A rapid review of the effectiveness of brief interventions in primary care to promote physical activity in adults.

NICE Public Health Collaborating Centre – Physical activity
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Contents

Executive Summary

This report examines the effectiveness of brief interventions in primary care to increase physical activity in adults. These were defined as: 'Any brief intervention involving verbal advice, encouragement, negotiation or discussion with the overall aim of increasing physical activity delivered in a primary care setting by a health or exercise professional, with or without written support or follow-up'.

A literature review was conducted to identify studies that used a controlled design to assess the effect of a brief intervention delivered in primary care to increase physical activity in the adult population. Studies were only included if they measured physical activity outcomes (self reported or objective measures) at baseline and from six weeks post intervention.

Evidence from eleven studies (6 individual RCTs, 2 cluster RCTs, and 3 controlled non-randomised trials) suggests that brief interventions in primary care to increase physical activity can be effective in the short term (6 to 12 weeks), longer term (over 12 weeks) and over a very long time-frame (1 year or more).

Six studies reported significant increases in physical activity outcomes: two (1++) studies (Elley et al., 2003; Petrella et al., 2003); two (1+) studies (Harland et al., 1999; Swinburn et al., 1998); one (1-) study (Halbert et al., 2000) and one (2-) study (Bull & Jamrozik, 1998;). Five reported no significant effect: one (1+) (Hillsdon et al, 2002) one (2+) (Smith et al., 2000); and two (2-) studies (Halbert et al., 2001; Naylor et al., 1999) and one (1-) study (Goldstein et al., 1999).

Short term outcomes (6 – 12 weeks)

Six studies measured short-term outcomes (Goldstein et al., 1999; Halbert et al., 2000; Harland et al., 1999; Naylor et al., 1999; Smith et al.., 2000; Swinburn et al., 1998). Three of these found significant increases in physical activity outcomes in sedentary middle aged populations (Halbert et al., 2000;

Harland et al., 1999; Swinburn et al., 1998). One (+) quality study found a 32% increase in the percentage of subjects reporting participation in any physical activity (compared to 17% in the control group) (Swinburn et al., 1998). Another (+) quality study found a 38% rise in those reporting increased levels of physical activity (compared to 16% in the control group) (Harland et al. 1999). A (-) quality study found an increase in walking sessions per week from 0 at baseline to 3 (compared to 2 in controls) and vigorous exercise from 0 to 2 (compared to 0 in controls) (Halbert et al. 2000).

Longer term outcomes (12 - 52 weeks)

Seven studies measured longer term outcomes (Bull & Jamrozik, 1998; Goldstein et al., 1999; Halbert et al., 2000; Halbert et al., 2001; Naylor et al., 1999; Petrella et al., 2003; Smith et al., 2000). Three of these found significant increases in physical activity outcomes (Bull & Jamrozik, 1998; Halbert et al., 2000; Petrella et al., 2003). One (++) quality study found that 11% of the intervention group increased aerobic fitness compared to 4% in the control (Petrella et al. 2003). A (-) quality study found a 38% increase in subjects taking at least one episode of exercise over the past fortnight compared to 30% in controls (Bull & Jamrozik, 1998). Another (-) quality study found that short term changes were sustained over the longer term in walking sessions per week from 0 at baseline to 3 (compared to 2 in controls) and vigorous exercise from 0 to 2 (compared to 0 in controls) (Halbert et al. 2000).

Very long term outcomes (12 months or more)

Seven studies measured outcomes over a very long time frame (all at 12 months) (Bull & Jamrozik, 1998; Elley et al., 2003; Halbert et al., 2000; Halbert et al., 2001; Harland et al., 1999; Hillsdon et al., 2002; Petrella et al., 2003). Three of these found significant increases in physical activity outcomes (Elley et al., 2003; Halbert et al., 2000; Petrella et al., 2003). Of these, two had also measured outcomes at 6 months (Halbert et al., 2000; Petrella et al., 2003). Improvements in aerobic fitness and improvements in frequency of walking sessions and vigorous exercises were sustained in both of these studies at 12

months. Another study found an increase of 34 minutes/week of leisure exercises at 12 months compared to control (Elley et al. 2003). The study populations in all three papers were older groups (40-79 with a mean age of 57-58, over 60 and over 65).

Features of the effective interventions

Of the six studies reporting significant improvement in physical activity outcomes, it is notable that only those incorporating follow-up sessions to the initial consultation reported significant improvement over a very long time frame (ie 12 months or more).

Of the six studies that reported significant effects, four studies were delivered by GPs (Bull & Jamrozik, 1998; Elley et al., 2003; Petrella et al., 2003; Swinburn et al., 1998), one by a health visitor (Harland et al., 1999) and one by an exercise specialist (Halbert et al., 2000).

Most interventions could potentially be applied to primary care in the UK with moderate training of health professionals (eg GPs, practice nurses, health visitors and exercise specialists), moderate additional resources (eg written materials, facilities for step testing during the consultation) and organisation of follow-up (eg by health professionals or exercise specialists). The evidence suggests that organisation of follow-up may be important in achieving change over a very long time frame (12 months)

Evidence statement BI.1. There is evidence from controlled trials that brief interventions in primary care can be effective in producing moderate increases in physical activity in middle aged and older populations in the short term (two (1+) studies, one (1-) study), in the longer term (one (1++), one (2-) study and one (1-) study) and in the very long term (two (1++) studies and one (1-) study). The findings are potentially applicable to the UK, assuming appropriate adaptation. However, for the effect to be sustained at one year, the evidence suggests that several follow-up sessions over a period of 3 to 6 months are required after the initial consultation episode.

Evidence statement BI.2. The evidence suggests that:

a. a 'written prescription' outlining physical activity goals and/or step testing during the consultation may be a useful adjunct to verbal advice to increase physical activity
b. follow-up over an appropriate time period appears to be more important than the length of individual sessions
c. interventions aimed at older groups seem more effective. However, these were also the studies which involved follow-up and it is therefore difficult to arrive at firm conclusions about whether this effect was linked to the age of the population or the design of the intervention

Evidence statement BI.3. There was insufficient evidence to identify important effects from:

a. differences between the ways that interventions tailored materials to individuals (or used standard materials)
b. the job title/position of the deliverer of the intervention
c. the setting of the delivery of the intervention (eg in a primary care setting or a local leisure centre).

Included studies

The following papers were included in the review:

Bull, F. C. & Jamrozik, K. (1998). Advice on exercise from a family physician can help sedentary patients to become active. Am.J.Prev.Med.15(2): 85-94.

Elley, C. R., Kerse, N., Arroll, B., & Robinson, E. (2003). Effectiveness of counselling patients on physical activity in general practice: cluster randomised controlled trial. BMJ 326(7393): 793-799.

Elley, R., Kerse, N., Arroll, B., Swinburn, B. et al. (2004). Cost-effectiveness of physical activity counselling in general practice. N.Z.Med.J. 117(1207):U1216.

Goldstein, M. G., Pinto B.M., Lynn, H., Jette A.M et al (1999). Physician-based physical activity counseling for middle-aged and older adults: a randomized trial. Ann.Behav.Med. 21(1):40-47.

Halbert, J., Crotty, M., Weller, D., Ahern et al (2001). Primary care-based physical activity programs: effectiveness in sedentary older patients with osteoarthritis symptoms. Arthritis.Rheum. 45(3):228-234.

Halbert, J., Silagy, C., Finucane, P., Withers R et al (2000). Physical activity and cardiovascular risk factors: effect of advice from an exercise specialist in Australian general practice. Medical Journal of Australia. 173:84-87.

Harland, J., White, M., Drinkwater, C., Chinn, D. et al. (1999). The Newcastle exercise project: a randomised controlled trial of methods to promote physical activity in primary care. BMJ 319(7213):828-832.

Hillsdon, M., Thorogood M, White, I., & Foster, C. (2002). Advising people to take more exercise is ineffective: a randomized controlled trial of physical activity promotion in primary care. Int.J.Epidemiol. 31:808-815.

