A Green Prescription Study:

Does Written Exercise Prescribed by a Physician Result in Increased Physical Activity Among Older Adults?

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Objective: To determine if a written exercise prescription increases physical activity when added to verbal advice. **Methods:** Forty-nine community-dwelling older adults supplied their geriatricians with baseline data on their exercise levels using a questionnaire. Participants were randomly placed in a verbal advice only group or a verbal advice plus written prescription, "green" prescription, group. Outcomes were assessed after 6 weeks. **Results:** Both groups showed a significant increase in time spent in physical activity. However, no significant differences between groups due to the effects of the different advice modalities were found. **Conclusions:** Geriatricians can effectively promote physical activity among sedentary older adults through goal-oriented physical activity advice.

Although loss of strength and stamina is often attributed to aging, the real cause for these declines may be inactivity. As persons age, they frequently become sedentary, but this is not a necessary consequence

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of aging. By age 75, about one in three men and one in two women engage in no physical activity (Centers for Disease Control, 1995). The Centers for Disease Control and Prevention defines physical activity as any kind of moderate-intensity activity performed during the course of a typical day. This definition includes a range of occupational, leisure, and routine daily activities such as gardening, walking, and household chores. Among adults aged 65 years and older, walking, gardening, and yard work are the most popular physical activities (Pate et al., 1995). For older adults, such physical activity can become an effective alternative to physical exercise, which tends to be more planned, structured, and vigorous. This practical approach encourages seniors, who often face physical, psychological, and economic barriers, to become more active.

Physical inactivity has been increasingly recognized as an important risk factor for premature morbidity and mortality. Especially threatening to the sedentary senior are obesity and non-insulin-dependent diabetes, both of which are increasing in prevalence (Rowe & Kahn, 1998; U.S. Department of Health and Human Services [USDHHS], 1991). Recent recommendations in the 1996 Surgeon General's Report on Physical Activity and Health make the case that older adults can reap significant health benefits from even quite low levels of physical activity. It is now believed that half an hour of daily moderate physical activity may prolong and improve functional capacity and quality of life (Rowe & Kahn, 1998). The health benefits of staying active are many. They include lowering the risk of heart disease by stabilizing blood pressure and lowering the incidence of adult-onset diabetes through control of blood glucose levels. Other benefits are accelerated weight loss, increased good cholesterol (high-density lipoprotein levels), strengthened bones, lessened anxiety, reduced depression, improved posture, and enhanced muscle tone. In addition, physical activity can help improve flexibility, balance, and strength, all of which are important in preventing falls (USDHHS, 1991; U.S. Preventive Services Task Force, 1996). In 1997, the American Geriatrics Society and the American Academy of Orthopedic Surgeons issued a joint position statement that recommended "that older adults engage in moderate physical activity at least thirty minutes a day regularly" and "that older adults engage in a

variety of daily activities to ensure continued interest and participation in their program."

Physicians and other health professionals need a variety of strategies to motivate sedentary seniors to become active. One component of such a program is an exercise prescription that enables physicians to quickly prescribe exercise for their patients. A prescription has important symbolic meaning for patients (Swinburn, Walter, Arroll, Tilyard, & Russell, 1998). It indicates that the physician believes enough in the health value of exercise that he or she equates it with a medication that will effectively promote the health of the patient. In addition, the prescription provides the patient with a ready reminder of the exercise to be accomplished.

This article describes a replication study undertaken to determine if exercise prescribed by a geriatrician increases physical activity among sedentary older adults more than verbal advice alone. The study design was adapted to older adults from previous research on middle-aged adults by Swinburn et al. (1998). A goal of the present study was to obtain data for an older cadre of adults, which could then be used to encourage more physicians to provide written exercise advice for their sedentary patients.

Method

SETTING

The study was conducted in a geriatrics ambulatory clinic, which is contiguous to a medical school in rural Appalachia, Ohio. Data were collected during a 28-week period from late February through August 1999.

RECRUITMENT AND QUESTIONNAIRE

During their regular office visits to the geriatrician, adults aged 60 years and older were informed of the study and invited to participate. Those agreeing to participate received verbal and written information about the study and were asked to sign an informed consent. The study was approved by the Ohio University Institutional Review Board.

