Physical activity and cardiovascular risk factors: effect of advice from an exercise specialist in Australian general practice

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ABSTRACT

Objective: To determine whether provision of individualised physical activity advice by an exercise specialist in general practice is effective in modifying physical activity and cardiovascular risk factors in older adults.

Design: Randomised controlled trial of individualised physical activity advice, reinforced at three and six months (intervention) versus no advice (control).

Setting: Two general practices in Adelaide, South Australia, 1996.

Participants: 299 adults aged 60 years or more who were healthy, sedentary and living in the community.

Main outcome measures: Changes to physical activity (frequency and duration of walking and vigorous exercise), selected cardiovascular risk factors (blood pressure, body weight, serum lipid levels) and quality of life over 12 months.

Results: Self-reported physical activity increased over the 12 months in both groups ($P<0.001$). The increase was greater for the intervention than the control group for all measures except time spent walking ($P<0.05$). More intervention than control participants increased their intention to exercise ($P<0.001$). Serum levels of total and low-density lipoprotein cholesterol and triglycerides fell significantly over the 12 months to a similar extent in the two groups. No other significant changes in cardiovascular risk factors were seen. Quality-of-life scores decreased over the 12 months. The decrease was significantly greater among intervention than control women, but not men, for emotional well-being ($P=0.02$), physical well-being ($P=0.04$) and social functioning ($P=0.04$).

Discussion: Provision of general practice-based physical activity advice reinforced three-monthly produced a sustained increase in self-reported physical activity. However, there were no associated changes in clinical measures of cardiovascular risk factors and minimal changes in quality-of-life measures.

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A LARGE BODY OF evidence shows that all-cause mortality and death and disability from cardiovascular disease decrease with regular physical activity[1] and physical fitness.[2] Leisure-time activity also reduces coronary risk factors,[3] and the greatest decrease is achieved by moving individuals from the sedentary, low-fitness category.[4,5]

Among Australians aged over 60 years, 55% of men and 61% of women are not sufficiently active to maintain general health.[6] Encouragingly, a Western Australian survey found that 93% of general practitioners (GPs) reported asking about physical activity when a patient presented with a condition that might benefit from exercise, and 50% asked new patients about current physical activity patterns.[7] However, GPs comment on a lack of skill in assessing and guiding activity and a lack of guidelines.[8] Although many believe referral to a qualified fitness professional is desirable, fewer than 15% make these referrals.[9]

Previous studies of interventions to increase provision of advice and patients' physical activity in primary care have had mixed results and are of varying methodological quality.[10] To reduce the demand on GPs, several groups have examined the effectiveness of advice from practice staff. Results of advice from a health visitor were initially favourable but were not sustained,[11] while advice from practice nurses produced no increases in objectively measured[12] or self-reported[13] exercise levels in the short term.

Therefore, we designed a properly powered study to determine the effectiveness of individualised advice from an exercise specialist in a general practice setting on changing physical activity levels and cardiovascular risk factors at 12-month follow-up.

METHODS

The study was a randomised, controlled trial. Ethics approval was granted by the Committee on Clinical Investigation, Flinders Medical Centre, Adelaide.

Recruitment and baseline measures

Sedentary adults aged 60 years or over who lived in the community were recruited from two general practices in the southern region of Adelaide, South Australia, in 1996, as described previously.[14] Briefly, 2878 people who met the above criteria were invited to a screening appointment; 913 attended and completed a questionnaire on demographic

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characteristics, medical history, medication use and physical activity levels.

Exclusion criteria included a cerebrovascular or ischaemic cardiac event in the previous six months, malignancy or other life-threatening disease, inability to comply with the requirements of the study, a condition for which physical activity was contraindicated, use of β-blocker medication, and regular physical activity, leaving 351 people eligible.

These 351 were invited to attend a baseline appointment at which they signed a consent form and were randomly allocated to the intervention or control groups using sealed opaque envelopes. They also answered a written questionnaire about current physical activity levels, intention-to-exercise,[15] quality of life (assessed by the Short Form 36[16]) and demographic information. Blood pressure, body weight and height were measured, and a blood sample was taken for lipid studies.

Interventions

Both groups had a 20-minute session with an exercise specialist (with a master's degree in exercise physiology; JAH). Spouses were invited to attend these and follow-up sessions, which were held at the participants' usual GP surgeries.

