

The Green Prescription Study: A Randomized Controlled Trial of Written Exercise Advice Provided by General Practitioners

ABSTRACT

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Objectives. The purpose of this study was to determine whether written advice from general practitioners increases physical activity among sedentary people more than verbal advice alone.

Methods. Sedentary patients (n = 456) received verbal advice on increasing physical activity and were then randomized to an exercise prescription (green prescription) group or a verbal advice group.

Results. The number of people engaging in any recreational physical activity at 6 weeks increased substantially, but significantly more so in the green prescription group. Also, more participants in the green prescription group increased their activity over the period.

Conclusions. A written goal-oriented exercise prescription, in addition to verbal advice, is a useful tool for general practitioners in motivating their patients to increase physical activity. (*Am J Public Health*. 1998;88:288-291)

Introduction

A sedentary lifestyle is an important risk for premature morbidity and mortality,¹⁻³ especially from obesity and non-insulin-dependent diabetes, which are increasing in prevalence despite current health promotion efforts.⁴⁻⁶ Further innovative strategies are needed to encourage regular physical activity in the sedentary population.⁷

General practitioners have access to a large proportion of the sedentary population and are a respected source of advice.⁸⁻¹² A prescription for exercise ("green prescription") from a general practitioner is an attractive paradigm because prescriptions represent a well-understood interaction between patient and doctor.¹² Such a prescription would provide a tangible reminder of the exercise goals jointly set by the general practitioner and the patient.¹³ Time constraints, one of the main barriers to providing lifestyle advice,^{10,11,14} could be minimized through use of the green prescription.

Several strategies to promote physical activity in general practice have been implemented, including matching patients' readiness for physical activity with appropriate counseling,¹⁵ referrals to a recreation center where discount rates apply,⁸ or as part of a wider lifestyle program.¹⁴ The

present study asked the question "Does written advice from a general practitioner increase physical activity more than verbal advice alone?"

Methods

Trial Design

The trial involved a randomized, controlled design assessing the impact of written vs verbal advice from a general practitioner on physical activity over 6 weeks in sedentary individuals. Physical activity was defined as walking, sports, or other recreational activity. The study was carried out in two New Zealand urban centers (Auckland and Dunedin) over a 13-week period

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from May to August, coinciding with the seasonal change from fall to winter.

Baseline data on exercise levels were collected by general practitioners using a standard questionnaire. For each participant, goals to increase physical activity (mainly centered around walking) were established. After the verbal advice had been given, the general practitioner opened an envelope that randomized the participant (within general practitioners) to having the goals written down or not.

After 6 weeks, follow-up telephone interviews were conducted by trained interviewers using the same set of questions. Interviewers were unaware of the randomization group of participants. The study was approved by the University of Auckland Human Participants Ethical Committee.

Recruitment

Thirty seven general practitioners underwent a training session on assessing and prescribing physical activity. They recruited patients who, in their judgment, were likely to benefit from an increase in physical activity and were able to increase their exercise over the following 6 weeks. Individuals were not included if they were already physically active (defined as having a physically active job or engaging in more than 1 hour of vigorous activity, 3 hours of sports, or 3 hours of walking or other moderate activity per week during recreation time). Only some of the patients who met the inclusion criteria were enrolled in the trial, primarily because of the time constraints of working in a busy general practice or because the particular consultation or patient was considered by the general practitioner to be inappropriate for the intervention.

Questionnaire

The questionnaire quantified time spent in physical activity over the previous 2 weeks specifically for walking, sports, and other leisure time activities. The test-retest reliability of the questions was assessed in 41 separate participants who were asked the same questions 2 weeks apart with no exercise advice. The rank order correlation coefficients ranged from .74 to .89, and the intra-class correlations ranged from .63 to .70, indicating moderate to good reliability of the questions.^{16,17}

Statistics

Analyses were conducted with PC-SAS (Cary, NC). The Wilcoxon rank test was used to test for differences between

groups in terms of changes in physical activity duration and in terms of numbers increasing, decreasing, or not changing exercise levels. Change from inactive to active status was assessed via repeated measures logistic regression. Analysis was also performed on an intention-to-treat basis assuming no change in exercise status among those lost to follow-up.

Results

Participants ($n = 491$) were randomized to green prescription ($n = 239$) or verbal advice only ($n = 252$), and 456 were followed up. The 35 participants lost to follow-up (21 in the green prescription group, 14 in the verbal advice group) had a mean age and gender proportion similar to that of the full group. Of those lost to follow-up, 15 had missing or incorrect phone numbers and 20 were not reached after five attempts.

