

The effectiveness of public health interventions for increasing physical activity among adults: a review of reviews

Evidence briefing

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Foreword

In 1999 the white paper, *Saving Lives: Our Healthier Nation*, was published (Department of Health, 1999). It signalled that the Health Development Agency (HDA) would be established and that it would have, as one of its roles, building the evidence base in public health with a special focus on reducing inequalities in health. In April 2001 the Department of Health published its *Research and Development Strategy*. The strategy identified the task for the HDA as 'maintaining an up-to-date map of the evidence base of public health and health improvement, advising on the setting of standards in the light of evidence for public health and health promotion practice, and effective and authoritative dissemination of evidence to practitioners' (Department of Health, 2001). To translate this into reality the HDA has developed a number of ways of taking a systematic approach to compiling the evidence, identifying gaps and making the evidence base accessible. The publication of this, one in a series of evidence briefings, marks a further milestone in that activity.

This evidence briefing is a review of reviews about the effectiveness of public health interventions for increasing physical activity among adults. The necessity for reviewing reviews, or tertiary-level research, stems from the proliferation over the last decade or more of systematic and other types of review in medicine and public health. The HDA has published other evidence briefings that deal with alcohol misuse, teenage pregnancy and parenthood, HIV prevention, obesity, prevention of low birth weight, breastfeeding, accidental injuries in children and older people, the prevention of sexually transmitted infections, and health impact assessment. Other briefings will include drug use prevention, home visiting, smoking cessation, depression in older people, and good mental health.

Taken together these briefings will provide a comprehensive synthesis of the evidence drawn from systematic and other kinds of reviews. They will all be available on the HDA's

website (www.hda.nhs.uk/evidence) and the electronic versions will be updated on a regular basis as new evidence becomes available.

The first editions of the briefings have been based on evidence drawn from systematic and other kinds of reviews. This means that the type of evidence that does not traditionally find its way into reviews has not been considered in detail for these briefings. In future publications it is planned to extend the coverage of evidence beyond reviews to other methodologies and other types of study, where these are available.

The construction of the evidence base has involved collaboration with a number of partners who have interests and expertise in practical and methodological matters concerning the drawing together of evidence and its dissemination. In particular the HDA would like to acknowledge the following: the Centre for Reviews and Dissemination, University of York; the EPPI-Centre at the Institute of Education, University of London; Health Evidence Bulletins Wales; the ESRC UK Centre for Evidence Based Policy and Practice at Queen Mary College, University of London and its nodes at the City University London and the MRC Public Health Sciences Unit at the University of Glasgow; members of the Cochrane and Campbell collaborations; the United Kingdom and Ireland Public Health Evidence Group and the members of the Public Health Evidence Steering Group. This latter organisation acts as the overall guide for the evidence-building project of the HDA. The cooperation of colleagues in these institutions and organisations has been of significant help in the general work in preparing the framework for how we assess the evidence. The HDA is, however, responsible for the presentation and organisation of the material in the briefings.

We would also like to express our gratitude to the Physical Activity Evidence Base Reference Group and to HDA colleagues who assisted in organising the literature searches.

Every effort has been made to be as accurate and up-to-date as possible in the preparation of this briefing. However, we would be very pleased to hear from readers who would like to comment on the content or on any matters relating to the accuracy of the briefing. We will make every effort to correct any matters of fact in subsequent editions. Comments can be made by using our website, www.hda.nhs.uk/evidence

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Summary

Introduction

This briefing presents the current evidence from selected good quality systematic reviews and meta-analyses published since 1996. The review will be updated regularly as new evidence becomes available and can be accessed via www.hda.nhs.uk/evidence. It aims to identify interventions shown to be effective in increasing physical activity among adults and is intended to inform policy and decision makers, NHS providers, public health physicians and other public health practitioners in the widest sense.

People who have a physically active lifestyle are at approximately half the risk of developing coronary heart disease (CHD) compared to those who have a sedentary lifestyle (Berlin and Colditz, 1990). Regular physical activity is also associated with a reduced risk of diabetes, obesity, osteoporosis and colon cancer, and with improved mental health (US Department of Health and Human Services, 1996). In older adults physical activity is associated with increased functional capacities (Huang et al., 1998).

In 1996, the Department of Health issued a *Strategy Statement on Physical Activity*. It outlined a new policy promoting 30 minutes of moderate intensity (3-6 METs [work metabolic rate/resting metabolic rate], 5-7.5kcal/min) physical activity on at least five days of the week and for those already taking some vigorous physical activity, three periods per week of vigorous intensity physical activity of 20 minutes each (Department of Health, 1996). In 1998, just 40% of men and 26% of women were physically active at either of these levels (Department of Health, 2000a). Physical inactivity is associated with low social class, income and educational attainment indicating that the promotion of physical activity is particularly important in these groups.

Promoting physical activity is a component of many government policy statements and commitments. These include those produced by the Department of Health and other departments such as the Department for Transport, the Department of Culture, Media and Sport and the Department for Education and Skills. The major policy areas are as follows:

- *The NHS Plan* set out comprehensive plans for investment in and reform of the NHS. It included the commitment to develop 'local action to tackle obesity and physical activity, informed by advice from the Health Development Agency on what works' (Department of Health, 2001a)
- National Service Frameworks (NSFs). Physical activity is an important component of NSFs covering coronary heart disease, older people, diabetes, mental health and cancer (through *The NHS Cancer Plan*). The NSF on coronary heart disease (Department of Health, 2000b) sets standards and services which should be available throughout England and indicates milestones for achieving these. They include:
 - By April 2001 all NHS bodies, working closely with local authorities, will have agreed and be contributing to the delivery of local programmes of effective policies on increasing physical activity
 - By April 2002 every local health community will: have quantitative data no more than 12 months old about the implementation of the policies on promoting physical activity; and as employers, have developed 'green' transport plans and taken steps to implement employee-friendly policies
 - By April 2002, every hospital should have clinical audit data no more than 12 months old that describe total number and percentage of those recruited to cardiac rehabilitation who, one year after discharge, report physical activity of at least 30 minutes duration on average five times a week

- By April 2003, every general practice should have available clinical audit data no more than 12 months old that describe information about modifiable risk factors and personalised advice about how they can be reduced (including advice about physical activity)
- *The NHS Cancer Plan* sets out the future for cancer services, including proposals aimed at reducing the risk of cancer (Department of Health, 2000c). The plan endorsed commitments on local action on physical activity outlined in *The NHS Plan* and the NSF on CHD
- The NSF for diabetes notes that physical activity is a key intervention to reduce the overall population prevalence of type II diabetes and in reducing the risk of developing type II diabetes in individuals at increased risk (Department of Health, 2001b)
- The NSF for older people states: ‘Strong evidence exists that older people benefit from increasing physical activity’ (Department of Health, 2001c). One of the core recommended actions is that the NHS, with councils, should assess local priorities to promote both physical and mental health/wellbeing among older population groups. They should ensure that older people have fair access to programmes of disease prevention and health promotion, including cancer screening, blood pressure management, smoking cessation, advice about lifestyle including nutrition and physical activity, and falls prevention
- The NSF on mental health does not contain specific milestones on exercise but refers to research which shows that ‘exercise, relaxation and stress management have a beneficial effect on mental health’ (Department of Health, 1999)
- The overall importance of physical activity is emphasised in the Chief Medical Officer’s report *Physical Activity and Health*, which details the risks associated with physical inactivity over the lifecourse, as well as stressing the public health implications (Department of Health, forthcoming, 2004).