The intervention group received individualised advice about the benefits of physical activity and a pamphlet containing a plan for physical activity for the next three months. This plan, based on current position statements,[17,18] involved aerobic activities at moderate intensity for a minimum of three sessions per week for at least 20 minutes per session, with self-monitoring of heart rate.

The exercise plan, potential barriers to exercise and strategies to overcome these were discussed. The focus was on incorporating physical activity into the individual's usual activities and on increasing "self-efficacy" (belief in one's ability to perform the activity) by recommending a preferred, familiar activity and setting modest targets for the first three months. These targets were to be progressively increased, depending on progress, enthusiasm and health.

The control group received a pamphlet promoting good nutrition for older adults, which was discussed for 20 minutes.

Follow-up

At three and six months, all participants were mailed a follow-up questionnaire to be returned in a postage paid envelope (control participants) or at an interview (intervention participants). This interview was arranged by telephone, and intervention participants were encouraged to attend whatever their adherence to the exercise plan. Participants were also asked to complete a seven-day physical activity log as a prompt for discussion, which included physical activity levels and benefits, reasons for success or failure, injuries, heart-rate monitoring and changes to the plan.

At 12 months, all participants were invited to a follow-up interview, at which they completed a questionnaire, and clinical characteristics (except height) were remeasured.

Energy expenditure was measured for 59 participants (31 intervention and 28 control participants) over four days (two weekends and two weekdays) using a Caltrac portable, vertical accelerometer.[19] These 59 were recruited by telephoning randomly selected participants until six volunteers per week were obtained (a total of 88 were telephoned).

Statistical analyses

Sample size calculations indicated that 212 people were required to detect a 5 mmHg difference in systolic blood pressure between the intervention and control group using a parallel group design (assuming a power of 0.9 and type I error rate of 0.05). Targeting 300 subjects allowed for a 40% dropout and non-compliance rate.

Assumptions for parametric analysis were investigated. Repeated-measures analyses of variance were used to examine data for physical activity and five quality-of-life scores, using time as the within-subject variable, and time, intervention and sex as the between-subject variables. As data for three quality-of-life scales (roles physical and emotional and social functioning) were non-continuous and skewed, they were dichotomised (score of $100 = 0$, score $< 100 = 1$) and then analysed with generalised estimating equations — an extension of generalised linear models — to examine time, intervention and sex interactions.[20] Twelve-month changes in clinical characteristics, quality-of-life and accelerometer results were analysed with Student's t tests (independent samples). Intention-to-exercise data were analysed with χ^2 statistics. All data were analysed on an intention-to-treat basis. In the event of missing responses, data were entered at the previous follow-up, thereby assuming no change.

RESULTS

Participants

Of the 351 people eligible for the study, 299 attended the baseline interview and were randomised (149 to the intervention group and 150 to the control group). Their characteristics have been reported previously.[14] There were no statistically significant differences between the intervention and control groups in age (mean age, 67.3 years [SD, 7.9 years] versus 67.8 years [SD, 5.5 years]), sex distribution (48% versus 44% men), current and past medical history and current medication use or clinical parameters at baseline (Box 1).

Three- and six-month follow-up questionnaires were returned by 274 (92%) and 269 (90%) participants, respectively, while 264 (88%) attended the 12-month follow-up interview (123 in the intervention and 141 in the control group). Of the 35 who did not attend, two had died, six were on holidays, seven were ill, and 20 were not interested. There were no statistically significant differences in baseline clinical and sociodemographic measures between participants who attended the 12-month follow-up interview and those who did not.

Physical activity

At all three follow-ups, all self-reported measures of physical activity had increased significantly from baseline levels in both the intervention and control groups ($P < 0.05$; Box 2). However, the intervention group reported significantly more physical activity than the control group for all measures except time spent walking ($P < 0.05$). Men reported significantly more minutes of walking per session ($P = 0.02$) and more frequent vigorous exercise ($P = 0.02$) than women at all follow-ups. In addition, the difference in frequency of vigorous exercise between the intervention and control groups was significantly

1: Clinical measures at baseline and 12-month follow-up (mean and 95% confidence interval)