Naylor, P. J., Simmonds, G., Riddoch, C., Velleman, G. et al (1999). Comparison of stage-matched and unmatched interventions to promote exercise behaviour in the primary care setting. Health.Educ.Res. 14(5):653-666.

Petrella, R. J., Koval, J. J., Cunningham, D. A., & Paterson, D. H. (2003). Can primary care doctors prescribe exercise to improve fitness? The Step Test Exercise Prescription (STEP) project. Am.J.Prev.Med. 24(4):316-322.

Smith, B. J., Bauman, A. E., Bull, F. C., Booth, M. L. et al. (2000) Promoting physical activity in general practice: a controlled trial of written advice and information materials. Br.J.Sports.Med. 34(4):262-267.

Swinburn, BA., Walter LG, Arroll B Tilyard MW et al (1998). The Green Prescription Study: A randomized controlled trial of written exercise advice provided by general practitioners. Am J Pub Health. 88:288-291.

1 Background

The National Institute of Health and Clinical Excellence (NICE) has been asked by the Department of Health to develop public health intervention guidance on physical activity as part of its 11th Wave.

Public health intervention guidance consists of recommendations on types of activity provided by local organisations to help to promote or maintain a healthy lifestyle or reduce the risk of developing chronic diseases or conditions. This guidance will provide recommendations for good practice, based on the best available evidence of effectiveness, including cost effectiveness.

NICE has been asked to develop public health intervention guidance on four commonly used methods to increase physical activity: brief interventions in primary care, pedometers, exercise referral schemes and community based exercise programmes for walking and cycling.

This review has been carried out by a team from the Public Health Collaborating Centre for Physical Activity. The Collaborating Centre is an alliance between the British Heart Foundation Health Promotion Research Group (University of Oxford) and the British Heart Foundation National Centre for Physical Activity and Health (Loughborough University).

1.1 The need for the guidance

1.1.1 Physical activity and ill health

There is a clear link between physical inactivity and ill health. The extent of this link is set out in publications such as the Chief Medical Officer's (CMO) report 'At least five times a week.'

Increasing physical activity levels will contribute to the prevention and management of over 20 diseases and conditions, including coronary heart disease, diabetes, cancer, positive mental health and obesity; in addition to reducing the human costs of physical inactivity in terms of mortality, morbidity

and quality of life. The CMO report estimated the cost of inactivity in England to be £8.2 billion annually. This excludes the contribution of physical inactivity to overweight and obesity, whose overall cost might run to £6.6–£7.4 billion per year according to recent estimates.

The current level of activity recommended for achieving the basic health benefits of physical activity are for adults to achieve at least 30 minutes of at least moderate intensity physical activity on five or more days of the week.

1.1.2 Current activity levels

The Health Survey for England (2003) gives the most accurate national data on current physical activity levels of the adult population. It estimates that around six out of ten men and seven out of ten women are not active enough to benefit their health. Activity declines dramatically with age: 53% of men aged 16-24 were active at recommended levels compared to 8% of men aged 75 and over. Among women, the proportion active at the recommended level was fairly steady at 29-31% to 32% in women aged 16-54, before falling to just 3% among women aged 75 and over.

Physical activity levels vary between different ages, genders, classes and ethnicities. The Health of Minority Ethnic Groups (1999) measured participation in physical activity among the main minority ethnic groups in England. The survey found that compared with the general population, South Asian and Chinese men and women were much less likely to participate in physical activities, whether sport and exercise, walking, heavy housework or DIY. Bangladeshi men and women had the lowest level of physical activity: they were almost twice as likely as the general population to be classified as sedentary.

The effect of social class and income on participation in physical activity is complicated. The CMO report indicated that surveys which include both work-related and leisure-time activity show higher levels of physical activity in the lowest social classes for men, but little class difference among women. However, people in higher socioeconomic groups take part in more leisure-

time activity than those in lower socioeconomic groups. This is the case for both men and women.

1.1.3 Trends

There have been few measured changes in overall participation in physical activity in England in the last decade. Walking and cycling as transport are important forms of physical activity. Data from the National Travel Surveys provides evidence of the changes in physically active travel over the years. They show that the average distance walked has fallen from 255 miles in 1975/6 to 192 miles in 2003. Bicycle mileage for the same years fell from 51 to 34 miles.

2 Methodology

2.1 Literature Search

The following search terms and databases were used. Each search took around two full days to perform. References were downloaded into a Reference Manager database and de-duplicated.

2.1.1 Search terms

Brief interventions, counselling, counselling, therapy AND primary care, general practice, physical activity, exercise, fitness AND controlled trial

Limits English Language only

1990 - June 2005

2.1.2 Databases searched:

Medline; Pubmed; Embase; Cinahl; PsychInfo; Sports Discuss

2.2 Selection of Studies for Inclusion

Following the initial search, titles of all identified studies were screened by a lead researcher and irrelevant studies discarded. Abstracts and full papers, where relevant were then reviewed against standard in-out criteria. Included studies were then read in full and appraised by two researchers. Once the final list of included studies were agreed data were extracted using a standard form (Appendix C).

Studies were included if they assessed the effect of a brief intervention to increase physical activity in the adult population delivered in a primary care setting on physical activity outcomes using a controlled research design.

The intervention of interest was defined as:

‘Any brief intervention involving verbal advice, encouragement, negotiation or discussion with the overall aim of increasing physical activity delivered in a

primary care setting by a health or exercise professional, with or without written support or follow-up'.

Studies were included if the key element of the intervention was a single initial consultation delivered in a primary care setting (no specific time limit was set for the length of this consultation).

Studies were only included if they measured physical activity outcomes (self reported or objective measures) or physical fitness outcomes at baseline and from 6 weeks post intervention.

The main reasons for exclusion of studies were:

- No control or comparison group
- Not an intervention study
- Did not measure physical outcomes measures
- Follow-up of outcomes at less than 6 weeks only

Effectiveness was examined over the following timescales:

- 6–12 weeks
- 12 weeks to one year
- over 1 year.

2.3 Quality Appraisal

Studies were quality appraised against standardised NICE internal validity criteria, set out below and subsequently classified into one of three categories (++, + or -).

NICE Internal Validity Criteria

- The study addresses an appropriate and clearly focused question.
- The assignment of subjects to treatment groups is randomised.
- An adequate concealment method of randomisation is used.
- The outcome assessment is independent and blind.
- The treatment and control groups are similar at the start of the trial.
- The only difference between groups is the treatment under investigation.
- All physical activity outcomes are measured in a standard, valid and reliable way.

- What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?
- All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention–to-treat analysis).
- There were different effects for the intervention between different study sites.
- The results were adjusted for baseline physical activity data.

++ All or most of the criteria have been fulfilled. Where they have not been fulfilled the conclusions of the study or review are thought very unlikely to alter

+ Some of the criteria have been fulfilled. Those criteria that have not been fulfilled or not adequately described are thought unlikely to alter the conclusions

- Few or no criteria fulfilled. The conclusions of the study are thought likely or very likely to alter.

2.4 Study type

Studies were classified by study type, where:

1 systematic reviews of RCTs, or RCTs (including cluster RCTs)

2 non-randomised controlled trials, case–control studies, cohort studies, controlled before-and-after (CBA), interrupted time series (ITS)

3 Non-analytic studies

4 Expert opinion, formal consensus

Study type and quality are indicated in the text in the format (1++), (2-) etc.

2.5 Applicability

An 'assessment of applicability' was made for each study, and for the body of evidence. This grades studies as follows:

1 likely to be applicable across a broad range

2 likely to be applicable across a broad range assuming appropriately adapted

3 applicable only to populations or settings included in the study, and broader applicability is uncertain

4 applicable only to settings or populations included in the study.