While much is known about the potential health gains of a physically active and fit population, far less is known about effective interventions for increasing physical activity. This review considers the existing evidence and, along with the results of the review, presents policy and research recommendations.

Methodology

This evidence briefing is a ‘review of reviews’; that is, a synthesis of high quality systematic reviews and meta-analyses to increase physical activity among adults. The briefing is not a systematic review of primary data.

We used the following procedures to identify the reviews included in the briefing:

- English language
- 1996 to November 2001
- Human studies
- Systematic reviews and meta-analyses
- Public health and primary care interventions to increase physical activity
- Adult populations (≥16 years old).

Findings

Ten systematic reviews and meta-analyses met the criteria outlined above and were included onto the HDA Evidence Base.

Healthcare

Five systematic reviews investigating the effectiveness of interventions in healthcare settings (including general practice, hospital outpatient clinics and hospital exercise facilities) were assessed (Ashenden et al., 1997; Eakin et al., 2000; Eaton and Menard, 1998; Lawlor and Hanratty, 2001; Simons-Morton et al., 1998):

- Review-level evidence suggests that brief advice from a doctor, based in primary care, supported by written materials, is likely to be effective in producing a modest, short-term (6-12 weeks) effect on physical activity
- Review-level evidence suggests that referral to an exercise specialist, based in the community, can lead to longer-term (>8 months) changes in physical activity
- Review-level evidence suggests that the short-term effectiveness of primary prevention interventions is associated with single-factor interventions (physical activity only), which focus on the promotion of moderate intensity physical activity (typically walking) in a sedentary population.

Community

Two systematic reviews investigated the effectiveness of interventions in community settings (Dunn et al., 1998; Hillsdon and Thorogood, 1996):

- Review-level evidence suggests that community based interventions targeting individuals are effective in producing short-term changes in physical activity
- Review-level evidence suggests that community based interventions targeting individuals are likely to be effective in producing mid- to long-term changes in physical activity
- Review-level evidence suggests that interventions based on theories of behaviour change, which teach behavioural skills, and that are tailored to individual needs, are associated with longer-term changes in behaviour
- Review-level evidence suggests that interventions that promote moderate intensity physical activity, particularly walking, and are not facility dependent, are also associated with longer-term changes in behaviour
- Review-level evidence suggests that studies that incorporate regular contact with an exercise specialist tend to report sustained changes in physical activity.

Older adults

One systematic review investigated the effectiveness of interventions in older adults (King et al., 1998):

- Review-level evidence suggests that interventions designed specifically for adults aged 50+ are effective in producing short-term changes in physical activity
- Review-level evidence suggests that interventions designed specifically for adults aged 50+ are likely to be effective in producing mid- to long-term changes in physical activity
- Review-level evidence suggests that interventions that use behavioural or cognitive approaches with a combination of group- and home-based exercise sessions rather than a class- or group-only format are associated with longer-term changes in behaviour
- Review-level evidence suggests that interventions that promote moderate and non-endurance physical activities (eg flexibility exercises) are associated with long-term changes in behaviour
- Review-level evidence suggests that interventions that used telephone support and follow-up are also associated with long-term behaviour change.

Gaps in the evidence base

None of the reviews specifically explored the effectiveness of physical activity interventions in disadvantaged groups. Population surveys have reported that the prevalence of physical inactivity is higher in some ethnic minority groups, in people in low-income households, in the lower social classes and in people with low levels of education. Therefore, it is imperative that future exercise promotion research is carried out in these groups.

However, ethnicity, income, social class and education are interrelated and it will be necessary to examine the independent association between these factors and physical activity to inform appropriate intervention study designs. Primary research will almost certainly be required to better understand the particular needs of different disadvantaged groups.

At present, no review-level evidence of the effectiveness of interventions aimed at changing policy (eg provision of cycle lanes) or the built environment to promote physical activity is available. This review was limited to experimental or quasi-experimental study designs, so excluding a substantial amount of literature from consideration. This observation highlights the important point that when this evidence briefing has uncovered no review-level evidence to support a certain intervention or programme, it does not mean there is absolutely no evidence of its effectiveness, just that no evidence was found from systematic reviews that met the inclusion criteria. For instance, we do not identify any reviews where the prime focus was the development of participation in sport. This should not be taken to mean that there is no evidence about the effectiveness of such interventions nor that there is evidence that such approaches are ineffective. Prior to including other types of study designs into reviews such as this there will need to be an agreed method for systematically synthesising or reviewing such work. There are a number of projects underway nationally and internationally involving the HDA to develop an appropriate methodology.

Introduction

The Health Development Agency (HDA) has been asked by the Department of Health to develop an evidence base of effective health improvement interventions. One of the topics chosen was physical activity, and this briefing joins many other topic-based papers on the HDA Evidence Base website (www.hda.nhs.uk/evidence). This briefing will also be routinely updated when new evidence becomes available.

The aims of this briefing are to:

- Identify all relevant systematic reviews and meta-analyses of exercise promotion which are limited to interventions at the individual level
- Review these papers and highlight 'what works' to increase physical activity among adults, but with particular reference to disadvantaged and vulnerable groups
- Highlight conflicting evidence, gaps in the evidence and provide a steer for future policy and research commissioning.

The HDA Evidence Base

Decisions about policy and practice in the public sector are increasingly driven by consideration of the best available evidence. The process of drawing together, analysing and synthesising evidence from research is a central principle of evidence-based practice. Typically, the process of reviewing an area of practice or intervention will include the production of a systematic review of effectiveness, a meta-analysis or some other review-level synthesis and interpretation of evidence from research.

As more reviews and meta-analyses are carried out across the spectrum of public health, there is an increasing need to map the areas that they cover, assess their quality, and

to pull together any common findings about what works in particular areas to improve health and reduce health inequalities. The task of keeping abreast of such large amounts of information is now too difficult for any one person. Systematic reviews are able to condense this large amount of information, via a structured method, into summary documents.

The HDA has taken on the task of mapping and synthesising the best available review-level evidence for the effectiveness of interventions to improve health and reduce health inequalities across priority areas of public health. This evidence briefing is part of the first set of publications from the project. Mapping and synthesis of review-level data will enable practitioners and policy makers to view the aggregate strength of the evidence in key areas, see clearly where review-level evidence is lacking, and inform the development and commissioning of future research and reviews.

Evidence briefings are essentially reviews of reviews, analysing the strengths and weaknesses at this level in a topic's evidence base, identifying gaps in the evidence, analysing future primary and secondary research needs, and discussing the implications of findings for policy and practice. Each briefing has a free-standing summary that is published separately. The briefings are also published on and supported by the website (www.hda.nhs.uk/evidence). The HDA Evidence Base website contains the latest edition of this briefing and the authors recommend that readers refer to the website to ensure they have the latest version. Access to the original reviews on which these briefings are based can also be found on the HDA Evidence Base website, if they are available. Evidence briefings are designed to be accessed by a variety of users including those simply looking for headline findings, those wanting complete and detailed syntheses, and those who need to track back to the original primary and secondary sources.

