Physical activity coaching by Australian Exercise Physiologists is cost effective for patients referred from general practice

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Published in:
Australian and New Zealand Journal of Public Health

DOI:
10.1111/1753-6405.12733

Physical activity coaching by Australian Exercise Physiologists is cost effective for patients referred from general practice

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Abstract

Objective: Interventions to promote physical activity for sedentary patients seen in general practice may be a way to reduce the burden of chronic disease. Coaching by an exercise physiologist is publicly funded in Australia, but cost effectiveness has not been documented.

Methods: In a three-arm randomised controlled trial, face-to-face coaching and telephone coaching over 12 weeks were compared with a control group using the outcome of step count for one week at baseline, three months and twelve months. Program costs and time-based costs were considered. Quality of life was measured as a secondary outcome.

Results: At 12 months, the intervention groups were more active than controls by 1,002 steps per day (95%CI 244, 1,759). This was achieved at a cost of AUD$245 per person. There was no change in reported quality of life or utility values.

Conclusion: Coaching achieved a modest increase in activity equivalent to 10 minutes walking per day, at a cost of AUD$245 per person. Face-to-face and telephone counselling were both effective.

Implication for public health: Persistence of increases nine months after the end of coaching suggests it creates long-term change and is a good value health intervention.

Key words: physical activity, cost effectiveness, intervention, randomised controlled trial, general practice, step counts.

Physical inactivity has been described as the greatest health challenge of developed countries in the 21st century.[1] Inactivity is also a very expensive problem, with direct health care costs due to inactivity estimated at $555 million per year for Australia in the year 2013.[2] Many strategies to increase daily physical activity have been proposed, ranging from town planning that encourages walking and cycling, to sports participation programs, and exercise-based rehabilitation after cardiac events. Some strategies have evidence for effectiveness but fewer have been subjected to economic analysis.

As most people in the population see a general practitioner (GP) at least once annually, and the relatively new profession of Exercise Physiologist (EP) – known as kinesiologist in some countries – has become established in Australia, we conducted a trial to measure the effectiveness of referral for EP coaching to increase the daily activity level of sedentary patients from general practices. We chose this strategy as we hypothesised that a recommendation from a known and trusted GP might increase the uptake of coaching. In Australia, the Medicare system subsidises the cost of GP visits and, if the GP creates a chronic disease management plan, Medicare will also subsidise EP visits up to a maximum of five per year as specified by Medical Benefits Schedule (MBS) item numbers. The number of EP services delivered has grown substantially in recent years.

Economic evaluations of physical activity interventions have been published but many have suffered from methodological problems such as using dichotomous analysis (counting the number of people who 'become active' at an arbitrary threshold), or by using self-reported physical activity measures of limited validity. A systematic review of studies published up to 2009 showed that in four studies the cost to move a participant from 'inactive' to 'active' ranged from €331 to €3,673.[3] A more recent 2015 systematic review found a summary cost per Quality Adjusted Life Year (QALY) of £76,276 over eight studies, with considerable uncertainty, and concluded that many physical activity interventions had cost utility ratios similar to those from funded pharmaceuticals.[4]

Dalziel and colleagues[4] examined the cost utility of the New Zealand green prescription program, finding, in 2001, a cost of NZD$2,053 per QALY. The green prescription intervention was similar to ours in that it was for patients referred from general practice and the follow-up coaching was delivered by telephone. However, it differed in that the physical activity was measured by self-

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Submitted: June 2017; Revision requested: July 2017; Accepted: September 2017
The authors have stated they have no conflict of interest.

Aust NZ J Public Health. 2018; 42:12-15; doi: 10.1111/1753-6405.12733

report, and the participants did not have a face-to-face meeting with the coach. The Dalziel analysis calculated QALY benefits from changes in SF36 utility scores, plus expected reduction in mortality over a life expectancy of 40 years. Sensitivity analysis based only on the SF36 scores, ignoring any mortality benefit, showed cost per QALY of $2,713. The considerable variation in cost utility values reported in the literature probably reflects the practice of measuring physical activity using self-report measures of low validity. A 2015 report by Deloitte Access Economics estimated cost per QALY of $5,611 for exercise interventions in people with pre-diabetes but, as this was based on research using combined exercise and dietary interventions, the individual contribution of the activity coaching was unclear.[5] The existing uncertainty underlines the need to objectively measure costs and outcomes of physical activity coaching delivered in Australian conditions.