2.6 Summary of studies identified

2.6.1 Number of studies

- 1749 initial hits from databases
- Following screening of titles and abstracts, 50 abstracts and papers, where relevant, were assessed against the in/out criteria.
- 12 studies were included for full data extraction: (10 primary studies; one study (Halbert et al. 2001) that was a sub-analysis of a larger study, (Halbert et al. 2000) and one study that was a cost effectiveness analysis of one of the primary studies (Elley et al. 2004))

Of the included studies, two were (++) quality;(Elley et al. 2003;Petrella et al. 2003) four were (+) quality; (Harland et al. 1999;Hillsdon et al. 2002;Smith et al. 2000;Swinburn et al. 1998)and five were (-) quality .(Bull & Jamrozik 1998;Goldstein et al. 1999;Halbert et al. 2000;Halbert et al. 2001;Naylor et al. 1999) The cost-effectiveness study was not graded. The main reasons for studies being assessed as (-) quality were: lack of randomisation; analysis not done on an 'intention to treat basis'; use of unvalidated physical activity

measures; outcome assessment not blind or failure to adjust for baseline physical activity measure.

2.6.2 Description of studies

The 11 studies are shown in detail in Section 4. They included 6 individualised RCTs (one study(Halbert et al. 2001) was a sub-analysis of a larger study (Halbert et al. 2000) and for descriptive purposes is treated as a separate study in this report)(Halbert et al. 2000;Halbert et al. 2001;Harland et al. 1999;Hillsdon et al. 2002;Petrella et al. 2003;Swinburn et al. 1998), 2 cluster RCTS (Elley et al. 2003;Goldstein et al. 1999) and 3 controlled non-randomised trials(Bull & Jamrozik 1998;Naylor et al. 1999;Smith et al. 2000). They tested a range of brief interventions to increase physical activity. These involved an initial consultation with reinforcement of advice through written materials or follow-up sessions.

The initial consultation involved a range of approaches including:

- Standard verbal advice
- Tailored advice (usually based on the 'stage of change' of patient)
- Advice supplemented by an exercise prescription written during the consultation
- Use of step testing within the consultation to supplement counselling

All interventions involved supplementation with one or a combination of written materials, telephone follow-up and/or face-to-face follow-up. Some studies compared different approaches to the verbal advice (Hillsdon et al. 2002), different levels of intensity of the intervention (Harland et al. 1999) and/or different types of written materials (eg tailored versus standard) (Bull & Jamrozik 1998;Bull, Jamrozik, & Blanksby B.A 1999).

3 studies were set in the UK (Harland et al. 1999;Hillsdon et al. 2002;Naylor et al. 1999), 4 in Australia (Bull & Jamrozik 1998;Halbert et al. 2000;Halbert et

al. 2001;Smith et al. 2000), 2 in New Zealand(Elley et al. 2003), 1 in Canada (Petrella et al. 2003) and 1 in the USA (Goldstein et al. 1999).

Most studies involved screening to identify sedentary subjects for the study. 7 of the studies targeted a primarily middle aged population and 4 targeted older people (over 60s or higher) (Goldstein et al. 1999;Halbert et al. 2000;Halbert et al. 2001;Petrella et al. 2003).

7 studies measured short term outcomes (of which only one did not measure longer term or long term outcomes (Swinburn et al. 1998)) (Goldstein et al. 1999;Halbert et al. 2000;Halbert et al. 2001;Harland et al. 1999;Naylor et al. 1999;Smith et al. 2000;Swinburn et al. 1998). 7 studies measured longer term outcomes (Bull & Jamrozik 1998;Goldstein et al. 1999;Halbert et al. 2000;Halbert et al. 2001;Naylor et al. 1999;Petrella et al. 2003;Smith et al. 2000) and 7 measured very long term outcomes (all at 12 months) (Bull & Jamrozik 1998;Elley et al. 2003;Halbert et al. 2000;Halbert et al. 2001;Harland et al. 1999;Hillsdon et al. 2002;Petrella et al. 2003).

3 Summary of Findings

3.1 Evidence of efficacy

Evidence from eleven primary studies (6 individual RCTs, 2 cluster RCTs, and 3 controlled non-randomised trials) suggests that brief interventions in primary care to increase physical activity can have short, longer term or very long term effects.

Six studies reported significant increases in physical activity outcomes: two (++) quality (Elley et al. 2003;Petrella et al. 2003); two (+) quality (Harland et al. 1999;Swinburn et al. 1998) and 2 (-) quality (Bull & Jamrozik 1998;Halbert et al. 2000). Five reported no significant effect (2 (+) quality (Hillsdon et al. 2002;Smith et al. 2000) and three (-) quality (Goldstein et al. 1999;Halbert et al. 2000;Naylor et al. 1999)).

Six studies measured short-term outcomes (Goldstein et al., 1999; Halbert et al., 2000; Harland et al., 1999; Naylor et al., 1999; Smith et al., 2000; Swinburn et al., 1998). Three of these found significant increases in physical activity outcomes in sedentary middle aged populations (Harland et al. 1999;Swinburn et al. 1998). A (+) quality New Zealand study that combined verbal advice with a written exercise prescription found a 32% increase in the percentage of subjects reporting participation in any recreational physical activity compared to 17% in the control group (Swinburn et al. 1998). A UK based (+) quality study found that 38% of subjects increased their self-reported physical activity score compared to 16% in the control group following motivational interviewing sessions by a health visitor (vigorous activity increased from in 29% compared to 11%) (Harland et al. 1999). A (-) quality Australian study involving individualised advice from an exercise specialist found an increase in median walking sessions per week from 0 to 3 (compared to 2 in controls) at both three months (this was sustained at 6 months).(Halbert et al. 2000) Vigorous exercise sessions per week increased from 0 to 2 (compared to 0 in the control group).

Seven studies measured longer term outcomes (Bull & Jamrozik 1998;Goldstein et al. 1999;Halbert et al. 2000;Halbert et al. 2001;Naylor et al. 1999;Petrella et al. 2003;Smith et al. 2000).Three of these found significant increases in physical activity outcomes in sedentary middle aged or older populations (Bull & Jamrozik 1998;Halbert et al. 2000;Petrella et al. 2003). A (++) quality Canadian study found that 11% of the intervention group increased aerobic fitness compared to 4% of the control following an intervention combining verbal advice and step testing at initial and follow up family physician consultations (Petrella et al. 2003). A (-) quality Australian study reported a 38% increase in the percentage of subjects taking at least one episode of physical activity over the past fortnight compared to 30% in the control group at six months after receiving brief GP advice supplemented by an information pamphlet (Bull & Jamrozik 1998). The (-) quality Australian study involving individualised advice from an exercise specialist referred to in the previous paragraph found sustained improvements at 6 months in walking and vigorous exercise frequency at similar levels to those at 3 months. (Halbert et al. 2000)

Seven studies measured outcomes over a very long time frame (all at 12 months) (Bull & Jamrozik 1998;Elley et al. 2003;Halbert et al. 2000;Halbert et al. 2001;Harland et al. 1999;Hillsdon et al. 2002;Petrella et al. 2003). Three of these found significant increases in physical activity outcomes.(Elley et al. 2003;Halbert et al. 2000;Petrella et al. 2003) Two studies had also measured long term outcomes (at 6 months) (Halbert et al. 2000;Petrella et al. 2003).The (++) quality Canadian study referred to above found sustained improvements in aerobic fitness at 12 months (14% in the intervention group improved aerobic fitness compared to 3% in the control group)(Petrella et al. 2003). The (-) quality Australian study delivered by an exercise specialist reported sustained improvements in walking and vigorous exercise frequency at similar levels to those at 3 and 6 months (Halbert et al. 2000). A recent (++) quality New Zealand study found an increase of 34 minutes/week of leisure

exercise at 12 months compared to control in subjects receiving brief oral and written advice from the GP initially followed by at least three telephone calls (10-20 minutes) from an exercise specialist. The study populations in all three papers were older groups (40-79 with a mean age of 57-58, over 60 and over 65).

Of the six studies reporting significant improvement in physical activity outcomes, it is notable that only those incorporating follow-up sessions to the initial consultation reported significant improvement over a very long time frame (see section 3.2.6).

Of the high quality studies that did not show statistically significant differences between intervention and control groups, the intervention group tended to show an increase in physical activity outcomes compared to controls, which showed either no increase or a smaller increase (Smith et al 2000, Hillsdon et al 2000).

Evidence statement BI.1. There is evidence from controlled trials that brief interventions in primary care can be effective in producing moderate increases in physical activity in middle aged and older populations in the short term (two (1+) studies, one (1-) study), in the longer term (one (1++) study, one (2-) study and one (1-) study) and in the very long term (two (1++) studies and one (1-) study).

