (3.0)	2 (4.2)	1 (1.9)	0.51
Emphysema/bronchitis	9 (9.0)	5 (10.4)	4 (7.7)	0.63
Arthritis	52 (52.0)	21 (43.8)	31 (59.6)	0.11
Cancer	18 (18.0)	9 (18.8)	9 (17.3)	0.85
Mean age (SD) (5 missing)	68.5 (7.16)	68.3 (7.62)	68.7 (6.77)	0.78
Body mass index (5 missing)	29.2 (5.28)	28.2 (4.50)	30.0 (5.82)	0.10

$p < 0.05$ (bolded).
Ref/dk/missing, refused/don't know/missing; SD, standard deviation.

Motivational Readiness

There were no significant group differences in motivational stage at baseline and at 3 months. At 6 months (n =93 responded), significant group differences were found: 72% (n =34) of the ExtAd group were in preparation versus 45.7% (n =21) in the BriefAd group; and 17% of the ExtAd group (n =8) were in the action/maintenance stage versus 13.0% (n =6) in BriefAd group (Fisher's exact test, p =0.009) (Table 4).

We also categorized participants into three groups based on their motivational stage of readiness at baseline and at 3 months: those whose stage of readiness stayed the same at both time-points ("no change"), those whose progressed in motivational stage from baseline to 3 months (e.g., from precontemplation to contemplation, "progressors"), and those who regressed in motivational stage (e.g., from preparation to contemplation, "regressors"). Similar analyses were repeated based on the participants' motivational readiness at baseline and at 6 months. Chi-square analyses showed that group difference in change in motivational readiness was not significant at 3 months, but there were significant group differences favoring the ExtAd group at 6 months (59.6% of the ExtAd group "progressed" versus 30.4% in the BriefAd group) (χ^2=7.97, p =0.005).

We then conducted logistic regression, adjusting for employment status, to determine group effects on change in motivational readiness (outcome variable was dichotomized into "progressors" vs the "regressors" plus "no change" groups). At 3 months, no significant effects were found (p =0.54); in contrast, at 6 months significant effects were found, favoring the ExtAd group for the odds of progressing in motivational readiness: OR=3.76 (95% CI=1.51–9.36, Wald statistic=8.06, p =0.005).

Intervention Delivery

Based on the completed chart prompt, we were able to document that 91% (n =91, BriefAd=44, ExtAd=47)

Table 2. Mean values of 7-Day Physical Activity Recall and biotrainer outcomes (intention to treat)

Variable	Group	*n*	Base (SD)	3 months (SD)	6 months (SD)
Moderate minutes/week	All	100	41.55 (69.41)	70.80 (97.03)	75.30 (89.90)
	BriefAd	48	45.31 (74.55)	50.63 (83.83)	56.25 (89.87)
	ExtAd	52	38.08 (64.84)	89.42 (105.2)	92.88 (87.11)
Hard+very hard minutes/week	All	100	4.20 (25.50)	0.90 (9.00)	0.15 (1.50)
	BriefAd	48	0.31 (2.17)	1.88 (12.99)	0.31 (2.17)
	ExtAd	52	7.79 (35.08)	0.00 (0.0)	0.00 (0.0)
Moderate kilocalories/week	All	100	2.77 (4.63)	4.72 (6.47)	5.02 (5.99)
	BriefAd	48	3.02 (4.97)	3.38 (5.59)	3.75 (5.99)
	ExtAd	52	2.54 (4.32)	5.96 (7.01)	6.19 (5.81)
Hard+very hard kilocalories/week	All	100	0.42 (2.55)	0.09 (0.90)	0.02 (0.15)
	BriefAd	48	0.03 (0.22)	0.19 (1.30)	0.03 (0.22)
	ExtAd	52	0.78 (3.51)	0.00 (0.0)	0.00 (0.0)
Total kilocalories/day	All	100	32.13 (0.99)	30.97 (7.28)	31.50 (5.73)
	BriefAd	48	32.09 (1.06)	32.43 (1.51)	32.21 (1.49)
	ExtAd	52	32.17 (0.92)	29.63 (9.85)	30.85 (7.79)
Biotrainer mean counts (crude)	All	94	241.42 (116.89)	255.82 (135.96)	248.71 (118.53)
	BriefAd	45	259.20 (119.97)	242.09 (126.53)	230.13 (106.21)
	ExtAd	49	225.09 (112.74)	268.43 (144.22)	265.78 (127.51)
Biotrainer mean counts (weight adjusted)	All	94	260.78 (128.39)	280.56 (152.96)	270.39 (130.64)
	BriefAd	45	277.35 (139.29)	263.31 (150.36)	247.96 (123.72)
	ExtAd	49	245.56 (116.87)	296.40 (155.15)	290.99 (134.65)

BriefAd, brief advice; ExtAd, extended advice; SD, standard deviation.

of the randomized sample received brief advice from their clinician (chart prompts were misplaced from two BriefAd and one ExtAd patient folders). The mean duration of the advice reported by the clinicians was 3.02 minutes (SD=1.57). All ExtAd participants received the first in-person counseling with the health educator, 83% (n =43) attended the second visit, and 78% (n =41) attended the third visit. The health educators delivered 86% of the scheduled telephone calls (mean duration 14.79 minutes, SD=8.11).