Three geriatricians completed a training session on the study protocol. Baseline data on the subjects' physical activity levels were collected by two trained research assistants using a questionnaire similar to that used by Swinburn et al. (1998) but modified to better evaluate older adults. Physical activity was defined as either household activity or leisure activity. Household activity included such things as yard work, gardening, mowing the lawn, washing the car, and washing windows. Light interior housework was excluded. Leisure activity included such things as walking, biking, exercise classes, and swimming.

PARTICIPANTS

Exercise baseline data were collected on 76 individuals; 49 (44 women and 5 men) of these individuals were enrolled in the study. Seventeen were excluded because they were already physically active (i.e., they were doing 3 or more hours of moderate physical activity per week). Eight were excluded by their physicians for medical reasons, and 2 later withdrew from the study after baseline data were collected. Participants ranged in age from 62 to 92 years with a mean age of 74 years ($SD = 1.1$). Enrollees were randomly assigned to either the green prescription group ($n = 24$) or the verbal advice only group ($n = 25$) using a table of random numbers.

INTERVENTION

After review of the baseline data, the physician and participant worked together to set goals that would increase the participant's physical activity, mainly through additional walking. This exercise advice was given verbally to all participants by the physicians. Then, the physician opened an envelope that indicated if that patient was in the group to receive further written exercise advice. Those patients placed in this group had their goals written on a green prescription form.

After 6 weeks, telephone interviews were conducted by a research assistant using the same questions used in the baseline questionnaire. The interviewer was unaware of the type of advice given to the

participant. Forty-seven follow-up questionnaires were completed. Two participants did not wish to answer follow-up questions.

STATISTICS

Analyses were conducted with SPSS 10.0 for Windows (Chicago). The Wilcoxon rank test was used to examine differences between the two groups in the change in number of minutes spent performing various activities. Change from inactive to active status or the number increasing, decreasing, or not changing activity levels was assessed by logistic regression. The analysis was also performed on an intention-to-treat basis assuming no change in exercise status for the two participants who withdrew from the study.

Results

Participants ($n = 49$) were randomly placed either in the green prescription group ($n = 24$) or the verbal advice only group ($n = 25$), and 47 were followed up. In both groups combined, the number of people engaging in physical activity increased from 33 to 38. In addition, there was an average increase in duration of activity of 149 minutes per week.

Exercise intensity changed considerably from baseline to follow-up. At baseline, 16 participants were not engaged in any physical activity, whereas the remaining 33 were engaged in 42 activities. Participants were asked to rate the exercise intensity of each activity. Of the 42 activities, 18 were rated as *easy* (little exertion), 20 as *moderate* (some work), 2 as *vigorous* (makes you breathe hard or puff a lot), and 2 activities were not rated. At follow-up, 38 participants were performing 77 separate activities. Of the 77 activities, 12 were rated as *easy*, 46 as *moderate*, 13 as *vigorous,* and 6 were not rated.

Differences between the green prescription group and verbal advice group were assessed in the five ways described in the study by Swinburn et al. (1998). The first analysis compared the change in the number of individuals participating in any moderate-intensity household or leisure activity from baseline to follow-up (see Table 1). In the study by Swinburn et al. (1988), results for middle-aged adults

Table 1
Baseline and Follow-Up Physical Activity After Written or Verbal Exercise Advice in Athens, OH, February Through August 1999

	Baseline			*Follow-Up*		
	% Active	*Minutes/ Week*[a]	*Range*	*% Active*	*Minutes/ Week*[a]	*Range*
Green prescription (n = 24)						
Household[b]	17	37	8-80	54	180	10-540
Walking	46	75	26-150	58	111	20-315
Leisure (includes walking)[c]	50	110	35-360	67	119	20-315
Total (one or more activities)	63	98	8-360	79	223	10-540
Verbal advice (n = 25)						
Household[b]	32	100	15-240	52	334	20-1,320
Walking	40	68	10-210	60	102	20-400
Leisure (includes walking)[c]	52	60	10-210	64	108	20-400
Total (one or more activities)	72	88	10-270	76	320	25-1,365

a. Mean duration for participants performing the activities.
b. Household includes gardening, mowing lawn, washing car, washing windows, yard work and other moderate-intensity activities; active participants may have been engaging in more than one activity.
c. Other leisure includes biking, swimming, exercise classes; active participants may have been engaging in more than one activity.