3.2 Key Questions

3.2.1 What is the aim/objective of the intervention?

All six studies shown to have an effect aimed to increase physical activity levels in sedentary middle aged or older populations through an initial face-to-face consultation with a health professional or exercise specialist in a primary care setting. These consultations were supplemented with written information and/or follow-up consultations (telephone or face to face).

3.2.2 How does the content of the intervention influence effectiveness?

The six studies shown to have an effect varied according to what happened at the initial consultation and whether there was follow-up to reinforce advice to increase physical activity.

All studies involved verbal advice and supporting written material. One (++) quality study differed from the others as it was the only one to use step testing as part of the consultation to determine training heart rate and set training goals for subjects (Petrella et al. 2003) This study reported significant longer term and very long term impacts on aerobic fitness.

Four studies involved a 'written prescription' in which the healthcare professional provided written goals during the consultation to increase physical activity (Elley et al. 2003;Halbert et al. 2000;Petrella et al. 2003;Swinburn et al. 1998). One of these was a (+) quality study which found that a written goal orientated prescription to supplement verbal advice provided during the initial consultation was significantly more effective than verbal advice alone in the short term (longer terms effects were not measured(Swinburn et al. 1998). The other three studies (2 (++) quality (Elley et al. 2003;Petrella et al. 2003) and one (-) quality (Halbert et al. 2000)) reported significant very long term increases in physical activity outcomes. However, these were also the three studies in which the intervention incorporated follow-up sessions (see section 3.2.6).

Of the five studies that showed no effect, three also involved a written prescription. In one (+) quality study, the intervention recruited both active and inactive subjects and, although the intention to treat analysis showed no significant effect, the 'treatment received' analysis indicated that the odds of inactive people reporting increasing activity was significant in the longer term compared to controls(Smith et al. 2000). In a (-) quality study, a significant short term improvement in motivational readiness to change was demonstrated in the short term despite no significant improvement in physical activity outcomes (Goldstein et al. 1999). Finally, in a third (-) study the lack of effect could be explained by small study size (Halbert et al. 2001).

In summary, on the basis of a small number of studies, the evidence would suggest that:

Evidence statement BI.2.a. a 'written prescription' outlining physical activity goals and/or step testing during the consultation may be useful adjuncts to verbal advice to increase physical activity.

However, it is difficult to separate the relative contribution of these elements of the intervention from the impact of follow-up sessions after the initial consultation and studies that did not find significant effects also involved a 'written prescription'.

3.2.3 How does the way that the intervention is carried out influence effectiveness?

The common theme of the studies was that the advice delivered at the initial consultation was individualised to the patient through taking into account factors such as readiness to change, self efficacy, barriers to change, measured fitness levels or preferred exercise activities. There was insufficient evidence to support any particular way of individualising advice to patients apart from the use of an exercise prescription (see section 3.2.2). A further analysis of one of the primary studies (Bull & Jamrozik 1998) found no significant differences in effectiveness between the use of tailored or

standardised pamphlets to reinforce the advice at the initial consultation. ((Bull, Jamrozik, & Blanksby B.A 1999).

There were no clear differences between the way that interventions reporting a significant effect and those that did not were carried out.

Evidence statement BI.3.a. There is insufficient evidence to identify important effects from differences between the ways that interventions tailored materials to individuals (or used standard materials)

3.2.4 Does the effectiveness depend on the job title/position of the deliverer?

Of the six interventions with a significant effect, the initial consultation was conducted by GPs in four studies(Bull & Jamrozik 1998;Elley et al. 2003;Petrella et al. 2003;Swinburn et al. 1998), a health visitor in one study, (Harland et al. 1999) and an exercise specialist in one study (Halbert et al. 2000). A small subsample of practice nurses were also involved in one study although there was no sub-analysis of their relative effectiveness compared to GPs(Elley et al. 2003). Where the intervention involved follow-up, this was delivered by the GP in one case (Petrella et al. 2003) and by an exercise specialist in two cases (Elley et al. 2003;Halbert et al. 2000). Of the four separate studies in which no significant effect was found, two were delivered by GPs (Goldstein et al. 1999;Smith et al. 2000), one by practice nurses (Naylor et al. 1999) and one by an exercise specialists (Hillsdon et al. 2002).

Evidence statement BI.3.b. There is insufficient evidence to make clear inferences about the impact of the job title/position of the deliverer of the intervention.

It is possible that delivery of the initial consultation by a GP may have an impact on effectiveness. However, evidence from one (-) quality study suggests that an intervention in which both initial and follow-up consultation are delivered by an exercise specialist can produce long term increases in physical activity(Halbert et al. 2000). In addition, all three studies that had a

long-term impact also included follow-up after the initial consultation and it is possible that this may also be a critical factor in influencing effectiveness(Elley et al. 2003;Halbert et al. 2000;Petrella et al. 2003).

3.2.5 Does the site/setting of delivery of the intervention influence effectiveness?

In five of the studies shown to have an effect, the initial consultation was carried out in a primary care setting. In one study, this was carried out in either the practice or the local leisure centre (Harland et al. 1999). In the three studies involving follow-up, two delivered follow-up in a primary care setting (Halbert et al. 2000;Petrella et al. 2003) and one delivered telephone follow-up by an exercise specialist based in the local leisure centre (Elley et al. 2003). The five studies that found no significant effect were also delivered in primary care.

Evidence statement BI.3.c. There is insufficient evidence to make any firm conclusions about the setting of the delivery of the intervention (eg in a primary care setting or a local leisure centre).

3.2.6 Does the intensity (or length) of the intervention influence effectiveness/duration of effect?

The length of the initial consultation varied considerably from 5 minutes or less (Bull & Jamrozik 1998;Naylor et al. 1999;Swinburn et al. 1998), 15 minutes or under (Elley et al. 2003;Petrella et al. 2003) or 20 to 40 minutes (Halbert et al. 2000;Harland et al. 1999;Hillsdon et al. 2002). There were no clear correlations between effectiveness of intervention and length of the initial consultation. However, it is again notable that the three interventions with impacts over the very long term were those in which there was follow-up for several months after the initial intervention.(Elley et al. 2003;Halbert et al. 2000;Petrella et al. 2003) Two of these provided face-to-face follow-up for subjects at 3, 6 and 12 months.(Halbert et al. 2000;Petrella et al. 2003) The

other study provided at least three telephone follow-up sessions (lasting 10-20 minutes) over a three month period(Elley et al. 2003).

Evidence statement BI.2.b. Follow-up over an appropriate time period appears to be more important than the length of individual sessions.

However, it should be noted that two studies reporting no significant effects also incorporated follow-up. In one (-) study the follow-up occurred only four weeks after the initial consultation (Goldstein et al. 1999). Conversely, the other study involved extensive telephone follow-up by an exercise specialist (6 telephone follow-up session over 34 weeks). This study had considerable attrition but analysis of participants who completed the final data collection only (rather than intention to treat analysis) indicated a significant effect at 12 month although such an analysis is clearly biased as is excludes non completers(Hillsdon et al. 2002).

3.2.7 How does the effectiveness vary with age, gender, class, ethnicity etc?

Two studies focussed on older populations (Halbert et al. 2000;Petrella et al. 2003), three focussed on middle aged populations (Bull & Jamrozik 1998;Harland et al. 1999;Swinburn et al. 1998) and one involved both middle aged and older populations (Elley et al. 2003). The three studies with long term impacts tended to involve older populations(Elley et al. 2003;Halbert et al. 2000;Petrella et al. 2003).

Evidence statement BI.2.c. Interventions aimed at older groups seem more effective. However, these were also the studies in which the interventions involved follow-up and it is therefore difficult to arrive at firm conclusions about whether this effect was linked to the age of the population or the design of the intervention.

The potential impact of these interventions on reducing inequalities is unclear although one study that had a short term impact was set in a socially deprived population in the UK (Harland et al. 1999).

3.2.8 How much does the intervention cost (in terms of money, people, time)? What evidence is there on cost effectiveness?