The usual EP coaching intervention is delivered during office visits but, due to the cost and inconvenience for patients of travelling to the EP office and the sometimes long distances that rural patients have to travel to access services, we were interested in the effectiveness of telephone delivery of the intervention after an initial face-to-face consultation. In the context of a three-arm randomised controlled trial, we assessed the question: What is the cost effectiveness and cost utility at 12 months after referral of sedentary patients to an EP for coaching (either face-to-face or by telephone) to become more active?

Methods

For this three-arm trial, we recruited adults >18 years considered by their GP to be insufficiently active, who were then screened at baseline and entered the trial only if their average daily step count during a week of pedometer wear was fewer than 7,000 steps. Many participants had inactivity-related health problems, but this was not a requirement. The intervention was motivational interviewing aimed at helping them to become more active, based on social cognitive theory as appropriate for each person's readiness to change. Participants were randomised to delivery either during five face-to-face (FTF) visits with an EP, or one visit followed by four sessions delivered by telephone, or to a control group who received a printed pamphlet to encourage increases in physical activity. Futher details of the methods have been published previously.[6]

Input costs are shown in Table 1. Cost analysis included time taken for the GP to make a referral. Referral occurred during a clinical review or consultation for an incidental problem, with discussion of what could be expected from EP coaching, then writing a referral letter that was highly automated by the GP clinical software. Expert GP opinion was that it would take about half the time of a standard consultation, which is MBS item 23 with the value of $37.05, so referral cost was taken to be $18.50.

The EPs, who work in private practices, were paid $90 for an initial consultation and $55 for follow-up consultations, whether by phone or face-to-face. These amounts were based on the $52.95 paid by Medicare for an EP consultation under Chronic Disease Management MBS item 10953, which covers a nominal 30-minute consultation. As we expected the motivational interviewing intervention to take longer, we used a higher cost for the initial consultation based on the median private fee of the EPs involved. In two alternative analyses, we used first a time-based cost, which we regard as the best estimate of the true economic cost, and second a Medicare item cost that reflected the funder's perspective. The time-based costs included time for phone calls, unsuccessful calls, record keeping and consultation duration, while the Medicare item analysis used a flat rate of $52.95 and ignored other costs. It should be noted that telephone coaching is not currently eligible for Medicare funding.

The cost of missed appointments was considered; however, enquiries with EPs revealed that it was rare for a patient to not attend their appointment, once booked, so we have not included a cost for missed appointments.

Table 1: Input costs.

Intervention element	Unit cost	Notes
GP referral	$18.50	Half of a level B consultation
EP first consult	$90	The fee paid to EPs in this project for an initial consultation
Subsequent consults	$55	The fee paid for a subsequent consultation.
EP Medicare item 10953 from funder's perspective	$52.95	Medicare subsidy for an EP consultation
Time spent per failed phone call	4 mins	Estimate
Hourly rate for time based costs, including overheads.	$90	

As we have adopted a funder's perspective, participant costs to attend EP visits, such as transport or parking, and costs such as gym membership or sports equipment were not included, nor were any patient contributions to cost of the GP referral consultation. As all intervention costs were incurred during a three-month period, and outcomes measured within one year, there was no need to apply discounting. The primary analysis was the cost effectiveness for increased physical activity, i.e. the money spent to achieve an extra 1,000 steps per day at the 12-month time point.