The intention-to-treat analyses were conducted on 491 subjects, and the remainder of the analyses were conducted on 456 participants. Participants' mean age was 49 years ($SD = 15$). The green prescription group included 218 participants (90 men, 128 women), and the verbal advice group included 238 (85 men, 153 women). Fifty-five percent ($n = 251$) of the participants had at least one medical condition related to inactivity, overweight ($n = 132$), hypertension ($n = 96$), hypercholesterolemia (>6.5 mM; $n = 35$), and coronary heart disease ($n = 34$) being the most common.

The advice given in 79% ($n = 362$) of cases was to increase walking. On average, general practitioners spent 5.1 minutes (range: 2 to 15 minutes) assessing physical activity levels and giving advice. In both groups combined, the percentage of people engaging in any recreational physical activity increased from 54% ($n = 245$) to 81% ($n = 370$), with an average 2-week increase in duration of 156 minutes.

Differences between the green prescription and verbal advice groups were assessed in five different ways. The first analysis compared the change in the number of individuals participating in any recreational physical activity from baseline to follow-up (Table 1); this change was significantly greater in the green prescription group ($P = .004$). The patterns were similar when men and women were analyzed separately. Analysis by intention to treat ($n = 491$) showed a similar difference between the groups ($P = .01$).

The second analysis assessed the number of participants who changed their amount of physical activity from baseline

to follow-up (increased, decreased, or no change) according to the activity questionnaire (Table 2); rates were higher in the green prescription group ($P = .02$). Analysis by intention to treat showed a similar difference between the groups, but this difference was not quite statistically significant ($P = .06$).

The third analysis assessed the change in duration of physical activity between the green prescription and verbal advice groups using all participants in each study group as the denominator. Substantial mean and median increases in physical activity duration were seen in both groups (Table 3). The difference between groups, however, was not significant, although it came close to statistical significance in the male participants.

In the fourth analysis, self-reported participation in physical activity in order to maintain health or fitness increased from 36% to 68% in the green prescription group. This was a greater increase ($P = .02$) than for the verbal advice group (40% to 57%).

The final analysis was a retrospective self-assessment. Participants were asked whether they had increased, decreased, or not changed their activity over the previous 2 months. Ninety-three participants (43%) in the green prescription group reported an increase, as opposed to 88 (37%) in the verbal advice group ($P = .10$).

Discussion

This study tested the effectiveness of written exercise advice in addition to verbal advice (vs verbal advice alone) for sedentary people in the general practice setting. Assessment of current activity levels and goal setting took approximately 5 minutes. The green prescription was more effective than verbal advice alone in increasing the physical activity level over a 6-week period. The increase in physical activity in both groups was in excess of 1 hour per week, which would be clinically important; however, statistical assessment of this overall increase in physical activity was not appropriate because there was no nonadvice control group. It is important to note, however, that the increase occurred despite the fact that the study period included the winter months, with two major snowfalls in Dunedin.

Overall, there was a moderate added benefit of written advice over verbal advice; greater increases were observed in both the number of people exercising and the number of people who increased time spent performing physical activity. Randomization

TABLE 1—Baseline and Follow-up Physical Activity following Written or Verbal Exercise Advice, Dunedin and Auckland, New Zealand, May through August 1995

| | Baseline | | Follow up | |
|------------------------------|----------|--------------------------------------|-----------------|--------------------------------------|
| | % | Minutes/2 Weeks ^a (Range) | % | Minutes/2 Weeks ^a (Range) |
| Green prescription (n = 218) | | | | |
| Walking | 43 | 133 (20–300) | 73 | 217 (10–1500) |
| Sport | 4 | 207 (90–360) | 10 | 315 (60–1440) |
| Other | 8 | 125 (30–240) | 26 | 172 (15–630) |
| Total active ^b | 51 | 148 (20–420) | 86 ^c | 272 (10–1500) |
| Verbal advice (n = 238) | | | | |
| Walking | 44 | 142 (20–315) | 66 | 249 (15–3360) |
| Sport | 4 | 140 (10–270) | 5 | 263 (40–720) |
| Other | 13 | 140 (30–360) | 26 | 242 (20–1080) |
| Total active ^b | 56 | 153 (10–380) | 77 | 314 (20–3360) |

^aMean duration for participants performing the activities.