One study set in New Zealand produced a separate cost effectiveness analysis of the intervention (Elley et al. 2003;Elley et al. 2004). This was the (++) quality study involving verbal advice, written exercise prescription and telephone follow-up by an exercise specialist. The study concluded that for every 10 prescriptions written, one person achieved and sustained 150 minutes of moderate or vigorous leisure activity per week. Based on a programme-cost of NZ$ 170 per patient, the incremental cost of converting one additional 'sedentary' adult to an 'active' state over a 12 month period was calculated as NZ$1,756. However, this is based on those participating in the study and it should be noted that 13% of patients attending their GP during the recruitment phase were too ill to be screened, missed or refused screening for eligibility and that one-third of patients declined to participate.

3.3 Applicability (of evidence from efficacy studies) to UK population/setting.

Of the six studies that found improvements in physical activity outcomes, 2 were set in New Zealand, 2 in Australia, 1 in Canada and 1 in the UK. All studies were set broadly within the context of mainstream primary care. The likelihood is that the effectiveness of the non-UK studies would be different if applied in a UK setting due to differences in population, environment (eg opportunities for physical activity), and primary care (eg the role of the GP, length of consultation). However, factors of relevance to applicability include the following:

- Apart from one study,(Bull & Jamrozik 1998) the length of the initial consultation tended to be slightly longer than the average UK GP consultation in primary care eg 7-13 minutes,(Elley et al. 2003) 7-22 minutes(Petrella et al. 2003)

- Two studies employed exercise specialists either to deliver the initial consulation,(Halbert et al. 2000) or for follow up (Elley et al. 2003;Halbert et al. 2000). This is a professional group that is not currently routinely linked with primary care. It should also be noted that a (+) study set in the UK involving an exercise specialist found no significant effect on physical activity outcomes (Hillsdon et al. 2002).

- The one UK based study (Harland et al. 1999) involved health visitor expertise and time commitment that is not routine in the UK (40 minute motivational interviewing). Despite being UK based, its current general applicability in UK primary care is therefore limited.

All six studies reporting an effect on physical activity are potentially applicable to primary care in the UK. However, all would need to be adapted and therefore their efficacy may be affected. Overall, the body of evidence is likely to be applicable across broad range, assuming appropriately adapted

3.4 Implementability of intervention.

All the six studies that reported a significant effect would be, to a greater or lesser extent, feasible to implement in a UK primary care setting with appropriate adaptation.

Studies in which the initial consultation was conducted by a GP involved feasible levels of training (lasting from between half an hour (Bull & Jamrozik 1998) and four hours (Elley et al. 2003)), recruitment of patients from usual attendees at the practice and integration of the intervention into the patient

consultation (Bull & Jamrozik 1998;Elley et al. 2003;Petrella et al. 2003;Swinburn et al. 1998).

Additional resources would be needed to produce appropriate goal-orientated written exercise plans or prescriptions during the consultation. Systems would also be required to organise and deliver follow-up (either face to face or telephone). The feasibility of introducing step testing to determine fitness levels and establish training goals in a primary care setting in the UK could be a promising avenue of research.

The current feasibility and acceptability in the UK of implementing interventions with substantial input from exercise specialists (Elley et al. 2003;Halbert et al. 2000) is difficult to estimate as this is not a group routinely linked with primary care. However, evidence from other countries suggests that involvement of this group in delivering brief interventions to increase physical activity could be effective.

Finally, fieldwork carried out by the former HDA Collaborating Centre (HDA 2004) found a number of clear barriers to the promotion of physical activity by staff in primary care, notably a perceived lack of evidence of effectiveness; concerns over litigation; and problems with measurement of physical activity.

Evidence statement BI.1. There is evidence from controlled trials that brief interventions in primary care can be effective in producing moderate increases in physical activity in middle aged and older populations in the short term (two (1+) studies and one (1-) study); in the longer term (one (1++) study, one (2-) study and one (1-) study); and in the very long term (two (1++) studies and one (1-) study. The findings are potentially applicable to the UK, assuming appropriate adaptation. However, for the effect to be sustained at one year, the evidence suggests that several follow-up sessions over a period 3 to 6 months are required after the initial consultation episode.

4 Evidence Tables

First author	**Study design**	**Research quality** internal validity score ++/+/-	**Research Question**	**Study population, setting and country of study**	**Sample size** include power calculation if available	**Description of intervention** include what happens and who delivers the intervention **I = intervention C = control**	**Outcome Variable (s)**	**Main results at follow-up**[∇] include symbol[#] (+, 0, -), description of change, time point(s), effect size(s) if available			**Applicability to the UK populations and settings** score 1-4 (if effective) 1= most applicable (see methods for details)
								6 to <12 weeks	12 to <52 weeks	≥52 weeks	
Swinburn 1998	RCT	+	Does written advice from GPs increase physical advice increase physical activity more than verbal advice alone?	Sedentary, urban, mean age 49, primary care, NZ	491, yes	Brief verbal advice followed by written prescription (I) vs verbal advice alone (C). Delivered during consultation by GP. No follow-up.	% participants reporting increase in self reported participation in physical activity	+ 36% to 68% (intervention) 40% to 57% (control)	Not measured	Not measured	2
Harland 1999	RCT	+	Does stage based brief or intensive motivational interviewing delivered in primary care increase physical activity?	Sedentary, 40-64, socially deprived area, primary care, UK	734, yes	Brief advice (at baseline assessment from researcher) and motivational interviews (1 session or 6 sessions) from health visitor +/- leisure centre vouchers (so 4 intervention groups) vs brief advise only at baseline assessment (C)	% participants reporting increase in self reported physical activity levels % participants	+ 38% (combined intervention) 16% (control) Difference = 22% (13 to 32) 29%		0 – (Differences only reported) 3% (-7 to 13) 8% (-0 to 16)	2

[∇] All results are p<0.05 unless stated otherwise.

[#] use one of the following symbols to indicate any change and direction of change: 0=no effect between groups; + effect in favour of intervention; - effect in favour of control/comparison.

First author	**Study design**	**Research quality** internal validity score ++/+/-	**Research Question**	**Study population, setting and country of study**	**Sample size** include power calculation if available	**Description of intervention** include what happens and who delivers the intervention **I = intervention C = control**	**Outcome Variable (s)**	**Main results at follow-up**[∇] include symbol[#] (+, 0, -), description of change, time point(s), effect size(s) if available			**Applicability to the UK populations and settings** score 1-4 (if effective) 1= most applicable (see methods for details)
								6 to <12 weeks	12 to <52 weeks	≥52 weeks	
							reporting increase in total number of vigorous exercise sessions % participants reporting increase in total number of moderate exercise sessions	(intervention) 11% (control) Difference between intervention group and control = 18% (10 to 26) 30% (intervention) 13% (control) Difference between intervention group and control = 17% (8 to 26)		3% (-6 to 12)	
Bull 1998	CCT	- Not randomized Loss to follow-up > 20%	Does verbal advice on exercise from a family physician combined with supporting written information increase physical activity?	Sedentary, mean age 50, primary care, Australia	763, yes	Brief verbal advice from GP either standard (I1) or tailored (I2) vs no advice unless required by condition (C). Standard or tailored pamphlet sent within 2 days.	% participants 'now active' (=one episode physical activity in fortnight) – 0 at baseline % participants exercising for minimum recommended time (5 or more hours over 2 weeks)		+ 38% (combined intervention) 30% (control) 42.8% (intervention) vs 39.1% (control)	0	2