Evaluation

The patient sample rated their satisfaction with study participation at 4.2 (SD=1.0) (n =89) on a 1-to-5 rating scale (1=not at all satisfied, 5=very satisfied); and rated the usefulness of clinician advice at 3.3 (SD=1.2) (1-to-5 rating scale, 1=not at all useful, 5=extremely useful). Using a similar rating scale, the ExtAd participants rated the mean usefulness of talking to the health educators at 3.9 (SD=0.7). They rated the number of

Table 3. Mean change in physical activity (7-Day Physical Activity Recall variables) and biotrainer outcomes (intention to treat)

Variable	lGroup	3-month mean change (SD)[a] (n = 44 BriefAd, n = 49 ExtAd)	6-month mean change (SD)[a] (n = 44 BriefAd, n = 49 ExtAd)
Moderate minutes/week	BriefAd	12.45 (14.15)	16.60 (12.81)
	ExtAd	**57.69 (13.38)***	**62.84 (12.12)***
Hard+very hard minutes/week	BriefAd	−2.84 (1.45)	−4.24 (0.24)
	ExtAd	−4.19 (1.37)	−4.46 (0.23)
Moderate kilocalories/week	BriefAd	0.83 (0.94)	1.11 (0.85)
	ExtAd	**3.85 (0.89)***	**4.19 (0.81)***
Hard+very hard kilocalories/week	BriefAd	−0.28 (0.15)	−0.42 (0.02)
	ExtAd	−0.42 (0.14)	−0.45 (0.02)
Total kcal/day	BriefAd	0.15 (0.91)	−0.08 (0.75)
	ExtAd	−1.38 (0.86)	−0.84 (0.71)
Biotrainer mean counts (crude)[b]	BriefAd	−12.77 (18.71)	−22.69 (15.53)
	ExtAd	**41.37 (18.07)***	**36.32 (14.99)****
Biotrainer mean counts (weight adjusted)[b]	BriefAd	−11.11 (21.13)	−24.18 (16.86)
	ExtAd	**50.79 (20.40)***	**42.39 (16.28)****

[a]Means for 3-month and 6-month change[a] are adjusted for baseline value and employment status. Positive value change scores indicate an increase in the outcome measured.
[b]For 3-month and 6-month Biotrainer: n = 89 (43 = BriefAd; 46 = ExtAd).
*$p < 0.05$
**$p < 0.01$ (all bolded).
BriefAd, brief advice; ExtAd, extended advice; SD, standard deviation.

Table 4. Intention to treat: motivational stage of readiness (frequency and proportion of group reporting each stage)

Variable	Group	*n* (base)*	*n* (3 months)*	*n* (6 months)*
	All	93	93	93
	BriefAd	46	46	46
	ExtAd	47	47	47
Precontemplation	All	6 (6.5%)	6 (6.5%)	10 (10.8%)
	BriefAd	3 (6.5)	3 (6.5)	8 (17.4)
	ExtAd	3 (6.4)	3 (6.4)	2 (4.3)
Contemplation	All	45 (48.4)	41 (44.1)	14 (15.1)
	BriefAd	21 (45.7)	20 (43.5)	11 (23.9)
	ExtAd	24 (51.1)	21 (44.7)	3 (6.4)
Preparation	All	42 (45.2)	35 (37.6)	55 (59.4)
	BriefAd	22 (47.8)	19 (41.3)	21 (45.7)
	ExtAd	20 (42.6)	16 (34.0)	34 (72.3)
Action/maintenance	All	0 (0.0)	11 (11.8)	14 (15.1)
	BriefAd	0	4 (8.7)	6 (13.0)
	ExtAd	0	7 (14.9)	8 (17.0)

*Fisher's exact tests: $p = 0.89$ at baseline; $p = 0.77$ at 3 months; $p = 0.01$ at 6-month follow-up.
BriefAd, brief advice; ExtAd, extended advice.

in-person meetings as "just right" (mean=2.0, SD=0.3, 1-to-3 rating scale with 1=too many, 2=just right, 3=too few); the number of telephone contacts as "just right" (mean=1.9, SD=0.1, 1-to-3 rating scale with 1=too many, 2=just right, 3=too few); and the length of the calls as "just right" (mean=1.9 [SD=0.2], 1-to-3 rating scale with 1=too long, 2=just right, 3=too short).

