Cost-effectiveness of lifestyle and structured exercise interventions in sedentary adults: results of project ACTIVE

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Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
'Lifestyle' versus 'structured' exercise interventions to enhance physical activity. 'Lifestyle' interventions included the tuition of behavioural skills and cognitive-behaviour modification techniques to increase physical activity, taught in small groups. The 'structured' intervention followed a typical exercise prescription as described by the American College of Sports Medicine, including intensive exercise in a purpose-designed facility under the supervision of a health educator.

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised sedentary adults aged between 35 and 60 who were greater than 140% of ideal body weight, with a baseline energy expenditure value of less than 36 kcal/kg/day for men and 34 kcal/kg/day for women. Participants were excluded from the study if they were pregnant or planning to become so during the study period, consumed 3 or more alcoholic drinks per day, were planning to leave the area within 2 years of the study, had a history of myocardial infarction (MI), stroke, type-1 diabetes, hypertension, osteoporosis, osteoarthritis, or used prescription medications that may have impaired exercise performance.

Setting
The study was carried out in a community setting, in Dallas, Texas, USA.

Dates to which data relate
Effectiveness data were collected between 1994 and 1997. The years to which resource costs and prices applied were not stated.

Source of effectiveness data
The evidence for the final outcomes was derived from a single study.

Link between effectiveness and cost data
Cost data were based on post hoc estimates of the value of time and resources.

Study sample
It was unclear from this publication whether any power calculations were performed in planning the size of the study as details of the design of the study were published elsewhere. Participants were recruited by a variety of means including print, radio and television, word of mouth and by contacting past participants from previous studies. A sample of 235 sedentary, but otherwise healthy, community-dwelling adults was randomised into either the 'lifestyle' or 'structured' intervention arms. Each arm was split into 3 cohorts, which commenced the trial six months apart. No details of the randomisation method, the numbers of participants initially invited or the numbers subsequently excluded, were quoted. The number of patients in each study arm was not explicitly stated, however a split of 121 to the 'lifestyle' arm and 114 to the 'structured' arm can be inferred from cost data.

**Study design**
This was a randomised study based at a single centre in Dallas, Texas. The duration of follow-up was 24 months, with evaluations at 6 months and 24 months. Details of randomisation, and any losses to follow-up were stated elsewhere.

**Analysis of effectiveness**
It is unclear whether or not the analysis was carried out under the intention to treat principal. The outcomes measured were increases in energy expenditure in kcal per kg per day, increases in energy expenditure from moderate and hard activity, reduction in hours spent sitting per week, increases in minutes per day spent walking, flights of stairs climbed per day, peak flow, minutes spent on treadmill, and reductions in heart rate, blood pressure and weight. 'Treadmill' units were simply reported as 'minutes' which probably represents minutes per day.

The authors reported that baseline analyses showed the two groups to be comparable in clinical chemistries, fitness performance, and energy expenditure. It was unclear whether the groups were comparable in terms of age and sex, although the authors stated that details were provided in an earlier published paper on the study.

**Effectiveness results**
The outcomes of the two groups were discussed in detail in earlier published papers on this study. Only point estimates of outcomes were presented in this paper.

Averaged over the first six months of the study, the 'lifestyle' intervention was more effective at: increasing overall energy expenditure; energy expenditure from moderate activity; time spent walking; climbing stairs; and reducing blood pressure.

The 'structured' intervention was more effective at: increasing energy expenditure from hard activity; reducing time spent sitting; increasing peak flow; time spent on a treadmill; and reducing heart rate and weight.

When averaged over 24 months, similar results were observed except that the 'structured' intervention now had the greatest effect in increasing time spent walking per day, and the 'lifestyle' group showed the greatest weight loss. (The 'structured' intervention group had gained weight).

**Clinical conclusions**
Overall, both interventions demonstrated "significant and comparable improvements in physical activity and cardiorespiratory fitness from baseline to 24 months".

**Measure of benefits used in the economic analysis**
A cost-consequences analysis was performed (the reader is referred to the effectiveness results reported earlier). The authors concluded that the interventions were equally effective (although this was hard to assess as no statistical analysis of effectiveness results was reported), and hence the overall economic analysis was based on cost differences only (cost-minimisation).
Direct costs
Resource quantities were not listed separately from costs, although unit costs and total costs were reported.

Costs included in the analysis were supervision, preparation, and classroom instruction time for health educators, costs of preparation of mail reminders for those classes, the development of class content and classroom instruction for both the nutritionist and exercise psychologist, the development of class content, and monitoring content delivery time for the clinical psychologist. In addition, the cost of a computerised tracking system, curriculum materials (manuals and 'digi-walkers'), printing and postage (mail reminders and general supplies), facilities and health club memberships were included.

Staff time costs were calculated based on hourly wages plus fringe rate, and the labour costs for preparation of classes were reduced for the second and third cohort, to reflect the extra preparation required for the first. After 6 months, participants in the 'structured' group were given the opportunity to join a health club at their own expense. Membership for the first six months was incorporated into the analysis. However, out-of-pocket expenses incurred by participants were not. This is consistent with the study perspective (clinician or payer).