Measures

The primary outcome measure was step count recorded for a period of one week on a pedometer (G-sensor 2025 Braintek Electronics Co Ltd Taipei Taiwan) that was mailed to participants. Every device was tested on a purpose-built pedometer tester for 100 cycles before every use, and was required to record within plus or minus two steps. Participants were instructed to wear the pedometer clipped to their clothing at the waist from when they rose in the morning until they undressed at night. Steps were recorded at the end of each day in a study diary, and the daily average was calculated for people who had at least three days of at least 10 hours wear time. Non-step activities of swimming and cycling were also recorded in the diary, and imputed steps based on activity MET values were added to the total.[7] Step count data were collected for one week at baseline, three months and 12 months. The step count value from one participant with extreme but plausible step counts was truncated at the mean + 3SD.

At baseline, three- and 12-month time points, participants completed the validated eight dimension Australian Quality of Life scale (AQoL). The AQoL comprises 35 questions and measures the following dimensions: independent living, relationships, mental health, coping with pain, senses, life satisfaction and self-worth. It gives a utility score ranging from zero to one, with higher values reflecting better quality of life. Utility scores were calculated in STATA 13 using an algorithm published by the Monash University Centre for Health Economics, for which validity and reliability have been published.[8]

Analyses of the trial data have been reported elsewhere.[9] Briefly, treatment group differences in adjusted daily step counts were estimated using linear mixed models in an ANCOVA framework based on intention to treat.

Results

Recruitment, participation and costs

Two hundred and three participants were randomised; the group consisting of 143 females and 60 males, with average age 57 and average BMI 33 for women and 34 for men, and activity at baseline was 4,427 steps per day(SD 1,543). Further details have been published previously.[9]

Participants attended from one to five consultations (average 4.4) and the total duration of EP consultations per participant was between 25 and 235 minutes. The average total consultation time was 165 minutes in the face-to-face group, and 134 minutes in the telephone group. There was less than one failed phone call attempt per person on average in the telephone group. Costs of record keeping and telephone calls are included in the hourly rate used for time-based costs.

Intervention costs are shown in Table 2. The per-consultation cost is the average paid for EP interventions in the trial, plus the cost of the GP referral. The time-based cost is the time spent by EPs on the intervention multiplied by the hourly rate, plus the cost of the GP referral. We regard this as the true economic cost. The item number based cost reflects that the face-to-face group had on average 4.48 consultations, while the telephone group had on average 4.41 consultations, plus the cost of the GP referral. This is the cost from the funder's perspective.

Cost effectiveness

The primary hypothesis of the effectiveness trial was that face-to-face and telephone interventions would be equally effective, so data from these groups were combined for analyses. Step count outcomes are shown in Table 3. The linear mixed model between group difference (interventions vs. control) in change from baseline to 12-month follow-up was 1,002 (95% CI 244, 1,759) steps per day in the combined group. The telephone group increased steps by an average of 619 per day more than the face-to-face group, but this difference was not statistically significant (p=0.27; 95%CI -489, 1,726) so the combined group costs are compared with the combined group outcomes. Overall cost effectiveness was $245 per 1,000 steps per day increase in activity at 12 months from time-based costs, or $254 per 1,000 steps per day estimated from the funder's perspective.

Table 2: Intervention costs.

$AUD	FTF	Phone	Combined
Per consultation	$300	$296	$298
Time based	$266	$224	$245
Item number based	$256	$252	$254

Cost utility

Although the intervention groups did become more active, this was not reflected in a significant change in utility as measured by AQoL utility values, which are shown in Table 4, so QALY values were not calculated. Utility values range from 1 to 0 with 1 being perfect health, and zero being death. They are widely used but the validity is disputed.

Conclusion

Coaching by an EP to increase physical activity was modestly effective in sedentary patients referred from general practices. The increase of 1,002 steps per day equates to 10 minutes of walking at a moderate pace, or 70 minutes per week. This is about half the recommended 150 minutes per week of moderate to vigorous activity promoted by guidelines. However, studies have shown that smaller 'doses' of physical activity have beneficial health associations. For example, in the Nurses' Health Study, for women in the middle quintile of walking activity who did no vigorous activity, there was a 20% reduced risk of diabetes, compared with those in the lowest quintile.[10] The participants achieved a median of 3.0 MET.h per week of walking, or about 54 minute/week, which is similar to the intervention effect we observed.