Discussion

The results of this randomized controlled clinical trial provide evidence in support of our primary hypothesis that a patient-centered behavior counseling intervention provided by clinicians and health educators in a primary care setting results in improvements in the level of moderate PA and motivational readiness for PA among sedentary older adults. At the 3-month follow-up, the ExtAd group reported an increase of almost 1 hour per week of moderate-intensity PA compared with only a 12.45- minute increase in the BriefAd group. These significant group differences were sustained at the 6-month follow-up. Significant group differences were also achieved in energy expenditures at both follow-ups for reported weekly kilocalorie expenditures in moderate-intensity PA using the 7-Day PAR and the accelerometer data. It should be noted that the overall kilocalorie expenditure as reported on the 7-Day PAR did not change significantly in the ExtAd group. This may have been due to the decrease in hard plus very hard activity over time (nonsignificant). The intervention focused on promoting moderate-intensity PA, and patients were not provided any encouragement to adopt vigorous PA.

Study results also supported the hypothesis that the extended PA counseling achieved a significant improvement in motivational readiness for PA. When comparing the 6-month levels with baseline, 59.6% of the ExtAd group "progressed" in their level of motivational readiness compared with 30.4% of the BriefAd group.

These findings not only provide important new evidence that supports the delivery of behavioral counseling in primary care settings to promote PA among older adults, but also provide guidance as to an effective protocol for doing so. Consistent with some previous studies,[12,38] brief PA advice provided by a physician was not effective in consistently changing either motivational readiness or actual levels of moderate PA (see review by Lawlor and Hanratty[39]). Our findings call into question the continued use of brief primary care clinician advice as the sole intervention element to increase PA among patients. In the present study, improvement in PA was achieved by a more sustained, patient-centered, multicomponent behavioral intervention. This type of intervention met some of the recommendations for effective PA promotion in healthcare settings.[21] This was an efficacy trial, so it remains to be seen as to whether these procedures and protocols can be replicated in other primary care settings.

Although there are questions about whether PA behavior change occurs in a series of stages that are qualitatively different (see meta-analysis by Marshall and Biddle,[40]), our findings provide further evidence, as shown by previous studies,[41,42] that stage-matched PA interventions can be an effective means of structuring an intervention. We await future studies to address the question as to whether tailoring to motivational readiness for PA versus not tailoring is essential to the success of PA interventions.

The primary care setting is an attractive approach for promoting more active lifestyles among older adults since these clinicians see a substantial proportion of the older population and they have high credibility with

What This Study Adds . . .

Sedentary behavior among older adults increases their risk for chronic disease, but efforts to promote their physical activity have yielded mixed results.

A randomized controlled trial showed that older primary care patients who received brief advice from their physicians supplemented by extended counseling via telephone increased their physical activity compared to those who received brief advice only.

Results suggest that older adults require additional support to reduce sedentary behavior.

their patients. However, important barriers (e.g., limited clinician time, lack of training in counseling techniques, lack of office systems to support assessments and interventions, and the absence of reimbursement) need to be overcome if evidenced-based primary care interventions such as the one evaluated in this study can be implemented on a large scale across the country.

Multicomponent interventions such as the ExtAd intervention package offer several advantages over more traditional clinician-based interventions. By combining a brief 3-minute clinician-delivered PA message with health educator-delivered extended counseling, the clinician's time is used efficiently. The clinician's authority and credibility are brought to bear on the need for PA behavior change, while the actual change and maintenance of change over time is achieved by a health educator. This approach minimizes demands on a clinician's limited time, thus enhancing the feasibility of the intervention. In addition to utilizing this team-based approach to addressing PA, other system-based elements in the intervention design and delivery were needed to support the clinician-delivered PA message: baseline assessment of PA, brief clinician training in health behavior counseling, chart prompts, and reimbursement for the extra office visit. These system-based elements have been recommended as important to the effectiveness and feasibility of primary care–based health behavior counseling.[43–45]

The ExtAd intervention was feasible and was evaluated positively by participants. Having established the efficacy of this multicomponent intervention, future research needs to explore its cost-effectiveness before dissemination efforts.

Limitations in this study include the convenience sample of practices and volunteer sample of patients drawn from only one region of the country. It should also be noted that the sample was made up of relatively young old adults (mean age 68.5 years) and predominantly English-speaking, white adults (85%). All these factors reduce the generalizability of the findings, and underscore the need for future research with a broader sociodemographic population drawn from multiple regions of the country.

In summary, our findings reveal that a patient-centered counseling intervention provided by primary care clinicians and health educators resulted in improvements in moderate-intensity PA and motivational readiness among sedentary older adults. Further research is needed to explicate this intervention's cost-effectiveness. Interventions based within primary care settings can have a positive impact on the epidemic of physical inactivity in the older population.

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