^bDefined as any walking, sport, or other recreational exercise; active participants may have been engaging in more than one activity.

^cChange in active vs inactive categories; green prescription in comparison with verbal advice, $P = .004$ (repeated measures logistic regression).

by individual (rather than by general practitioner), blinding of general practitioners until after verbal advice had been given, and blinding of interviewers were strengths of the study would have minimized the chance of bias.

From additional questions addressed to the participants, it was clear that there was overwhelming support for the inclusion of physical activity advice in the consultation and that such advice is likely to increase patient satisfaction.¹² In addition, patients are often more vulnerable or concerned about their health when visiting their general practitioner and thus they are more receptive and responsive to the information they receive.^{12,13} The physical activity advice was incorporated into the well-understood paradigm of the "prescription," which has symbolic meaning for patients¹² and is likely to be a powerful motivator at a time when patients are receptive.

Walking was the most popular activity prescribed by the general practitioners. Other studies concur that walking is an acceptable, accessible exercise, especially for relatively sedentary people,¹⁸ and that such advice can be easily integrated into the regular pattern of patient care.¹⁹ If followed, such advice is likely to improve cardiovascular risk factors, reduce anxiety and tension, aid weight loss, and possibly reduce morbidity and mortality.^{2,3,20}

This study was designed to encourage sedentary people to become more physically active, and the short follow-up limits conclusions about the ability of the green prescription strategy to keep people more active. However, some indication of longer term benefit came from an 11-month follow-up survey of a random selection of 100 participants who were given the green prescription. Of those who indicated that they had increased their physical activity as a

result of the green prescription, 59% (47/80) said they had maintained an increased level of activity, and 72% had been back to see their general practitioner in that time period.

People with significant medical conditions such as hypertension, diabetes, and heart disease should be the highest priority for this intervention because (1) they see their general practitioners on a regular basis, (2) they stand to gain the greatest absolute benefit from an increase in activity, and (3) general practitioners feel comfortable about promoting physical activity to these patients.^{9–11} This selection process was evident in the present study, although time constraints and familiarity with discussing exercise were also important factors in the general practitioner's decision to enroll patients. While this may indicate that the study population does not adequately represent the wider population of sedentary adults, it is likely to reflect the population that general practitioners would choose as a high priority for physical activity advice.

The central impact of widespread use of the green prescription strategy is likely to be in the prevention and treatment of cardiovascular diseases and non-insulin-dependent diabetes and in the attendant cost savings.²¹ Added to this high-risk approach, however, there are likely to be wider public health benefits that could include a greater acceptance by general practitioners and patients of the importance of physical activity and lifestyle modification to health in general, recognition and increased funding of this important aspect of primary care, and a reorientation of recreation facilities toward health-related physical activity in addition to sports and fitness activities.

TABLE 2—Percentage of Participants Who Changed Total Physical Activity in Response to Written or Verbal Exercise Advice

| | Increased, % | No Change, % | Decreased, % | P^a |
|------------------------------|--------------|--------------|--------------|-------|
| Men | | | | |
| Green prescription (n = 90) | 78 | 11 | 11 | .06 |
| Verbal advice (n = 85) | 65 | 19 | 16 | |
| Women | | | | |
| Green prescription (n = 128) | 70 | 14 | 16 | .14 |
| Verbal advice (n = 153) | 62 | 16 | 22 | |
| All participants | | | | |
| Green prescription (n = 218) | 73 | 13 | 14 | .02 |
| Verbal advice (n = 238) | 63 | 17 | 20 | |

^aGreen prescription vs verbal advice (Wilcoxon rank test).

TABLE 3—Increase in Physical Activity Duration (Minutes/2 Weeks) following Written or Verbal Advice

| | Green Prescription | | | | Verbal Advice | | | | P ^a |
|------------------|--------------------|------------|--------|-----------------------------|---------------|------------|--------|-----------------------------|----------------|
| | No. | Mean ± SEM | Median | 75 th Percentile | No. | Mean ± SEM | Median | 75 th Percentile | |
| Men | 90 | 183 ± 26.3 | 120 | 280 | 85 | 142 ± 27.5 | 80 | 180 | .08 |
| Women | 128 | 137 ± 19.2 | 75 | 202 | 153 | 163 ± 40.0 | 80 | 270 | .68 |
| All participants | 218 | 156 ± 15.7 | 90 | 240 | 238 | 156 ± 22.2 | 80 | 240 | .16 |

^aMean values of green prescription vs verbal advice (Wilcoxon rank test).