	Control group (n = 150)		Intervention group (n = 149)	
	Baseline	12 months	Baseline	12 months
Body weight (kg)	74.0 (71.8–76.1)	73.6 (71.5–75.8)	75.9 (73.8–78.0)	76.0 (73.9–78.1)
Height (cm)	165.8 (164.4–167.2)	ND	166.9 (165.5–168.4)	ND
Resting heart rate (bpm)	71.3 (69.7–72.9)	71.6 (70.0–73.2)	70.9 (69.1–72.6)	71.1 (69.6–72.6)
Blood pressure (mm Hg)				
Systolic	148.1 (145.1–151.0)	146.6 (143.4–149.6)	148.6 (145.9–151.4)	147.4 (144.4–150.5)
Diastolic	85.7 (84.2–87.1)	86.3 (84.9–87.7)	85.6 (84.1–87.1)	86.1 (84.6–87.7)
Serum levels (mmol/L)				
Total cholesterol	5.88 (5.73–6.03)	5.70 (5.55–5.85)*	5.85 (5.68–6.02)	5.63 (5.47–5.80)*
Triglycerides	1.64 (1.50–1.78)	1.57 (1.43–1.70)*	1.70 (1.50–1.89)	1.57 (1.42–1.73)*
HDL cholesterol	1.34 (1.27–1.40)	1.34 (1.28–1.41)	1.30 (1.24–1.37)	1.29 (1.23–1.35)
LDL cholesterol	3.81 (3.67–3.95)	3.65 (3.52–3.80)*	3.78 (3.65–3.95)	3.64 (3.50–3.79)*

* Significant decrease from baseline level ($P < 0.05$). HDL = high-density lipoprotein. LDL = low-density lipoprotein. ND = measurement not done.

2: Self-reported physical activity at baseline and follow-up (median value and 25th–75th percentile)

	Control group (n = 150)				Intervention group (n = 149)			
	Baseline	3 months	6 months	12 months	Baseline	3 months	6 months	12 months
Walking								
Frequency (sessions/week)	0 (0–2)	2 (0–3)*	2 (0–4)*	2 (1–3)*	0 (0–1)	3 (1–4)*†	3 (2–4)*†	3 (1–4)*†
Time (mins/session)	0 (0–20)	30 (0–49)*	30 (0–60)*	30 (10–60)*	0 (0–25)	30 (19–50)*	30 (20–60)*	30 (10–60)*
Vigorous exercise								
Frequency (sessions/week)	0 (0–0)	0 (0–1)*	0 (0–2)*	0 (0–1)*	0 (0–0)	2 (0–3)*†	2 (0–3)*†	2 (0–3)*†
Time (mins/sessions)	0 (0–0)	0 (0–16)*	0 (0–21)*	0 (0–15)*	0 (0–0)	20 (0–35)*†	20 (0–40)*†	20 (0–35)*†

* Statistically significant increase from baseline level ($P < 0.05$). † Values significantly higher than for control group ($P < 0.05$).

greater for men than for women ($P < 0.001$).

Energy expenditure data were available for 59 participants who wore an accelerometer (31 intervention and 28 control participants). The intervention and control groups did not differ significantly in any measured parameter of energy expenditure — total per day, per day as a percentage of total energy expenditure, during activity per day, or during activity per kg body weight.

At all follow-ups, there were significant differences between the intervention and control groups for change in intention to exercise ($P < 0.001$). At 12-month follow-up, more intervention than control participants increased their intention to exercise (Box 3).

Cardiovascular risk factors

Over the 12 months, there were no statistically significant changes in body weight, resting heart rate, blood pressure or serum high-density lipoprotein levels in either the control or intervention group (Box 1). However, there were significant decreases in serum levels of total and low-density lipoprotein cholesterol and triglycerides in both groups; the decreases did not differ significantly between the two. In addition, body weight decreased for all men and for control-group women, but increased for intervention-group women ($P = 0.01$).

Quality of life

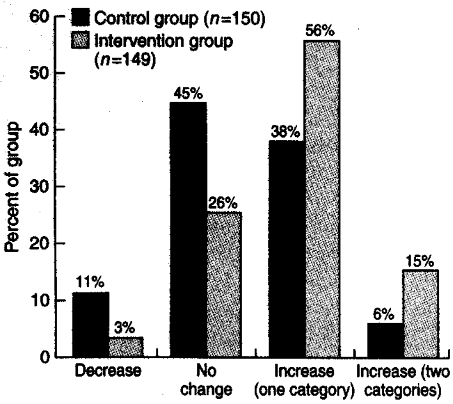
Quality-of-life scores decreased between baseline and 12-month follow-up in both the intervention and control groups. These score decreases were significant in both groups for bodily pain ($P = 0.001$), general health ($P < 0.001$), physical functioning ($P < 0.001$), vitality ($P = 0.04$) and role physical (odds ratio [OR], 1.80; 95% CI, 1.33–2.43).