Providing comprehensive, up-to-date syntheses of the literature available in reviews is the chosen first step in a process of building the public health evidence base. As our programme of work continues, we will turn our attention to bringing into our evidence briefings work that does not usually find its way into systematic reviews.

Presently a three-tier structure underpins the HDA's work to develop the public health evidence base:

- A Public Health Evidence Steering Group (PHESG) with membership drawn from universities, public health and research and development divisions of the Department of Health, other government departments, public health practitioners, representatives of research funding bodies, the NHS Centre for Reviews and Dissemination, Cochrane and Campbell collaborations, the EPPI-Centre, and other UK and WHO representatives. The group is chaired by Jim McEwen, Professor Emeritus of Public Health at the University of Glasgow, on behalf of the Chief Medical Officer for England. This overarching group advises on the broad strategic direction of the evidence base and has a remit to quality assure the processes developed by the HDA to construct the evidence base
- For each topic area covered (eg accidental injuries and low birth weight), there is a reference group. These report to the PHESG, and consist of key academics, practitioners and officials with expertise in the area. Reference groups control the content of the evidence base and guide the production of evidence briefings
- Finally, the HDA is working to establish a robust evaluation framework for the entire HDA Evidence Base project.

The next stage in the process is the development of practice advice derived from the findings of the evidence briefings. This briefing does not contain advice or guidance for practice. Following the publication of this briefing, a similar process of mapping and synthesis, informed and reviewed by practitioner and research experts, will take place, leading to the production of practice-based advice and publications. Evidence into practice requires gathering evidence from all sources and combining it with political and social information, mindful of resource constraints, to develop learning that is passed on to practitioners. The HDA has piloted this process of evidence into practice in two topic areas (physical activity and the prevention of accidental injuries, Kelly and Speller, 2003).

Who is this briefing for?

This briefing is intended to inform policy and decision makers, NHS providers, public health physicians and other public health practitioners in the widest sense. Further work will be done to turn the summary of evidence presented here into advice for practice. The limitations of this briefing and the data on which it is based, and alternative sources of evidence that may be helpful to inform policy and practice, are set out below. This briefing does not draw on many other sources of evidence available and should not be used to provide specific advice for practice.

The main research question was: 'What evidence is there that physical activity can be increased in insufficiently active, community dwelling adults?'

This briefing is primarily a review of meta-analyses and systematic reviews and describes the current state of this level of evidence and judges the strength of that evidence. This process allows the gaps in the evidence base to be identified, particularly with regard to health inequalities, and so provides the basis on which to formulate research and practice recommendations.

This review does not examine the unplanned consequences of interventions on increasing the risks of accidents as a result of becoming more active. However, the Health Development Agency has produced a more general evidence review on accidental injuries in children and older people (Millward et al., 2003).

At present, the systematic review is probably the most robust and reliable marker of effectiveness, closely followed by a well designed meta-analysis. However, relying on this type and level of evidence to inform conclusions has some limitations, and it is important to consider them when making decisions about policy or practice. Reviews tend to focus on a relatively narrow spectrum of potential evidence that sits within traditional evidence hierarchies, while also being influenced by publication bias (ie absence of articles with inconclusive or negative findings). Furthermore, public health priorities often do not 'fit' easily into these types of study designs.

This briefing will provide a basis for developing practice guidelines using the reviews identified, as well as the individual studies identified within these reviews.

Methodology

This briefing is based on findings from systematic reviews of public health interventions to increase physical activity. It is a 'review of reviews' and not a systematic review of individual intervention trials.

An extensive and systematic search was conducted to identify the relevant literature. The search strategy was devised in collaboration with the NHS Centre for Reviews and Dissemination (CRD) at the University of York. Full details of the search strategies are shown in Appendix 1. Searches were conducted on the following electronic databases, websites and published sources:

- DARE admin database (<http://agatha.york.ac.uk/faq2.htm>)
- Clinical Evidence
- Cochrane Library
- EMBASE
- Health Evidence Bulletins Wales
- HTA
- National Guidelines Clearinghouse
- National Research Register
- NCCHTA website
- NICE website
- PsycINFO
- ReFeR
- SIGN
- Sociological Abstracts
- TRIP
- 'Wider Public Health' report

All databases were searched from January 1996 to November 2001. The searches of the databases listed above were downloaded into Reference Manager software. Titles and abstracts of identified references were assessed for relevance. The following inclusion criteria were used:

- English language
- 1996 to November 2001

- Human studies
- Systematic reviews and meta-analyses
- Public health and primary care interventions to increase physical activity
- Adult populations (≥ 16 years old).

Where a clear decision could be made on the basis of the title or abstract, studies were either judged to be relevant or were not considered further. If no decision could be made the papers were examined in detail. In addition, personal retrieval systems were also employed and the reference lists of existing reviews were searched. From this process a total of 70 papers thought to be relevant were ordered from the British Library and retrieved within the timescale of this review. All papers were then assessed independently by two reviewers and critically appraised in terms of transparency, systematicity and relevance according to HDA Evidence Base methodology (as detailed in the HDA Evidence Base *Process and Quality Standards Manual for Evidence Briefings* (www.hda.nhs.uk/evidence/ebmanual_pqs.html)). There was no blinding of authorship of retrieved papers. A critical appraisal form was completed by each reviewer (Appendix 2) and a joint decision was made regarding whether the paper was of a suitable quality to be an HDA Evidence Base paper, whether or not it could be used to inform discussion. Disagreements were resolved through discussion or by recourse to a third reviewer.

This process identified 10 papers, which were compared and top-level findings collated. Any conflicting evidence was identified and gaps in the evidence base with respect to reducing health inequalities were charted. The evidence statements were derived from top-level findings. Any kind of quantitative summary, including an attempt to calculate pooled effect sizes, has not been undertaken due to the heterogeneous nature of the studies and the diversity of outcome measures employed.

Reviews identified

The search strategy identified 70 studies for possible inclusion in this review. Each of these were read by both authors and considered for inclusion by using a critical appraisal tool (Appendix 2). Papers were included in the review if they met the following criteria:

- Systematic review or meta-analysis
- Results reported for adults ≥ 16 years old
- Results reported for experimental/quasi-experimental studies
- Main outcome measure was self-reported physical activity
- Methods of conducting the review were clearly described
- Sufficient data from individual studies was reported to mediate between data and conclusions.

Ten papers met the inclusion criteria and are listed here and in Table 1 (overleaf). The main reason for excluding studies was that they were not systematic reviews. Our search strategy did not identify reviews of interventions at the community, policy or environmental level but did identify reviews of individual-level interventions based in healthcare, community and workplace settings. The search strategy also identified reviews of interventions targeting older adults, adults from black and ethnic minority groups and adults with physical limitations.

A similar report from the Centers for Disease Control and Prevention (US) (Taskforce on Community Preventive Services, 2001) (www.thecommunityguide.org/pa/default.htm) was not included in this review because insufficient details of the methods employed did not allow for assessment using the critical appraisal tool. In addition, it was clear that the review included studies that were not experimental or quasi-experimental.

Included reviews (by date of publication)

Hillsdon, M. and Thorogood, M. (1996). A systematic review of physical activity promotion strategies. *British Journal of Sports Medicine* 30: 84-9.