First author	**Study design**	**Research quality** internal validity score ++/+/-	**Research Question**	**Study population, setting and country of study**	**Sample size** include power calculation if available	**Description of intervention** include what happens and who delivers the intervention **I = intervention C = control**	**Outcome Variable (s)**	**Main results at follow-up**[∇] include symbol[#] (+, 0, -), description of change, time point(s), effect size(s) if available			**Applicability to the UK populations and settings** score 1-4 (if effective) 1= most applicable (see methods for details)
								6 to <12 weeks	12 to <52 weeks	≥52 weeks	
Halbert 2000	RCT	- Outcome assessment not blind and not measured in a uniform way for intervention and control groups at 3 and 6 months. Unclear if questionnaire measuring self reported physical activity validate	Is individualised physical activity advice by an exercise specialist in general practice effective in modifying physical activity and cardiovascular risk factors?	Sedentary, healthy, 60 or over, primary care, Australia	299	20 minute session with exercise specialist involving individualised advice and pamphlet with plan for physical activity for next 3 months. Follow-up sessions at 3,6,12 months (I). Compared to 20 minute session on nutrition (C)	Baseline medians = 0 Walking sessions/week Walking time Sessions of vigorous exercise/week Minutes of vigorous exercise/week	+ Medians (25^{th}-75^{th} percentile) 3 months*: 3 (1-4) – Intervention 2 (0-3) – Control 30 mins (19-50) vs 30 (0-49) NS 3 months: 2 (0 to 3) – intervention 0 (0-1) - control 3 months: 20 (0-35) - intervention 0 (0-16) - control * 3 months is taken as short term outcome	+ Medians (25^{th}-75^{th} percentile) 6 months: 3 (2-4) 2 (0-4) 30 mins (20-60) vs 30 (0-60) NS 6 months 2 (0-3) – intervention 0 (0-2) control 6 months 20 (0-40)- intervention 0 (0-21) - control	+ Medians (25^{th}-75^{th} percentile) 12 months 3 (1-4) – intervention 2 (1-3) – control 30 mins (10-60) vs 30 (10-60) NS 12 months: 2 (0-3) – intervention 0 (0-1) – control 12 months: 20 (0-35) intervention 0 (0-15)	2

First author	**Study design**	**Research quality** internal validity score ++/+/-	**Research Question**	**Study population, setting and country of study**	**Sample size** include power calculation if available	**Description of intervention** include what happens and who delivers the intervention **I = intervention C = control**	**Outcome Variable (s)**	**Main results at follow-up**[∇] include symbol[#] (+, 0, -), description of change, time point(s), effect size(s) if available			**Applicability to the UK populations and settings** score 1-4 (if effective) 1= most applicable (see methods for details)
								6 to <12 weeks	12 to <52 weeks	≥52 weeks	
Petrella 2003	RCT	++	Is an exercise prescription instrument (Step Test Exercise Prescription) delivered by primary care doctors effective in increasing fitness and exercise self efficacy in elderly community dwelling patients compared to usual care?	Sedentary, urban and rural, over 65, primary care, Canada	284, power calculation	Step test administered by family physician and patient counselled. Follow-up at 3,6,12 months when training heart rate adjusted (I). Compared to opportunistically delivered guideline based advice (C)	VO2 max % of participants increasing fitness		+ From 21.3 ml/kg/min at baseline to 24ml/kg/min at 6 months (intervention) 22 to 23 ml/kg/min (control) 11% (intervention) 4% (control)	+ From 21.3 ml/kg/min at baseline to 24.9ml/kg/min at 12 months (intervention) 22.1 to 22.8 ml/kg/min (control) 14% (intervention) 3% (control)	2
Elley 2003	Cluster RCT	++	Is the 'green prescription' programme (a clinician based initiative in general practice providing counselling on physical activity) effective in the long term	Sedentary, urban and rural, 40-79 (mean age 57-58), NZ	42 urban and rural practices (117 GPs), 878 participants	Brief oral and written advice (based on motivational interviewing) prompted by patient delivered by GP or practice nurse. Followed by 3 phone calls from exercise specialist (I). Compared to usual care (C)	Total energy expenditure Leisure exercise minutes/week			+ Increased 9.38 kcal/kg/week more in intervention than control (3.96 to 14.81) = 975kcal/week Increased 33.6 minutes/week more in intervention than control	2

First author	**Study design**	**Research quality** internal validity score ++/+/-	**Research Question**	**Study population, setting and country of study**	**Sample size** include power calculation if available	**Description of intervention** include what happens and who delivers the intervention **I = intervention C = control**	**Outcome Variable (s)**	**Main results at follow-up**[∇] include symbol[#] (+, 0, -), description of change, time point(s), effect size(s) if available			**Applicability to the UK populations and settings** score 1-4 (if effective) 1= most applicable (see methods for details)
								6 to <12 weeks	12 to <52 weeks	≥52 weeks	
							Proportion achieving 2.5 hrs moderate or vigorous exercise			(2.4 to 64.2) Increased by 9.72% more than in the control group	

First author	**Study design**	**Research quality** internal validity score ++/+/-	**Research Question**	**Study population, setting and country of study**	**Sample size** include power calculation if available	**Description of intervention** include what happens and who delivers the intervention **I = intervention C = control**	**Outcome Variable (s)**	**Main results at follow-up**[∇] include symbol[#] (+, 0, -), description of change, time point(s), effect size(s) if available			**Applicability to the UK populations and settings** score 1-4 (if effective) 1= most applicable (see methods for details)
								6 to <12 weeks	12 to <52 weeks	≥52 weeks	
Goldstein 1999	Cluster RCT	- Randomization method not described (concealment?) Not intention to treat Not adjusted for baseline physical activity	Does brief physician delivered physical activity counselling increase self reported physical activity more than usual care?	Sedentary, mean age 67, primary care, US	24 practices, 355	Brief counselling and written prescription during consultation by family physician with follow-up at 4 weeks (I) vs usual care (C).	Self reported physical activity (Physical Activity Scale for the Elderly – PASE) % meeting CDSP/ACSM criteria for moderate (20mins/day on at least 3 days per week) or vigorous exercise (30 mins per day day on at least 5 or more days per week)	0 6 wk score vs baseline: Intervention group: 118.56 vs 108.53 (change = 10.03) Control group: 122.31 vs 108.82 (change = 13.49) p=0.94 27% in intervention group met criteria vs 21 % in control group (p = 0.27, OR = 1.37, 95% CI = 0.77-2.43)	0 8 mth score vs baseline: Intervention group: 112.58 vs 108.53 (change = 4.05) Control group 111.03 vs 108.82 (change = 2.21) p=0.74 28% in intervention group met criteria vs 23% in control group (p=0.41, OR = 1.26, 95% CI = 0.72-2.22)		
Naylor 1999	CCT	- Not	Is stage based counselling delivered by	Mean age 42, 77% female,	294	Brief advice either non staged based (I1) or stage based	Self reported physical activity (Activity	0 *Data not*	0		

First author	**Study design**	**Research quality** internal validity score ++/+/-	**Research Question**	**Study population, setting and country of study**	**Sample size** include power calculation if available	**Description of intervention** include what happens and who delivers the intervention **I = intervention C = control**	**Outcome Variable (s)**	**Main results at follow-up**[∇] include symbol[#] (+, 0, -), description of change, time point(s), effect size(s) if available			**Applicability to the UK populations and settings** score 1-4 (if effective) 1= most applicable (see methods for details)
								6 to <12 weeks	12 to <52 weeks	≥52 weeks	
		randomized Control and intervention groups different at baseline Loss to follow-up >20% No adjustment for baseline PA	practice nurses effective in increasing physical activity?	primary care, UK		(I2). Both groups received written materials (non stage or stage based) and reduced rate leisure pass. Third group (I3) as in I2 but no counselling. Above compared to usual care (C). Delivered by practice nurses.	Assessment Questionnaire)	*presented in way enabling size of effect in control and intervention group to be assessed*			