Recent analysis from the Hunter Community Study showed that an extra 4,300 steps at baseline, i.e. the difference between the 25th and 75th centile of steps in that group of adults over the age of 55 years, resulted in a reduction of 0.29 bed days per year during eight years of follow-up.[11] If the effect is linear, we could expect an extra 1,000 steps per day to result in reduced requirement for hospital care by one-third of a day over the subsequent five years. As the cost per bed day of hospital admission in the local area health service in 2013 was in the range $1,350 to $1,600, preventing one-third of a bed day in hospital is likely to save more than the cost of our intervention.

A meta analysis of studies up to 2008 took the approach of estimating cost per MET.hour of activity, estimating a benchmark of US$0.50 to US$1.00 per MET.hour as the cost at which health care savings would equal intervention costs.[12] Taking the commonly used MET value of 3.0 for walking, our intervention effect of ten minutes of walking produces 182 MET. hours per year of activity, which suggests the cost of the intervention would be recouped in health care savings if the intervention effect persisted for 16 to 32 months.

This was one of the first studies of EP coaching in Australia under real world conditions. Although we provided training for the EPs to ensure they delivered the intervention as planned, they told us that the study intervention was not substantially different from their usual practice. Many studies of physical activity interventions have only short-term follow-up; however, our results give some certainty that changes last at least 12 months.

We were disappointed to not find an effect on quality of life, which may be explained by a modest intervention effect on physical activity, imprecision of the measurement tool and the many unrelated influences that could be at work in participants' lives.

Possible limitations of this work are in the measurement of habitual physical activity. Pedometers are more valid than self-report measures[13] but may induce a Hawthorn effect. Any influence of wearing

Table 3: Physical activity outcomes. Steps per day averaged over a week.

Steps per day	Baseline	3 months	12 months
Control	4,415 (SD 1,529)	5,386 (SD 2,749)	4,736 (SD 2,187)
FTF	4,549 (SD 1,407)	6,172 (SD 2,428)	5,346 (SD 2,330)
Telephone	4,309 (SD 1,705)	5,949 (SD 3,188)	6,289 (SD 4,136)
Combined intervention groups	4,433 (SD 1,557)	6,075 (SD 2,767)	5,792 (SD 3,322)

Table 4: Changes in utility scores derived from AQoL 8.

Utility score (SD)	Baseline	3 months	12 months
Control	0.650 (0.195)	0.688 (0.174)	0.702 (0.196)
FTF	0.666 (0.179)	0.715 (0.199)	0.689 (0.214)
Telephone	0.608 (0.220)	0.684 (0.222)	0.636 (0.220)

a pedometer on activity levels should have been equal at baseline and follow-up, so would not influence the measured change. Measurement of physical activity with accelerometers would give slightly greater precision and information about intensity, but pedometers are easier to use and steps per day are a unit that people understand. The control group received a printed pamphlet about the benefits of being active, so were not an absolutely pure zero intervention group. We did this to potentially reduce disappointment, which may have influenced participation, but cannot prove that it had no influence on activity levels. The intervention effect was larger at the end of the intervention period at three months than at 12 months, and we hope that the effect observed at 12 months reflects long-term physical activity habits. Whether this will persist in future years, however, is unknown. We did not attempt to measure whether being more active had a beneficial effect on physiological markers of health, as this is well established.

Implications for public health

Coaching by an EP over a three-month intervention produced a small but valuable increase in physical activity that persisted at 12 months, at a cost of $245 per extra 1,000 steps per day. In this study we did not observe a change in quality of life so could not estimate utility.

Given the wide-ranging benefits of increased physical activity, even this small increment will have worthwhile health benefits if this increase persists over years. That telephone delivered coaching was also effective supports inclusion of this mode of delivery in MBS item numbers, which will be of most assistance to people in rural areas or with transport disadvantage.

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