Ashenden, R., Silagy, C. and Weller, D. (1997). A systematic review of the effectiveness of promoting lifestyle change in general practice. *Family Practice* 14: 160-76.

Eaton, C. B. and Menard, L. M. (1998). A systematic review of physical activity promotion in primary care office settings. *British Journal of Sports Medicine* 32: 11-6.

King, A. C., Rejeski, W. J. and Buchner, D. M. (1998). Physical activity interventions targeting older adults. A critical review and recommendations. *American Journal of Preventive Medicine* 15: 316-33.

Taylor, W. C., Baranowski, T. and Young, D. R. (1998). Physical activity interventions in low-income, ethnic minority, and populations with disability. *American Journal of Preventive Medicine* 15: 334-43.

Dunn, A. L., Andersen, R. E. and Jakicic, J. M. (1998). Lifestyle physical activity interventions. History, short- and long-term effects, and recommendations. *American Journal of Preventive Medicine* 15: 398-412.

Dishman, R. K., Oldenburg, B., O'Neal, H. and Shephard, R. J. (1998). Worksite physical activity interventions. *American Journal of Preventive Medicine* 15: 344-61.

Simons-Morton, D. G., Calfas, K. J., Oldenburg, B. and Burton, N. W. (1998). Effects of interventions in health care settings on physical activity or cardiorespiratory fitness. *American Journal of Preventive Medicine* 15: 413-30.

Eakin, E. G., Glasgow, R. E. and Riley, K. M. (2000). Review of primary care-based physical activity intervention studies: effectiveness and implications for practice and future research. *Journal of Family Practice* 49: 158-68.

Lawlor, D. A. and Hanratty, B. (2001). The effect of physical activity advice given in routine primary care consultations: a systematic review. *Journal of Public Health Medicine* 23: 219-26.

Table 1: Systematic reviews of physical activity promotion

Authors	No. studies reviewed	Total subjects (including controls)	Last year of searching
Hillsdon and Thorogood (1996)	12 studies/12 RCTs	1,699	1996
Ashenden et al. (1997)	6 studies/6 RCTs	22,643	1995
Eaton and Menard (1998)	8 studies/8 RCTs	14,181	1997
King et al. (1998)	29 studies/26 RCTs	3,602	Not stated
Taylor et al. (1998)	14 studies/5 RCTs	1,560	1997
Dunn et al. (1998)	14 studies/7 RCTs	3,248	Not stated
Dishman et al. (1998)	26 studies/9 RCTs	8,800	1997
Simons-Morton et al. (1998)	36 studies/not stated	20,551	1997
Eakin et al. (1998)	15 studies/9 RCTs	26,222	1998
Lawlor and Hanratty (2001)	8 studies/2 RCTs	5,102	2000

Authors	Population (people + age group etc)	Setting/target group
Hillsdon and Thorogood (1996)	Healthy adults, 18-72 years	Community
Ashenden et al. (1997)	Adults: healthy and with chronic cardiovascular disease, 18-75 years	Healthcare
Eaton & Menard. (1998)	Adults, 17-85+ years	Healthcare
King et al. (1998)	Older adults: healthy and with chronic disease, 50+ years	Older adults
Taylor et al. (1998)	Adults from ethnic groups, with disabilities, 18-81 years	Ethnic minority, low income, disability
Dunn et al. (1998)	Adults: healthy and with chronic disease, 25-80+ years	Community
Dishman et al. (1998)	Manual and non-manual workers, 18-73 years	Workplace
Simons-Morton et al. (1998)	Healthy adults, 18-75+ years, adults with chronic disease, 32-75 years	Healthcare
Eakin et al. (1998)	Adults: healthy and with chronic cardiovascular disease, 16-80 years	Healthcare
Lawlor and Hanratty (2001)	Sedentary healthy adults, 18+ years	Healthcare

Findings

This section highlights the key findings of the reviews identified.

Healthcare settings

- Review-level evidence suggests that brief advice from a doctor based in primary care, supported by written materials, is likely to be effective in producing a modest, short-term (6-12 weeks) effect on physical activity.
- Review-level evidence suggests that brief interventions, with apparently healthy individuals, based in primary care and other healthcare settings, are unlikely to be effective in producing longer-term (>8 months) changes in physical activity.
- Review-level evidence suggests there is some evidence that referral to an exercise specialist based in the community can lead to longer-term (>8 months) changes in physical activity.
- Review-level evidence suggests there is equivocal evidence for the effectiveness of interventions based in hospital outpatient clinics settings.
- Review-level evidence suggests that the short-term effectiveness of brief interventions with apparently healthy individuals with undiagnosed illness is associated with single factor interventions (physical activity only), which focus on the promotion of moderate intensity physical activity (typically walking) in a sedentary population.
- Currently there is no review-level evidence of the effectiveness of exercise referral schemes.

Community settings

- Review-level evidence suggests that community based interventions targeting individuals are effective in producing short-term changes in physical activity.

- Review-level evidence suggests that community based interventions targeting individuals are likely to be effective in producing mid- to long-term changes in physical activity.
- Review-level evidence suggests that interventions based on theories of behaviour change, which teach behavioural skills, and that are tailored to individual needs, are associated with longer-term changes in behaviour.
- Review-level evidence suggests that interventions that promote moderate intensity physical activity, particularly walking, and are not facility dependent, are also associated with longer-term changes in behaviour.
- Review-level evidence suggests that studies that incorporate regular contact with an exercise specialist tend to report sustained changes in physical activity.

Workplace settings

- Currently there is no review-level evidence of the effectiveness of workplace interventions to promote physical activity.

Older adults (50+)

- Review-level evidence suggests that interventions designed specifically for adults aged 50+ are effective in producing short-term changes in physical activity.
- Review-level evidence suggests that interventions designed specifically for adults aged 50+ are likely to be effective in producing mid- to long-term changes in physical activity.
- Review-level evidence suggests that interventions that use behavioural or cognitive approaches with a combination of group- and home-based exercise

sessions rather than a class- or group-only format are associated with longer-term changes in behaviour.

- Review-level evidence suggests that interventions that promote moderate and non-endurance physical activities (eg flexibility exercises) are associated with long-term changes in behaviour.
- Review-level evidence suggests that interventions that use telephone support and follow-up are also associated with long-term behaviour change.

Adults from black and ethnic minority groups

- Currently there is no review-level evidence of the effectiveness of interventions focusing on people from ethnic minorities. Very few studies have been conducted with this target group.

Adults with physical limitations

- Currently there is no review-level evidence of the effectiveness of interventions focusing on people with physical limitations (arthritis, low back pain, chronic obstructive pulmonary disease and cystic fibrosis).

State of the evidence

The review-level evidence is presented in six categories, based on those identified by the original authors of the reviews. These categories cover three settings (healthcare, community and workplace) and three target groups (older adults, minority ethnic groups and adults with physical limitations – described in the original paper as adults with disabilities). The majority of the review evidence falls into the healthcare setting, where five reviews were identified. Only one review was found in each category for workplace and older adults, and one covering both ethnic minority groups and adults with physical limitations.