First author	**Study design**	**Research quality** internal validity score ++/+/-	**Research Question**	**Study population, setting and country of study**	**Sample size** include power calculation if available	**Description of intervention** include what happens and who delivers the intervention **I = intervention C = control**	**Outcome Variable (s)**	**Main results at follow-up**[∇] include symbol[#] (+, 0, -), description of change, time point(s), effect size(s) if available			**Applicability to the UK populations and settings** score 1-4 (if effective) 1= most applicable (see methods for details)
								6 to <12 weeks	12 to <52 weeks	≥52 weeks	
Smith 2000	CCT	+	Does a simple written prescription for physical activity given by a general practitioner (with or without supplementary material) have an impact on physical activity outcomes?	Active and inactive 25 to 65 year olds, general practice, Australia	1142	Written prescription (stage based advice) given to patient by GP during consultation and randomised to either no further intervention (I1) or mailed stage based pamphlet after two weeks (I2). Compared to usual care - although this is not specified (C)	Self reported physical activity – Average change in total minutes of activity, * = result adjusted for age, sex, education, language, baseline physical activity % increase in physical activity of 60 minutes or more per week,	0 6-10 wks Control = -5.7 min Prescription = 16.3 min (15.6*) (p=0.27) Prescription + Booklet = 16.9 min (15.3*) (p=0.27) Control = 29.1% Prescription = 34.2%, OR = 1.26 (0.92-1.75) Prescription + Booklet = 35.7%, OR = 1.32 (0.96-1.82)	0 7-8 months Control = -22.4min Prescription = -7.5 min (4.1*) (p=0.76) Prescription + Booklet = -3.4 min (10.3*) (p=0.45) Control = 23.1% Prescription = 24.5%, OR = 1.06 (0.74-1.51) Prescription + Booklet = 27.9%, OR = 1.26 (0.89 – 1.79)		
Halbert 2001	RCT (subanalysis)	- As for Halbert 2000 (this is a subanalysis) Study size small	Is individualised physical activity advice by an exercise specialist in general practice effective in	Sedentary, healthy, 60 or over, symptoms of osteoarthritis, primary care, Australia	69	20 minute session with exercise specialist involving individualised advice and pamphlet with plan for physical activity for next 3 months. Follow-up sessions at 3,6,12	Walking sessions/week Sessions of vigorous exercise/week Minutes of		0		

First author	Study design	Research quality internal validity score ++/+/-	Research Question	Study population, setting and country of study	Sample size include power calculation if available	Description of intervention include what happens and who delivers the intervention **I = intervention C = control**	Outcome Variable (s)	Main results at follow-up[∇] include symbol[#] (+, 0, -), description of change, time point(s), effect size(s) if available			Applicability to the UK populations and settings score 1-4 (if effective) 1= most applicable (see methods for details)
								6 to <12 weeks	12 to <52 weeks	≥52 weeks	
			modifying physical activity in older patients with osteoarthritis?			months (I). Compared to 20 minute session on nutrition (C)	vigorous exercise/week				
Hillsdon 2002	RCT	+	Is one-to-one counselling in primary care from a health promotion specialist using either brief negotiation or direct advice communication styles to increase physical activity effective?	Sedentary, 45-64, primary care, UK	1658, yes	30 minute session delivered by health promotion specialist delivering either brief negotiation based on motivational interviewing (I1) or direct advice (I2). 6 follow-up phone calls up between 2 weeks and 34 weeks. Compared to no intervention ie GP care as appropriate (control).	Self reported physical activity – kcals/kg/week			0 Combined intervention group showed 3.7%* (95% CI: –4.7%, 12.5%) greater increase in energy expenditure than control group (6 minutes brisk walking per week for 70kg person) p=0.36 Net increase in energy expenditure in Brief Negotiation Group compared to Direct Advice = 10.2%* (95% CI – 3.9,%,	

First author	**Study design**	**Research quality** internal validity score ++/+/-	**Research Question**	**Study population, setting and country of study**	**Sample size** include power calculation if available	**Description of intervention** include what happens and who delivers the intervention **I = intervention C = control**	**Outcome Variable (s)**	**Main results at follow-up**[∇] include symbol[#] (+, 0, -), description of change, time point(s), effect size(s) if available			**Applicability to the UK populations and settings** score 1-4 (if effective) 1= most applicable (see methods for details)
								6 to <12 weeks	12 to <52 weeks	≥52 weeks	
										26.1%) equivalent to 14 minutes brisk walking per week for 70kg person p=0.16 * = above adjusted for baseline energy expenditure, age, gender, health status, employment, education and home ownership.	

APPENDIX A – Included Studies

Bull, F. C. & Jamrozik, K. (1998). Advice on exercise from a family physician can help sedentary patients to become active. Am.J.Prev.Med., 15(2): 85-94.

Elley, C. R., Kerse, N., Arroll, B., & Robinson, E. (2003). Effectiveness of counselling patients on physical activity in general practice: cluster randomised controlled trial. BMJ, 326: 793-799.

Elley, R., Kerse, N., Arroll, B., Swinburn, B. et al (2004). Cost-effectiveness of physical activity counselling in general practice. N.Z.Med.J.,117(1207): U1216.

Goldstein, M. G., Pinto B.M., Lynn, H., Jette A.M et al (1999). Physician-based physical activity counseling for middle-aged and older adults: a randomized trial. Ann.Behav.Med.,21(1): 40-47.

Halbert, J., Crotty, M., Weller, D., Ahern, M., & Silagy, C. (2001) Primary care-based physical activity programs: effectiveness in sedentary older patients with osteoarthritis symptoms. Arthritis.Rheum. 45(3): 228-234.

Halbert, J., Silagy, C., Finucane, P., Withers R et al (2000). Physical activity and cardiovascular risk factors: effect of advice from an exercise specialist in Australian general practice Medical Journal of Australia. 173: 84-87.

Harland, J., White, M., Drinkwater, C., Chinn, D et al. (1999). The Newcastle exercise project: a randomised controlled trial of methods to promote physical activity in primary care. BMJ. 319(7213): 828-832.

Hillsdon, M., Thorogood M, White, I., & Foster, C. (2002) Advising people to take more exercise is ineffective: a randomized controlled trial of physical activity promotion in primary care. Int.J.Epidemiol. 31: 808-815.

Naylor, P. J., Simmonds, G., Riddoch, C., Velleman, G. et al. (1999). Comparison of stage-matched and unmatched interventions to promote exercise behaviour in the primary care setting. Health.Educ.Res. 14(5): 653-666.

Petrella, R. J., Koval, J. J., Cunningham, D. A., & Paterson, D. H. (2003) Can primary care doctors prescribe exercise to improve fitness? The Step Test Exercise Prescription (STEP) project. Am.J.Prev.Med. 24(4): 316-322.

Smith, B. J., Bauman, A. E., Bull, F. C., Booth, M. L. et al. (2000). Promoting physical activity in general practice: a controlled trial of written advice and information materials. Br.J.Sports.Med. 34(4): 262-267.

Swinburn, BA., Walter LG, Arroll B Tilyard MW et al. (1998) The Green Prescription Study: A randomized controlled trial of written exercise advice provided by general practitioners. Am J Pub Health. 88:288-291.

APPENDIX B – Excluded Studies

	Study	Reason for exclusion
1	Ashenden R, Silagy C, Weller D. A systematic review of the effectiveness of promoting physical change in general practice. *Family Practice* 1997;**14**:160-72.	Study focussed on primary care based interventions but not 'brief' interventions
2	Bull FC, Kreuter MW, Scharff DP. Effects of tailored, personalized and general health messages on physical activity. *Patient.Educ.Couns.* 1999;**36**:181-92.	Did not involve face to face contact in primary care setting (mailed materials)
3	Bull FC, Jamrozik K, Blanksby B.A. Tailored advice on exercise - does it make a difference? *Am.J.Prev.Med.* 1999;**16**:230-9.	Subanalysis of intervention arms of included study(Bull & Jamrozik 1998)
4	Calfas KJ, Long BJ, Sallis JF, Wooten WJ, Pratt M, Patrick K. A controlled trial of physician counseling to promote the adoption of physical activity. *Prev.Med.* 1996;**25**:225-33.	Follow up period too short
5	Cardinal B.J,.Sachs M.L. Effects of mail-mediated, stage matched exercise behaviour change strategies on female adults' leisure-time exercise behaviour. *J Sports Med Phys Fitness* 1996;**36**:100-7.	Did not involve initial face to face contact in

		primary care setting (mailed materials)
6	Chun-Ja Kim, Ae-Ran Hwang, Ji-Soo Yoo. The impact of a stage-matched intervention to promote exercise behaviour in participants with type 2 diabetes. *International Journal of Nursing Studies* 2004;**41**:833-41.	Not a brief intervention and not set in primary care
7	Clark D.O, Stump T.E., Samush T.M. Outcomes of an exercise program for older women recruited through primary care. *Journal of Aging and Health* 2003;**15**:567-85.	Not a study of brief intervention in primary care (group based activity in community)
8	Dubbert PM, Cooper KM, Kirchner KA, Meydrech EF, Bilbrew D. Effects of nurse counseling on walking for exercise in elderly primary care. *Journals of Gerontology Series A: Biological Sciences and Medical Sciences* 2002;**57A**:M733-M740.	No control to brief counselling session (comparison of different levels of follow up)
9	Dunn AL, Marcus BH, Kambert J.B., Garcia M.E, Kohl III H.W, Blair S.N. Comparison of lifestyle and structured interventions to increase physical activity and cardiorespiratory fitness. *JAMA: Journal of the American Medical Association* 1999;**281**:327-34.	Not a brief intervention
10	Eakin EG, Glasgow RE, Riley KM. Review of primary care-based physical activity intervention studies: effectiveness and implications for practice and future research. *J.Fam.Pract.* 2000;**49**:158-68.	Study focussed on primary care based interventions but not 'brief' interventions
11	Eaton C.B,.Menard L.M. A systematic review of physical activity promotion in primary care office settings. *Br*	Study focussed