Women in the intervention group had significantly greater score decreases than women in the control group for the scales role emotional ($P = 0.02$), role physical ($P = 0.04$) and social functioning ($P = 0.04$). In addition, women reported worse scores at 12-month follow-up than men for bodily pain ($P = 0.02$), mental health ($P = 0.03$), physical functioning ($P = 0.04$) and vitality ($P = 0.01$), and were 1.5 times more likely to report some difficulty with role physical (OR, 1.43; 95% CI, 1.03–1.99) and social functioning (OR 1.53; 95% CI, 1.06–2.21).

DISCUSSION

This randomised controlled trial showed that provision of physical activity advice by an exercise specialist was effective in increasing the intention to exercise and self-reported physical activity among patients 60 years and over in two general practices. Other studies have also found increased intention to exercise[14] and increased physical activity levels[12,21] as a consequence of physical activity advice.

However, our study differs from most others in that it had a large number of participants and high retention rate (88% at 12 months), and calculated results on an intention-to-treat basis. The high retention rate possibly resulted from participants' strong association with their GPs, who were aware and possibly encouraging of their participation, and the fact that all visits were conducted at the GPs' practices. The success of the intervention may be attributed to the enthusiastic volunteer population, who, while sedentary, were keen to start regular activity. Another possible contributor was the strong emphasis on walking as the preferred activity. The physical activity advice had the characteristics of successful physical activity interventions — a home-based program, comprising



3: Change in category of intention to exercise from baseline to 12-month follow-up. Categories: ***1:*** *I currently do not exercise and either do not intend to start, or am thinking about starting exercising, in the next six months.* ***2:*** *I currently exercise a little, but not regularly.* ***3:*** *I currently exercise regularly.*

unsupervised, informal exercise (generally walking), of moderate intensity and comparatively low frequency (which is associated with better maintenance), as well as frequent professional contact.[22]

The major limitation of this study was its reliance on self-report, as patients over 65 years tend to overestimate their physical activity.[12] The number of participants and limited resources precluded general use of more objective measures of physical activity or fitness. Objective measurements of energy expenditure by accelerometer in 59 volunteers did not detect a difference between the control and intervention groups, possibly because of the small sample size. Other possible reasons are that people in each group who had established regular physical activity volunteered preferentially for accelerometer measurement, or that the self-reported increase in physical activity in the intervention group was not real.

We were also unable to detect any differences between the intervention and control groups in cardiovascular risk factors after 12 months. This is consistent with results of others. For example, patients referred by their GPs to a local leisure centre had increased self-reported physical activity after 37 weeks, but no changes in systolic or diastolic blood pressures or body mass index.[23] In our study, the increase in self-reported physical activity in the intervention group was possibly not large enough to increase physical fitness. Previous investigators have shown that cardiovascular risk factors are more strongly related to physical fitness than to physical activity,[4,5] and that, in individuals with low levels of fitness, increased physical activity without a change in fitness does not modify cardiovascular risk factors.[24] Further, although the difference in physical activity between the intervention and control groups reached statistical significance, it was modest in absolute terms. Finally, all participants remained under the usual care of their GPs, who were free to initiate or cease prescribing medications that might modify cardiovascular risk factors.

We found declines in quality of life from baseline to 12 months in both groups, with the greatest change in the first three months. We hypothesise that quality of life was more accurately reported at three months than at baseline, when scores were much higher than the Australian norms for the participants' age. It is possible that participants were initially keen to present themselves as healthy in all respects or that they were expressing high hopes for the study.

In conclusion, this study showed that, for a specific population of general practice patients, providing physical activity advice three-monthly for six months resulted in increases to both self-reported physical activity and intention to exercise, which were maintained at 12-month follow-up. Further research in primary care is needed to determine whether these changes apply to other groups and whether they confer significant health benefits.