Healthcare settings

Summary

This section includes reviews of studies that were based in healthcare settings such as general practice, hospital outpatient clinics or hospital exercise facilities. Interventions were delivered at the individual level:

- Five reviews examined the effectiveness of physical activity interventions in healthcare settings (Ashenden et al., 1997; Eakin et al., 2000; Eaton and Menard, 1998; Lawlor and Hanratty, 2001; Simons-Morton et al., 1998)
- Settings included primary care (general practice), hospital outpatient clinics and occupational health
- 22 quasi-experimental/experimental studies were reported
- Only four studies were from the UK
- Review-level evidence suggests that brief advice from a doctor based in primary care, supported by written materials, is likely to be effective in producing a modest, short-term (6-12 weeks) effect on physical activity
- Review-level evidence suggests that brief interventions targeted at apparently healthy adults, based in primary

care and other healthcare settings, are unlikely to be effective in producing longer-term (>8 months) changes in physical activity

- Review-level evidence suggests that referral to an exercise specialist based in the community can lead to longer-term (>8 months) changes in physical activity
- Review-level evidence suggests there is equivocal evidence for the effectiveness of interventions based in hospital outpatient clinics (mainly cardiac rehabilitation programmes)
- Review-level evidence suggests that the short-term effectiveness of interventions targeted at apparently healthy adults with undiagnosed illness is associated with single-factor interventions (physical activity only), which focus on the promotion of moderate intensity physical activity (typically walking) in a sedentary population
- Currently there is no review-level evidence of the effectiveness of exercise referral schemes (Department of Health, 2001d).

Examples of interventions included in the reviews:

- Information and advice given by a nurse or general practitioner
- Written prescriptions for physical activity
- Self-help materials including brochures and tailored print material
- Telephone follow-up
- Referral to exercise specialist
- Multiple risk factor counselling.

Intervention characteristics common to the six studies that focused on physical activity alone and produced positive short-term changes in physical activity include:

- Brief advice from a general practitioner
- Written information about physical activity.

The one study that produced longer-term changes in physical activity recruited participants from general practice lists and offered them two one-to-one appointments with an exercise specialist in the community. A personalised exercise plan was negotiated and an offer of reduced cost exercise at local leisure centres was made.

The multiple risk factor trials reporting positive changes in physical activity generally included a risk assessment with a health professional followed by discussion of the results along with advice about behaviour change. With multiple risk factor interventions it is not possible to determine the extent of the effort with which physical activity was addressed and therefore which element of the intervention had the effect on physical activity.

Strengths and challenges

There were 14 intervention studies (for apparently healthy adults) and eight secondary prevention studies. Of the intervention studies (for apparently healthy adults), seven were single-factor interventions and seven were multiple risk factor interventions. Six of the seven single-factor interventions reported significant differences in physical activity between intervention and control groups at 4-12 weeks follow-up. Just one of seven reported a significant effect when the follow-up was greater than six months, with no studies reporting a significant effect in the long term (>12 months). Three of the seven multiple risk factor interventions reported a significant effect in the short term (up to six weeks), with one of seven reporting a significant effect in the longer term (>12 months).

All eight of the hospital outpatient studies reviewed were part of multiple risk factor interventions and included follow-up periods of >12 months. Three of the eight studies reported significant differences in physical activity between intervention and control groups.

Many of the studies included in the five reviews contained methodological limitations.

Study design

Limited information was available on how randomisation was conducted and if it was concealed from participants. This may lead to selection bias that may exaggerate the differences between intervention and control groups. A number of studies used cluster randomisation without taking selection bias into account in their analysis. This could lead to an overestimate of the effect of the

intervention. Not all studies conducted their analysis on an intention to treat basis (ie not all randomised participants included in the trial/intervention were included in the analysis). Participants who completed studies were likely to be different from those who were randomised and did not complete the study. Most studies relied on self-reported physical activity as their outcome, many of which did not report the validity and reliability of the method used. This risks non-differential misclassification of participants and therefore an underestimate of the true effect of the interventions.

Generalising results

The recruitment of participants and health professionals and the choice of medical centre is likely to have produced significant selection bias. Very often, health professionals or medical centres were selected because of their willingness to become involved. Therefore, they are likely to be more motivated than the majority of health professionals to deliver physical activity interventions. Similarly, study participants were generally volunteers who were probably more motivated to change their physical activity than people found in routine practice.

Study participants were generally well educated and white. Little is known about the effectiveness of healthcare-based physical activity interventions in non-white, less affluent groups. Only four of the studies were UK-based. It is not known how easily studies conducted in the US and Australia could be transferred to UK settings.

Despite the popularity of primary care interventions in the UK, it is still not known whether individual advice from a person's usual general practitioner may lead to significant increases in physical activity that can be sustained beyond three months.

Community settings

Summary

The reviews included participants who were recruited from the community (general population) rather than from a specific setting such as the workplace or general practice. Interventions were generally delivered at the individual level or to small groups as opposed to whole communities:

- Two reviews examined the effectiveness of physical activity interventions based in the community (Dunn et al., 1998; Hillsdon and Thorogood, 1996)

- Settings included the home and fitness/leisure/sports facilities
- 13 experimental studies were reported
- No studies were from the UK
- Review-level evidence suggests that community based interventions targeting individuals are effective in producing short-term changes in physical activity
- Review-level evidence suggests that community based interventions targeting individuals are likely to be effective in producing mid- to long-term changes in physical activity
- Review-level evidence suggests that interventions based on theories of behaviour change, which teach behavioural skills, and that are tailored to individual needs, are associated with longer-term changes in behaviour
- Review-level evidence suggests that interventions that promote moderate intensity physical activity, particularly walking, and are not facility dependent, are also associated with longer-term changes in behaviour
- Review-level evidence suggests that studies that incorporate regular contact with an exercise specialist tend to report sustained changes in physical activity.

Examples of interventions included in the reviews:

- Weekly group exercise 'counselling'
- Mailed self-help materials
- Stage-of-change written materials
- Exercise testing and prescription
- Telephone education, advice and support
- Supervised, facility based exercise
- Behaviour modification
 - Self-monitoring
 - Reinforcement
 - Relapse prevention.

The effective interventions in the two reviews reported here tended to include the following:

- Recruitment via advertisement in the local press or random phone survey
- Encouragement of exercise that can be taken from the home (ie walking)
- Written materials sent by post that provide education and guidance on starting and maintaining an exercise programme
- Self-monitoring via logbooks
- On-going support via the telephone.

The studies generally adopted a system of 'home based supervised' physical activity programmes. The 'supervision' was usually delivered by telephone and supported with printed material.

Strengths and challenges

Thirteen randomised controlled trials were included in these reviews, eight of which reported statistically significant differences in physical activity between intervention and control groups. Follow-up periods ranged from five weeks to two years. Three studies reported significant differences in physical activity between intervention and control groups at two year follow-up. All three studies promoted moderate intensity physical activity that typically focused on walking. One of the three studies has since reported that increased walking levels, following the intervention, can be sustained for up to 10 years. All three studies also included comprehensive pre-exercise assessment and personally tailored programmes. Participants were taught how to incorporate physical activity into their lifestyles and received regular support over the early months of the study.

A number of methodological limitations were present in the studies.