	J Sports Med 2005;**32**:11-6.	on primary care based interventions but not 'brief' interventions
12	Graham-Clarke P,.Oldenburg B. The effectiveness of a general-practice-based physical activity intervention on patient physical activity status. *Behaviour Change* 1994;**11**:132-44.	Multiple risk factor intervention (level of physical activity counselling input cannot be assessed)
13	Green BB, McAfee T, Hindmarsh M, Madsen L, Caplow M, Buist D. Effectiveness of telephone support in increasing physical activity levels in primary care patients. *Am.J.Prev.Med.* 2002;**22**:177-83.	Did not involve face to face contact in primary care setting
14	Harrison RA, Roberts C, Elton P.J. Does primary care referral to an exercise programme increase physical activity 1 year later? A randomized controlled trial. *Journal of public health* 2004;**27**:25-32.	Not a study of brief intervention in primary care
15	Hillsdon M, Thorogood M, Anstiss T, Morris J. Randomised controlled trials of physical activity promotion in free living populations: a review. *Journal of Epidemiology and Community Health* 1995;**49**:448-53.	Review not focussed on brief interventions in primary care setting
16	Hillsdon M,.Thorogood M. A systematic review of physical activity promotion strategies. *Br J Sports Med* 1996;**30**:84-9.	Study not focussed on

		brief intervention in primary care
17	Jimmy G,.Martin BW. Implementation and effectiveness of a primary care based physical activity counselling scheme. *Patient.Educ.Couns.* 2004;**56**:323-31.	Two interventions compared (no comparison group eg usual care)
18	Lamb SE, Bartlett HP, Ashley A, Bird W. Can lay-led walking programmes increase physical activity in middle aged adults? A randomised controlled trial. *J.Epidemiol.Community.Health* 2002;**56**:246-52.	Not a study of brief intervention in primary care
19	Lawlor DA,.Hanratty B. The effect of physical activity advice given in routine primary care consultations: a systematic review. *J.Public.Health.Med.* 2001;**23**:219-26.	Study focussed on primary care based interventions but not 'brief' interventions
20	Lewis BS,.Lynch B.D. The effect of physician behaviour on exercise behaviour. *Prev.Med.* 1993;**22**:10-21.	Follow up period too short
21	Little P, Dorward M, Gralton S, Hammerton L, Pillinger J, White P *et al*. A randomised controlled trial of three pragmatic approaches to initiate increased physical activity in sedentary patients with risk factors for cardiovascular disease. *Br.J.Gen.Pract.* 2004;**54**:189-95.	Follow up period too short
22	Lord JC,.Green F. Exercise on prescription: does it work? *Health Education Journal* 1995;**54**:453-64.	Not a study of brief intervention in primary care
23	Marcus BH, Pinto BM, Clark MM, Depue JD, Goldstein MG, Silverman LS. Physician-delivered physical activity and nutrition interventions. *Med Exerc Nutr Health* 1995;**4**:325-34.	Review not focussed on brief interventions in

		primary care
24	Petrella RJ,.Wight D. An office-based instrument for exercise counseling and prescription in primary care. The Step Test Exercise Prescription (STEP). *Arch.Fam.Med.* 2000;**9**:339-44.	Did not measure physical activity outcomes (explored acceptance of instrument used in included study (Petrella et al. 2003))
25	Pinto BM, Goldstein MG, DePue JD, Milan FB. Acceptability and feasibility of physician-based activity counseling. The PAL project. *Am.J.Prev.Med.* 1998;**15**:95-102.	Did not measure physical activity outcomes
26	Pinto BM, Lynn H, Marcus BH, DePue J, Goldstein MG. Physician-based activity counseling: intervention effects on mediators of motivational readiness for physical activity. *Ann.Behav.Med.* 2001;**23**:2-10.	Did not measure physical activity outcomes
27	Pinto BM, Friedman R, Marcus BH, Kelley H, Tennstedt S, Gillman M. Effects of a computer-based counseling system on physical activity. *American Journal of Preventive Medicine* 2002;**23**:113-20.	Did not involve face to face contact in primary care setting
28	Porter S, Eccleston P, Vilshanskaya O. Moving patients towards a more active lifestyle: the GP Physical Activity. *Health Promotion Journal of Australia* 2002;178-83.	No control (pre and post study)
29	Prochaska JJ, Zabinski MF, Calfas KJ, Sallis JF, Patrick K. PACE+: interactive communication technology for behavior change in clinical settings. *Am.J.Prev.Med.* 2000;**19**:127-31.	Did not measure physical activity outcomes
30	Samaras K, Ashwell S, Mackintosh A-M, Fleury AC, Campbell LV, Chisholm DJ. Will older sedentary people with non-insulin-dependent diabetes mellitus start exercising? A health promotion model. *Diabetes Research and Clinical Practice* 1997;**37**:121-8.	Not brief intervention in primary care

		setting. Group based.
31	Simons-Morton D, Calfas KJ, Oldenburg B, Burton NW. Effects of interventions in healthcare settings on physical activity or cardiorespiratory fitness. *American Journal of Preventive Medicine* 1998;**15**:413-29.	Review not focussed on brief interventions in primary care
32	Singh S. Why are GP exercise schemes so successful (for those who attend)? Results from a pilot study. *Journal of Management in Medicine* 1997;**11**:233-7.	Did not measure physical activity outcomes (qualitative)
33	Steptoe A, Doherty S, Rink E, Kerry S, Kendrick T, Hilton S. Behavioural counselling in general practice for the promotion of healthy behaviour among adults at increased risk of coronary heart disease: randomised trial. *BMJ* 1999;**319**:943-7.	Multiple risk factor intervention (level of physical activity counselling input cannot be assessed)
34	Steptoe A, Rink E, Kerry S. Psychosocial predictors of changes in physical activity in overweight sedentary adults following counseling in primary care. *Prev.Med.* 2000;**31**:183-94.	Multiple risk factor intervention (level of physical activity counselling input cannot be assessed)
35	Stevens W, Hillsdon M, Thorogood M, McArdle D. Cost-effectivenss 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-	No a study of a brief intervention

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36	Taylor AH, Doust J, Webborn N. Randomised controlled trial to examine the effects of a GP exercise referral programme in Hailsham, East Sussex, on modifiable coronary heart disease factors. *Epidemiol Community Health* 1998;**52**:595-601	Not a brief intervention study
37	van Sluijs EM, van Poppel MN, Twisk JW, Brug J, Van Mechelen W. The positive effect on determinants of physical activity of a tailored, general practice-based physical activity intervention. *Health.Educ.Res.* 2005;**20**:345-56.	Did not measures physical activity outcomes measures (measured intermediary factors)
38	Writing Group for the Activity Counselling Trial Research Group,.Simons-Morton D. Effects of physical activity counseling in primary care: the activity counseling trial: a randomized controlled trial. *JAMA: Journal of the American Medical Association* 2001;**286**:677-87.	No control to brief intervention. Brief intervention compared to more intensive interventions.

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