Table 2
Response to Written or Verbal Only Exercise Advice—Percentage of Participants

	Increased	*No Change*	*Decreased*	p[a]
Green prescription (n = 24)	71	17	12	
Verbal-only advice (n = 25)	68	12	20	.73

a. Green prescription versus verbal-only advice (Wilcoxon rank test).

showed a significantly greater increase in the number of individuals participating in physical activity in the green prescription group. In our study of senior citizens, there was no significant difference between the groups on this measure. Fifteen senior participants in the green prescription group were active at baseline and 19 at follow-up, a 16% change. In the verbal advice only group, 18 participants were active at baseline and 19 at follow-up, a 4% change.

Table 3
Increase in Mean Physical Activity Duration (minutes per week)

	Green Prescription	*Verbal-Only Advice*	p[a]
Middle-aged adults, New Zealand[b]			
Leisure	78	78	.16
Older adults, Ohio			
Leisure	24	38	.75
Household	92	142	.87
Total	116	180	.75

a. Mean value of green prescription versus verbal-only advice (Wilcoxon rank test).
b. Swinburn, Walter, Arroll, Tilyard, & Russell.

A second analysis assessed the physical activity response (increased, decreased, or no change) of the participants from baseline to follow-up (see Table 2). Activity levels changed in the green prescription group as follows: 71% of the participants increased their activity, 17% made no change, and 12% reduced activity. In the verbal advice only group, 68% increased their activity, 12% made no change, and 20% reduced their activity. The difference in the two groups was not statistically significant. These findings were similar to those of Swinburn et al. (1998).

The third analysis assessed the change from baseline to follow-up in duration of time spent in physical activity between the green prescription and verbal advice groups using all participants in each group as the denominator. Substantial increases in physical activity duration occurred in both groups (see Table 3). The increase was not significantly greater in the green prescription group, which is similar to the findings of Swinburn and colleagues (1998). The mean duration of active minutes per week increased from 61 to 177 minutes in the green prescription group, a change of 116 minutes per week. In the verbal advice only group, the mean duration of active minutes per week increased from 63 to 243 minutes per week, a change of 180 minutes per week (see Table 3).

At baseline and follow-up, each participant was asked, "Are you currently doing any regular physical activity to improve or maintain your health and fitness?" In the fourth analysis, self-reported participation in physical activity to maintain health or fitness increased

significantly ($p < .05$) in both groups, increasing from 36% to 65% in the green prescription group and from 32% to 68% in the verbal advice only group. Although the change was substantial in both groups, it was not significantly greater for the green prescription group. In contrast, Swinburn et al. (1998) found a significantly greater increase in the green prescription group on this measure.

The final analysis was a retrospective self-assessment. Participants were asked whether they had increased, decreased, or not changed their activity during the previous 2 months. Thirteen participants (52%) in the green prescription group reported increasing their activity, as did 12 (48%) in the verbal advice group.

Discussion

This study evaluated the effectiveness of combining verbal and written (green prescription) exercise advice versus verbal advice alone in motivating sedentary older adults to become more physically active. The study was modeled after a study by Swinburn and associates (1998), which took place in a general practice setting in New Zealand with middle-aged adults.

On average, it took 14 minutes (range = 9 to 25 minutes) to assess baseline physical activity and give exercise advice in the Ohio study. This included an average of 7 minutes of physician time to provide the exercise advice after a research assistant completed the assessment questionnaire. The entire procedure took only 5 minutes, on average, (range = 2 to 15 minutes) in the New Zealand study (Swinburn et al., 1998). This difference demonstrates the well-known need to take additional time when working with older adults.

In the New Zealand study, verbal advice coupled with the green prescription was found to be more effective than verbal advice alone in increasing the physical activity of middle-aged adults during a 6-week period. Among the participants in the present study, no significant difference was found between these advice modalities on any of the five measures analyzed. However, both modalities did result in increased physical activity among these older participants.

Several factors may account for the different findings. In the Ohio study, the participants had often received written instructions by the

geriatricians on prior visits. Such written information is a common device in this practice to promote compliance by elderly patients with prescribed health regimes. Therefore, the green prescription instructions may have received less attention from a group used to written advice from their physician. Such written advice, however, is uncommon in most busy medical practices and the New Zealand participants may have found such written advice to be so extraordinary that they gave it special attention.