Study design

Not all studies conducted their analysis on the basis of an intention to treat. Participants who completed studies are likely to be different from those who were randomised and did not complete the study. A number of studies did not include 'no-intervention control groups' but comparison groups. This prevents the dismissal of regression to the mean as a possible explanation for the results. Most studies relied on self-reported physical activity as their outcome, many of which did not report the validity and reliability of the method used. This risks non-differential misclassification of participants and therefore an underestimate of the true effect of the interventions. A number did, however, use validated measures and also backed up self-reports with motion sensor data and cardiorespiratory fitness tests.

Generalising results

The recruitment of participants often involved extensive screening and testing prior to randomisation. This is likely to have resulted in highly motivated study participants. The staff delivering the interventions were typically part of a university research team with undergraduate degrees

in exercise science or from the behavioural sciences. If the interventions were to be replicated in normal practice, the professionals responsible for delivering them would have to be identified, as would the resources to pay for them. A number of the studies involved participants who were university staff, who were likely to be different from the general population.

Study participants were generally well educated and white although a few studies included participants from minority ethnic groups. No studies were found from the UK. It is not known whether the findings from these US studies would be applicable to the UK.

Workplace settings

Summary

The one review included in this section covers interventions that were delivered in the workplace at the individual level:

- The review examined the effectiveness of physical activity interventions for adults in the workplace (Dishman et al., 1998)
- 26 experimental studies were reported
- No studies were from the UK
- Currently there is no review-level evidence of the effectiveness of workplace interventions to promote physical activity.

Examples of interventions included in the review:

- Exercise testing and prescription in workplace fitness facilities
- Health screening and counselling
- Individual exercise prescription, goal setting, reinforcement, relapse prevention.

Strengths and challenges

No statistically significant increases in physical activity or fitness were found between intervention and control groups. All the studies had considerable methodological limitations.

Study design

Nine studies randomised individuals within a worksite, with four randomising the workplace. The review commented upon the difficulty of conducting randomised controlled studies within a workplace setting. Particular

problems were observed with sampling bias (recruitment of participants in studies, eg volunteers), selection bias (the selection of participants into studies resulting in systematic differences in comparison groups) and attrition bias (systematic differences between the comparison groups in the loss of participants from the study). Poor outcome measurements were also observed, and there were no attempts to standardise results (at baseline or follow-up) for any physical activity performed outside of the workplace.

Generalising results

The heterogeneity of workplaces means the generalising of these interventions is very limited. The interventions adopted similar behavioural approaches, eg health education, behaviour modification and incentives to interventions in healthcare settings but in this context these did not prove effective. Three types of workplace were identified: university, private sector and public agency/organisation. Interventions were seen as crude, focusing on the individual employee rather than using the environment or organisational strategies for behaviour change, eg employment policy to encourage non-motorised transport. The workplaces were all US large-scale employers – note that 90% of the adult working population in the UK works in small-scale workplaces with fewer than 50 employees.

Older adults (50+)

Summary

Interventions were limited to adults aged 50 years and over:

- One review examined the effectiveness of physical activity interventions for older people (King et al., 1998)
- 29 experimental/quasi-experimental studies were reported
- No studies were UK-based
- Review-level evidence suggests that interventions designed specifically for adults aged 50+ are effective in producing short-term changes in physical activity
- Review-level evidence suggests that interventions designed specifically for adults aged 50+ are likely to be effective in producing mid- to long-term changes in physical activity
- Review-level evidence suggests that interventions that use behavioural or cognitive approaches with a

combination of group- and home-based exercise sessions rather than a class- or group-only format are associated with longer-term changes in behaviour

- Review-level evidence suggests that interventions that promote moderate and non-endurance physical activities (eg flexibility exercises) are associated with long-term changes in behaviour
- Review-level evidence suggests that interventions that used telephone support and follow-up are also associated with long-term behaviour change.

Examples of interventions included in the review:

- Community based exercise classes
- Mixture of community classes supplemented by supervised home-based exercise
- Use of behavioural strategies such as goal setting, reinforcement, self-monitoring and social support.

The successful interventions included:

- Structured class or group-based physical activity sessions
- Home-based physical activities, particularly walking
- Telephone contact and support
- Informal group meetings and events
- Exercise log books.

The one study that produced longer-term changes in physical activity used formal group-based exercise classes for the first three months. Participants were then encouraged to adopt more independent physical activities by using 'exercise buddies', informal small walking groups and individual self-sustaining strategies, eg self-reinforcement. This study allowed participants to move from starting formal exercise classes to less frequent centre-based activities, professional contacts and support, to independent physical activities. Another study followed face-to-face counselling with telephone follow-up and monthly education and social meetings to encourage home-based physical activity, again reducing the amount of support and professional contact over time.

Strengths and challenges

Twenty-nine randomised controlled trials were included in this section, eight of which reported statistically significant differences in physical activity between intervention and control groups. Follow-up periods ranged from six to twenty-four months. Two studies reported significant changes at two year follow-up. The studies

used home- and group-based moderate intensity physical activity sessions, incentives, social events and written and phone follow-up and support. Nineteen of twenty-nine studies reported a positive effect on adherence to prescribed exercise (36%-98%, mean ~75%, median ~80%) and/or self-reported physical activity change.

Most of the studies had methodological limitations.

Study design

Selection bias was evident as studies recruited volunteers from community groups. Randomisation methods were not described. A number of studies use cluster randomisation without taking selection bias into account in their analysis, risking overestimating the effect of their intervention. Intention to treat analysis was not applied to most studies. The measurement of physical activity behaviour with older adults is problematic, especially as activity choices tend to be more moderate in intensity and as such are harder to assess objectively. Studies compared participation rates in the programme between intervention and control groups as a primary outcome of the intervention and not differences in physical activity between groups.

Generalising results

Studies did not recruit older adults from important sub-groups – low income, ethnic minority groups, and older people aged 75+. No studies were found from the UK. Few studies addressed other types of physical activities that would be beneficial to this target group, eg activities that developed and maintained flexibility, balance and strength, and would help sustain independent living and quality of life.

Adults from black and ethnic minority groups

Summary

No UK studies were found, – all the studies were from the US, and so the ethnic minorities included Mexican-Hispanic, Mexican-American, African-American, Latino, Asian and Pacific Islanders. The studies were delivered at the individual level:

- One review examined the effectiveness of physical activity interventions for adults from ethnic minority groups (Taylor et al., 1998)
- Five experimental/quasi-experimental studies were reported

- There were no UK-based studies.
- Settings included churches, schools, medical clinics and leisure centres
- Currently there is no review-level evidence of the effectiveness of interventions focusing on people from ethnic minorities. Very few studies have been conducted with this target group.

Examples of interventions included in the review:

- Supervised exercise classes
- Telephone supervised home-based walking programmes
- Written materials
- Use of behavioural strategies such as goal setting, reinforcement, self-monitoring and social support.

Strengths and challenges

Five randomised trials showed no effect on the number of exercise sessions, energy expenditure, self-reported walking or fitness. Studies had considerable methodological limitations.

Study design

Only two studies randomised individuals, with the other three studies randomising families into intervention or control groups. Selection bias was evident as studies recruited participants as whole families or from community groups. One study reported over 80% loss at follow-up and poor participation rates in the experimental group. Physical activity measures were not tested for reliability and validity with sample populations.