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References

1. Paffenbarger RS, Hyde RT, Wing AL, et al. The association of changes in physical-activity level and other lifestyle characteristics with mortality among men. *N Engl J Med* 1993; 328: 538-545.
2. Blair SN, Kohl HW, Paffenbarger RS, et al. Physical fitness and all-cause mortality. A prospective study of healthy men and women. *JAMA* 1989; 262: 2395-2401.
3. Folsom AR, Caspersen CJ, Taylor HL, et al. Leisure time physical activity and its relationship to coronary risk factors in a population-based sample. *Am J Epidemiol* 1985; 121: 570-579.
4. Eaton CB, Lapane KL, Garber CE, et al. Physical activity, physical fitness and coronary heart disease risk factors. *Med Sci Sports Exerc* 1995; 27: 340-346.
5. Lochen M-L, Rasmussen K. The Tromso study: physical fitness, self-reported physical activity, and their relationship to other coronary risk factors. *J Epidemiol Community Health* 1992; 26: 103-107.
6. Active Australia. Physical activity levels of Australians. Results of the Active Australia baseline survey 1997. Available at <www.ausport.gov.au/partic/actozfr.html>
7. Bull FCL, Schipper ECC, Jamrozik K, Blanksby BA. Beliefs and behaviour of general practitioners regarding promotion of physical activity. *Aust J Public Health* 1995; 19: 300-304.
8. Murphy B, Ruth D. GPs role in CVD Prevention. A report on focus group discussions with general practitioners for the RISK study in general practice. Melbourne: Monash University, 1991.
9. Bull FCL, Schipper ECC, Jamrozik K, Blanksby BA. How can and do Australian doctors promote physical activity? *Prev Med* 1997; 26: 866-873.
10. Eaton CB, Menard LM. A systematic review of physical activity promotion in primary care settings. *Br J Sports Med* 1998; 32: 11-16.
11. Harland J, White M, Drinkwater C, et al. The Newcastle exercise project: a randomised controlled trial of methods to promote physical activity in primary care. *BMJ* 1999; 319: 828-832.
12. Sims J, Smith F, Duffy A, Hilton S. The vagaries of self-report of physical activity: a problem revisited and addressed in a study of exercise promotion in the over 65s in general practice. *Fam Prac* 1999; 16: 152-157.
13. Simmonds GJ, Naylor P-J, Riddoch CJ, Velleman G. Stage-based counselling for exercise in primary care — a controlled trial. Presented at the Scientific Basis of Health Services Conference. 1995 Oct; London.
14. Halbert JA, Silagy CA, Finucane P, et al. Recruitment of older adults for a randomized, controlled trial of exercise advice in a general practice setting. *J Am Geriat Soc* 1999; 47: 477-481.
15. Marcus BH, Banspach SW. Using the stages of change model to increase the adoption of physical activity among community participants. *Am J Health Promot* 1992; 6: 424-429.
16. Ware JE, Snow KK, Kosinski M, Gandek B. SF-36 health survey manual and interpretation guide. Boston: New England Medical Center, 1993.
17. National Institutes of Health Consensus Development Panel on Physical Activity and Cardiovascular Health. Physical activity and cardiovascular health. *JAMA* 1996; 276: 241-246.
18. American College of Sports Medicine. The recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness in healthy adults. Position Stand. *Med Sci Sports Exerc* 1990; 22: 265-274.
19. Jacobs DR, Ainsworth BE, Hartman TJ, Leon AS. A simultaneous evaluation of 10 commonly used physical activity questionnaires. *Med Sci Sports Exerc* 1993; 25: 81.
20. Liang K-Y, Zeger S. Longitudinal data analysis using generalized linear models. *Biometrika* 1986; 73: 13-22.
21. Stevens W, Hillsdon M, Thorogood M, McArdle D. Cost-effectiveness of a primary care based physical activity intervention in 45–74 year old men and women: a randomised controlled trial. *Br J Sports Med* 1998; 32: 236-241.
22. Hillsdon M, Thorogood M, Anstiss T, Morris J. Randomized controlled trials of physical activity promotion in free living populations: a review. *J Epidemiol Community Health* 1995; 49: 448-453.
23. Taylor AH, Doust J, Webborn N. Randomised controlled trial to examine the effects of a GP exercise referral programme in Halisham, East Sussex, on modifiable coronary heart disease risk factors. *J Epidemiol Community Health* 1998; 52: 595-601.
24. McMurray RG, Ainsworth BE, Harrell JS, et al. Is physical activity or aerobic power more influential on reducing cardiovascular disease risk factors? *Med Sci Sports Exerc* 1998; 30: 1521-1529.

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