Wider implementation of the green prescription strategy in New Zealand is currently a collaborative effort between the Hillary Commission, which is the government-funded body for sports and physical activity; the National Heart Foundation; government health services purchasers; and general practitioner organizations.

In conclusion, this study has demonstrated that general practitioners can effectively promote physical activity in sedentary people, particularly using written goal-oriented prescriptions. General practitioners have a unique position in the community, and this study supports the important role they can fulfill in encouraging active lifestyle changes among their patients. □

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References

1. Pate RR, Pratt M, Blair SN, et al. Physical activity and public health: a recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *JAMA*. 1995;273:402-407.
2. Paffenbarger RS, Hyde RT, Wing AL, Hsieh CC. Physical activity, all-cause mortality, and longevity of college alumni. *N Engl J Med*. 1986;314:605-613.
3. Blair SN, Kohl HW, Paffenbarger RS, Clark DG, Cooper KH, Gibbons LW. Physical fitness and all cause mortality. A prospective study of healthy men and women. *JAMA*. 1989;262:2395-2401.
4. King H, Rewers M, WHO Ad Hoc Diabetes Reporting Group. Global estimates of diabetes mellitus and impaired glucose intolerance in adults. *Diabetes Care*. 1993;16:157-177.
5. Kuczmarski RJ, Flegal KM, Campbell SM, Johnson CL. Increasing prevalence of overweight among US adults: the National Health and Nutrition Examination Surveys, 1960-1991. *JAMA*. 1994;272:205-211.
6. Jackson RT, Lay Yee R, Priest P, Shaw L, Beaglehole R. Trends in coronary heart disease risk factors in Auckland between 1982 and 1994. *NZ Med J*. 1995;108:451-454.
7. Illiffe S, See Tai S, Gould M, Thorogood M, Hillsdon M. Prescribing exercise in general practice. *BMJ*. 1994;309:494-495.
8. Taylor AH. *Evaluating GP Exercise Referral Schemes: Findings from a Randomized Controlled Study*. Brighton, England: Chelsea School Research Centre, University of Brighton; 1996. Topic report 6.
9. Green LW, Cargo M, Ottoson JM. The role of physicians in supporting lifestyle changes. *Med Exerc Nutr Health*. 1994;3:119-130.
10. Orleans CT, George LK, Houpt JL, Brodie MD. Health promotion in primary care: a survey of US family practitioners. *Prev Med*. 1985;14:636-647.
11. Bull FCL, Schipper ECC, Jamrozik K, Blanksby BA. Beliefs and behavior of general practitioners regarding promotion of physical activity. *Aust J Public Health*. 1995;19:300-304.
12. Becker MH, ed. The health belief model and personal health behavior. *Health Educ Monogr*. 1974;2:324-473.
13. Neale AV. Behavioural contracting as a tool to help patients achieve better health. *Fam Pract*. 1991;8:336-342.
14. Kelly RB. Controlled trial of a time efficient method of health promotion. *Am J Prev Med*. 1988;4:200-207.
15. Patrick K, Sallis JF, Long B, et al. A new tool for encouraging activity. *Physician Sports Med*. 1994;22:45-55.
16. Booth ML, Owen N, Bauman AE, Gore CJ. Retest reliability of recall measures of leisure-time physical activity in Australian adults. *Int J Epidemiol*. 1996;25:153-159.
17. Deyo RA, Diehr P, Patrick DL. Reproducibility and responsiveness of health status measures. Statistics and strategies for evaluation. *Control Clin Trials*. 1992;12:142S-158S.
18. Siegel PZ, Brackbill RM, Heath GW. The epidemiology of walking for exercise: implications for promoting activity among sedentary groups. *Am J Public Health*. 1995;85:706-710.
19. Harris SS, Caspersen CJ, DeFries GH, Estes EH. Physical activity counseling for healthy adults as a primary prevention intervention in the clinical setting. Report for the US Preventive Services Task Force. *JAMA*. 1989;261:3590-3598.
20. Rippe JM, Ward A, Porcari JP, Freedson PS. Walking for health and fitness. *JAMA*. 1988;259:2720-2724.
21. Russell DR, Berkley M, Fraser G, Wilson NC, Allen JB. *The Cost of Inactivity*. Otago, New Zealand: LINZ Activity and Health Research Unit, University of Otago; 1992. Report 92-20.