Generalising results

The ethnic minority groups who participated in these studies were Mexican-Hispanic, Mexican-American, African-American, Latino, Asian, Pacific Islander and mixed ethnic origin. Very few men were recruited to the interventions. The heterogeneity of these studies makes their findings difficult to generalise to the UK.

Adults with physical limitations

Summary

Although this review aimed to include studies of people with disabilities, it was limited to participants with the following conditions: arthritis, low back pain, chronic obstructive pulmonary disease and cystic fibrosis.

- The review examined the effectiveness of physical activity interventions for adults with physical limitations (Taylor et al., 1998)
- Three experimental/quasi-experimental studies were reported
- There were no UK-based studies
- Currently there is no review-level evidence of the effectiveness of interventions focusing on people with physical limitations.

Examples of interventions included in the review:

- Individual counselling
- Outpatient physiotherapy fitness classes
- Individually tailored home-based programmes.

Strengths and challenges

Effective interventions still need to be identified. No studies reported outcome in changes in physical activity but used disability or pain scales or exercise tolerance tests.

Study design

There was evidence of selection bias in the studies, as case definitions for disabilities were not presented in the review, eg chronic back pain or knee osteoarthritis. Results were not adjusted for baseline scores.

Generalising results

These studies focused on adults with chronic disease rather than adults with mental or physical disabilities, eg people with quadriplegia, paraplegia, mental health, learning disabilities, multiple sclerosis or poliomyelitis, visual and hearing impairments.

Gaps in the evidence

The existing research into the effectiveness of exercise promotion interventions, as identified in this evidence briefing, is mainly limited to middle class Caucasians. Also, much of the research has been conducted in the US and it is not known whether interventions demonstrated to be effective there could work in the UK. No reviews examined the unplanned consequences of interventions on increasing the risks of accidents as a result of becoming more active. These outcomes should be considered when studying all target groups.

By far the majority of intervention studies identified in this briefing have been targeted at the individual level and limited to a specific setting. This type of intervention, at very best, will have a limited impact on population levels of physical activity. Examples of population-based approaches to promoting physical activity may include using legislation or the physical and social environment. These potential determinants of physical activity require further evaluation and research to understand how they interact with different types of physical activity behaviour for different target groups.

At present, no review-level evidence of the effectiveness of interventions aimed at changing policy or the environment, on physical activity, is available. This briefing was limited to experimental or quasi-experimental study designs, so excluding a substantial amount of literature from consideration. This observation highlights the important point that if this evidence briefing has uncovered no review-level evidence to support a certain intervention or programme it does not mean there is absolutely no evidence of its effectiveness, just that no evidence was found from systematic reviews that met the inclusion criteria. For instance, we do not identify any reviews where the prime focus was the development of participation in sport. This should not be taken to mean that there is no evidence about the

effectiveness of such interventions nor that there is evidence that such approaches are ineffective. Prior to including other types of study designs into reviews such as this briefing there will need to be an agreed method for systematically synthesising or reviewing such work.

There is currently particular interest in the potential of multiple daily bouts of physical activity rather than one longer bout. It has been proposed that accumulating physical activity in this way may make it easier for people to meet public health guidelines compared to having to do physical activity in one go. At present there is no review-level evidence on the effectiveness of interventions that promote so-called 'bite sized chunks' of exercise versus less frequent but longer duration exercise. Such studies would require precise measures of physical activity.

The reviews reported here highlight some key limitations in the measurement of physical activity. First, virtually all studies of physical activity promotion rely on self-reported physical activity as the main outcome measure. Such self-reports are typically retrospective and therefore risk recall bias. There is also the risk of socially desirable responses occurring (ie the respondent may give the reply/answer they think the interviewer will want to hear). While these potential biases are likely to lead to some misclassification of physical activity, there is no evidence that any misclassification would be systematically different between intervention and control groups. Therefore, the most likely outcome is an underestimate of the true effect of an intervention. Any misclassification makes the interpretation of results more difficult, particularly in terms of the clinical importance of the outcomes. While a number of studies have been able to report a statistically significant change in physical activity between intervention and control groups, such change appears to be small and may not be clinically meaningful.

The precision of this observation is limited by the quality of the measure. As measures vary across studies, comparisons between studies are limited as the degree of misclassification is likely to vary between measures and therefore studies. The reporting of outcomes also makes comparisons between studies difficult. Self-reported physical activity is expressed in a variety of ways including:

- Total energy expenditure
- Proportion of participants meeting current public health recommendations
- Proportion of participants meeting a predetermined threshold of physical activity different from current public health recommendations
- Hours per week of different intensity physical activity.

The classification of physical activity using self-report measures may also lead to misclassification in terms of who is offered an intervention. Most studies have a measure of 'inactivity' and only offer intervention to participants classified as this. While this may lead to some people who would benefit from the intervention not being offered it (and vice-versa), this is not likely to vary systematically between experimental groups.

Inequalities

None of the 10 reviews presented in this evidence briefing specifically explored the effectiveness of physical activity interventions in disadvantaged groups. Population surveys have reported that the prevalence of physical inactivity is higher in some ethnic minority groups, in people in low-income households, in lower social classes and in people with low levels of education. Therefore, it is imperative that future exercise promotion research is carried out in these groups.

However, ethnicity, income, social class and education are interrelated and it will be necessary to examine the independent association between these factors and physical activity to inform appropriate intervention study designs. Primary research will almost certainly be required to better understand the particular needs of different disadvantaged groups.

Research and policy recommendations

The evidence presented in this briefing is limited to individual-centred interventions. Review evidence of effectiveness does not exist in other areas such as environmental, community, policy or fiscal interventions. Physical activity will require interventions at all of these levels as it is performed within a social and physical environment. How best to combine interventions at different levels, to diverse populations, in different settings, requires further exploration. Reviews into broader aspects of evidence will aid our understanding of effectiveness. Reviewing interventions at community, policy or environmental levels will first require criteria on the level of evidence of effectiveness that is being sought. While the randomised controlled trial is often referred to as the 'gold standard', this study design is not appropriate for all research questions.

Healthcare settings

Research recommendations

Future research needs to address the methodological issues described above. There is an urgent need for well conducted studies in the UK that focus on people from lower socio-economic and ethnic minority groups. In particular, future studies need to determine the long-term efficacy of primary care based interventions targeting apparently healthy adults and adults with disease. This is likely to require more intensive interventions than the one or two contact, time limited interventions investigated to date. While these types of interventions have been shown to produce short-term effects, they do not lead to sustained changes in behaviour. Having said that, no UK study, known to the authors, has yet assessed the effectiveness of direct advice and encouragement to increase physical activity from a person's general practitioner. Such a brief intervention has been evaluated for smoking cessation and is accepted as usual practice.

Factors associated with higher quit rates, such as ongoing support from other health professionals and behaviour modification from specially trained nurses (Thorogood et al., 2001) also warrant investigation.

In the UK 'exercise referral schemes' are increasingly common yet remain under-evaluated (Department of Health, 2001d). Much time, effort and resources are being invested in such programmes and therefore it is imperative that their effectiveness is evaluated through rigorous studies.

A further concern for future primary care studies are the competing time demands of health promotion activities such as smoking cessation, nutrition advice and adherence to medication. Cost-effective methods for helping practitioners deal with multiple health behaviours are needed. Only one study from the reviews included here presented any cost-effectiveness data.