Capital costs for a computerised tracking system were annuitised, and all costs were discounted using a 5% rate, although the year to which costs referred was not stated. Average cumulative costs at 6 months and 24 months were reported.

Statistical analysis of costs
Costs were deterministic point estimates.

Indirect Costs
No indirect costs were reported.

Currency
US dollars ($).

Sensitivity analysis
A 2-way simple scenario analysis was performed, assuming a lower course development time input for the 'lifestyle' intervention, and a lower health club membership fee.

The lower course development time simulated a pre-established curriculum, rather than one designed from scratch, hence the time input to prepare for classes for the first cohort was reduced to the same as that for the second and third.

The cost of health club membership was varied to reflect the use of cheaper clubs. The median cost of joining a number of local health clubs was used.

Estimated benefits used in the economic analysis
The reader is referred to the effectiveness results reported above.

Cost results
The total cost of the 'lifestyle' intervention at 6 months was $33,778.53, or $46.53 per participant per month. The total cost of the 'structured' intervention at 6 months was $130,123.41, or $190.24 per participant per month.

The total cost of the 'lifestyle' intervention at 24 months was $49,805.37, or $17.15 per participant per month. The total cost of the 'structured' intervention at 24 months was $134,910.67, or $49.31 per participant per month.

Costs were discounted at 5% per annum, and no statistical analysis of costs or confidence intervals were presented. The
costs of adverse effects were not considered.

**Synthesis of costs and benefits**
The two interventions were classed as 'equally effective', hence overall results were reported as a cost per participant per month (cost minimisation). However, costs and benefits were also combined in an average cost per average incremental unit of improvement in an outcome, where each group was considered as its own control from the period before the intervention.

The overall cost per participant per month of the 'lifestyle' intervention at 6 months was $46.53, compared with $190.24 in the 'structured' intervention. At 24 months, the cost per participant per month in the 'lifestyle' group was $17.15, and for the 'structured' group, $49.31.

Two alternative scenarios were considered:

Under the assumption of a reduced preparation time for classes for the first cohort, the average cost per participant per month in the 'lifestyle' arm fell from $17.15 to $12.73 (over 24 months).

Under the assumption of cheaper health club membership, the average cost per participant per month in the 'structured' arm fell from $49.31 to $28.62 (over 24 months).

**Authors' conclusions**
A behaviourally based 'lifestyle' intervention in which participants are taught how to increase activity levels in their daily lives is generally more cost-effective than a 'structured' exercise programme in improving physical activity and cardiorespiratory health.

**CRD COMMENTARY - Selection of comparators**
The study was designed to evaluate the effectiveness of two approaches to increasing physical activity and cardiorespiratory fitness. The authors did not justify the choice of interventions (however, the interventions were detailed in other papers). You, as a user of the database, should decide if this is a widely used health technology in your own setting.

**Validity of estimate of measure of benefit**
The analysis was based on a randomised trial, which was appropriate for the study question. It was not explicitly stated whether the study sample was representative of the study population, however a Community Advisory Council was employed to ensure that an appropriate ethnic balance was included in the study, and patient groups were shown to be comparable with each other at baseline. Analysis of covariance was used to compare changes in physical activity and cardiorespiratory fitness (details of how this was performed were not listed). The estimation of benefits was obtained directly from the effectiveness analysis. This choice of estimate was not explicitly justified.

**Validity of estimate of costs**
All categories of cost relevant to the perspective adopted were included in the analysis. The authors acknowledged that research costs, value of participants' time and recruitment costs were not included, but that this is consistent with the perspective adopted (practising clinician and/or third party payer). Costs and quantities were not reported separately, although unit costs and total costs were reported. No statistical analysis of quantities was performed. The authors acknowledged that the ex post collection of data might have introduced errors.

Costs for personnel time were taken from prevailing wage rates plus a 29% fringe, and costs for computerised tracking systems, curriculum materials and sundries were taken from current prices.

All costs were discounted at 5%, which may not apply across other countries. The date to which prices related was not reported, which limits the generalisability of the results.
Other issues
The authors report that there were no appropriate studies with which to compare their results. The issue of generalisability to other settings was addressed, for example the authors suggested that health maintenance organisation (HMO) subsidisation of the programmes could result in considerable cost savings for both interventions. However it was acknowledged that generalisability beyond similar populations and settings was limited. The authors reported a number of limitations to their study, namely, that the outcomes presented were not 'final', in that they could not be used to compare reductions in morbidity over the life of the subjects. The authors also commented that the cost analysis was based on post-hoc estimates of the value of time and resources, and that these were not collected alongside this study. They may therefore be subject to error (although no sensitivity analysis was reported addressing this issue).

Implications of the study
The reader is referred to the authors conclusions reported above.

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Other publications of related interest


Dunn A L, Marcus B H, Kampert J B, Garcia M E, Kohl H W, Blair S N. Comparison of lifestyle and structured interventions to increase physical activity and cardiorespiratory fitness: a randomized trial. JAMA 1999;281:327-34.

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