Another factor may simply be the smaller number of participants (49 vs. 456) in the present study. In particular, if the effect of a written prescription for exercise becomes diminished as the age of the participants increases, then a much larger group may be necessary to display this subtle change in behavior.

Table 3 compares the increase in mean physical activity duration for all the middle-aged adults in the New Zealand study (Swinburn et al., 1998) with all the older adults in the Ohio study. Middle-aged adults in the green prescription and verbal advice only groups both increased their duration of leisure activity by 78 minutes per week, whereas older adults in the green prescription group had an increase of 24 minutes (55 minutes at baseline vs. 79 minutes at follow-up) and those in the verbal advice only group had an increase of 38 minutes (31 minutes at baseline vs. 69 minutes at follow-up). Walking accounted for the greatest increase in leisure activity. Twenty-one persons (42%) were walking at baseline and 27 (54%) at follow-up.

Table 3 further shows the importance of including the household activity of older adults in providing a more complete picture of their activity level. When this is included for older adults, the green prescription group had an increase in duration of activity of 116 minutes per week ($p < .01$) and the verbal advice only group had an increase of 180 minutes per week ($p < .05$).

Gardening accounted for the greatest increase in household activity. Whereas only one person was gardening at baseline, 18 (36%) were gardening at follow-up. Because this study took place during a 28-week period, from February through August, which coincided with seasonal changes from winter to spring and into summer, it was important to consider possible seasonal effects. That is, did activity levels increase because the weather improved, thus promoting

outdoor activities? To check for seasonal effects, a repeated measures logistic regression analysis was done on the change in physical activity reported by the participants according to the time of year in which they entered the study. In one analysis, participants were grouped into individual months, February through July, and in a second analysis, they were grouped into seasons, February 18 through April 14 and April 15 through July 15. For each grouping, the subsequent change in activity was noted. In both cases, there was no significant difference between the green prescription cohort and the verbal advice only cohort in the percentage of participants that reported increased physical activity. It does not appear, therefore, that the season of the year in which the data were collected affected the change in physical activity reported by this study. Seasonal effects may be minimal given the short 6-week span between the intervention and the data collection.

Without a control group, it is difficult to determine the relative influences of physicians' verbal advice and their written advice on these outcomes. The inclusion of a control group that received no exercise advice would help answer the question on how much physicians' advice influenced the increase in activity.

Seniors who found it difficult to increase physical activity levels cited chronic health problems being a challenge. For example, impeded mobility ($n = 17, 34\%$) and pain ($n = 6, 12\%$) were frequently mentioned barriers. Other factors included the rural locale, weather, and attitude ("Exercise isn't for me—I'm too old"). In rural communities, sidewalks are often unavailable. This increases the fear of falling and makes walking unattractive as a physical activity. Some seniors worried about their safety when walking on isolated rural county roads. Using the local bike path was an alternative, but rural elders frequently mentioned a lack of transportation as the reason they did not use this resource. These responses clearly show that programs that address these barriers are needed if more seniors are to increase their physical activity. The present results indicate that physicians and other health providers can address the attitude barrier by regularly expressing their confidence in their patients' abilities to become more active.

Conclusions

The current study does not support the greater effectiveness of verbal plus written exercise advice over verbal advice alone in increasing physical activity among older adults. Both interventions were shown to have an impact on promoting physical activity, particularly walking and gardening. Because the authors received so many positive remarks from the study participants about the value of written exercise advice, we still believe this is a promising intervention to pursue. For example, 36 of the 49 participants made such comments as, "It is really good to have things written down when you are older"; "Anything the doctor writes down is motivating"; and "The green prescription is a real good idea." Geriatricians and other physicians have a valued position in the community, and this study illustrates the important role they can play via a variety of interventions in encouraging physical activity among their patients.

The data on household activity help support exercise paradigms that count all moderate-intensity activity as contributing to a fitness program. As the older adult population grows, it becomes increasingly important that researchers continue to seek motivational methods that effectively address the exercise barriers identified in this study. Physicians need to urge their patients to remain active with the same persistence with which they promote other preventive activities.

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