As the focus of most primary care physical activity interventions is a change in physical activity behaviour, future studies need to carefully select a measure of physical activity that has published validity and reliability data, on a population similar to that being considered for the intervention. As any changes achieved are likely to be small, physical activity measures need to be sensitive enough to detect them.

Policy recommendations

The existing reviews provide insufficient evidence about the effectiveness of healthcare-based interventions to provide policy recommendations with any confidence. It is possible that initial expectations about the effectiveness of brief advice and encouragement from a health professional were too high. Modifications in intra-individual factors such as attitude, knowledge and motivation may be insufficient to overcome an

environment that is 'hostile' to the behaviours being promoted. Multi-level interventions that have intrapersonal, interpersonal and environmental factors may be required to achieve sustainable changes in physical activity behaviour at a level that would lead to health benefits.

There is enough evidence, including UK evidence, to suggest that a brief intervention from a health professional will lead to at least a short-term change in physical activity in previously sedentary people. If supported by other professionals, including leisure professionals, it may be possible to maintain the short-term changes achieved, although there is only limited evidence for this.

Community settings

Research recommendations

Future studies should take place in the UK and should include participants who are non-white and from lower socio-economic groups. Research is also needed to test the dissemination of the effective interventions from the US. Issues to be addressed include methods of recruitment, identification of appropriate personnel to deliver the interventions, and sustainability. More needs to be understood about environmental factors that may support people who have received face-to-face behavioural interventions. Longitudinal studies are required with follow-up periods greater than two years to understand the sustainability of interventions.

More complex, multi-level interventions are required to reach a greater proportion of the physically inactive population. The studies reported in the community section required intensive interventions to reach a relatively small number of people. None of the reviews included studies of the cost effectiveness of community interventions, which clearly needs to be addressed. Many sports and physical activity development officers are employed by local authorities and have good links with churches, community centres and other local groups. This is an entirely unevaluated approach to recruiting people into interventions in the UK that may have a wide-reaching impact.

Policy recommendations

Since many of these studies were organised and delivered via universities, alternative models of delivery will be required away from that setting and appropriate for the

UK. Also, recruiting via local advertisements is unlikely to reach disadvantaged groups.

As mentioned earlier, a high number of programmes exist around the country that involve general practitioners referring selected patients to leisure centres for low or no cost physical activity (Department of Health, 2001d). The efficacy of this approach is yet to be established and appears to require a relatively large effort to intervene with a small number of people. However, the leisure sector may be well placed to supplement this approach with broader recruitment strategies that allow for self-referral. Community physical activity development officers could carry out targeted recruitment in areas of need. No obvious model exists for providing ongoing support and it is not clear whether the success of telephone support experienced in the US will transfer to the UK.

Workplace settings

Research recommendations

Future research should evaluate interventions that focus on workplace organisational and policy change as well as individual-level interventions. Research is needed to test a combination of successful individual interventions from other settings as part of a wider policy and organisational intervention. The relationship between workplace or onsite physical activity and home-based activity is unknown. Recent research has shifted worksite interventions towards commuting to and from work rather than physical activity on site (Vuori et al., 1994). Studies investigating physically active commuting to work were not identified in this review and warrant further investigation through primary research.

Policy recommendations

Although no evidence for effective workplace physical activity interventions is currently available, the potential for workplaces to encourage physical activity remains large. The potential effect of any workplace intervention is more likely to be part of the role of large-scale workplaces rather than small employers. Travel to work incentives that encourage walking or cycling plus the use of public transport rather than car use are part of existing national policy. Financial incentives for companies that provide exercise and recreational facilities may warrant further investigation. A large number of big employers are developing and implementing 'green travel plans' and as yet these schemes remain largely underevaluated.

Older adults (50+)

Research recommendations

Research is needed to test effective interventions from the US in the UK context. In particular the interventions will need to assess the individual needs of the older person and offer safe and appropriate exercise prescriptions that can be achieved through home- or group-based activities. As the functional capacities of adults aged 50 years and over vary so widely, interventions will need to be tailored to these capacities rather than simply chronological age. Little is understood about the recruitment of older people to physical activity programmes or the appropriateness of current physical activity recommendations for older populations. The studies reported in this section were intensive and only reached a small number of older people. Further research is needed to reach the increasing number of sedentary older people, who are the largest proportion of the inactive population. No cost effectiveness data of these interventions has been established.

Policy recommendations

Identifying and recruiting older adults suitable for participation in exercise programmes represents a significant challenge:

- Establishing the safety of exercise prior to participation is likely to require the input of medical personnel. Also, the exercise prescription will require suitably qualified personnel (Department of Health, 2001d)
- These concerns, along with providing appropriate classes and the necessary support and maintenance, will require a combination of statutory and voluntary organisations
- The training and resources needed for appropriate exercise personnel to deliver group and encourage home-based programmes is unknown and warrants further exploration
- The efficiency of present provision and the impact of existing older people's physical activity programmes remains unevaluated and unexplored.

Adults from black and ethnic minority groups

Research recommendations

As the effectiveness of interventions aimed at adults from black and minority ethnic groups (due to a lack of data/interventions) remains unclear, future research should focus on developing a better understanding of the particular needs of each ethnic group. Primary research is required to develop appropriate opportunities for physical activity that are culturally sensitive. We urgently need UK-based research on physical activity in our main ethnic minority groups (ie south Asian, African-Caribbean and Chinese populations).

Policy recommendations

Present policy encourages physical activity providers and programmes to be inclusive of ethnic minorities. Many sports and physical activity development officers and local health development workers have good links with local ethnic minority groups. The process and impact of their work in recruiting men and women for physical activity remains unexplored. Resources and training for current leisure providers in working with ethnic minority groups should be sustained and encouraged.

Adults with physical limitations

Research recommendations

Each of the groups identified with physical limitations (arthritis, low back pain, chronic obstructive pulmonary disease and cystic fibrosis) are different and need appropriate individualised exercise prescriptions. Future research should cover a range of physical activity interventions including physical activity as a treatment option for chronic conditions to physical activity as a lifestyle intervention.

Policy recommendations

Providing opportunities for physical activity in the community for people with physical limitations should remain a priority. Access to buildings should include transport to the building as well as physical access. Resources and training for current leisure providers in working with people with physical limitations should be sustained and encouraged (Department of Health, 2001d).

Conclusions

An important finding from this report is that relative brief interventions, typically consisting of one short occasion of tailored advice with some follow-up, can lead to at least short-term changes in physical activity. Less is known about how to help people maintain changes in physical activity that might lead to future health benefits.

The identified effective interventions are heterogeneous, making consistent advice on policy difficult. However, the effective interventions share a number of common attributes:

- Individualised advice for behaviour change delivered verbally with written support
- Setting goals for behaviour change
- Self-monitoring
- Explore cognitive and behavioural factors associated with behaviour change including beliefs about the costs and benefits of physical activity, reinforcement of changes in physical activity, perception of the health risks of physical inactivity, confidence to engage in physical activity
- Ongoing verbal support
- Intervention follow-up
- Promote moderate intensity activity such as walking
- Not dependent on attendance at a facility.

The evidence base for policy recommendations in the UK is still sparse. There is an urgent need to conduct research into the effectiveness of interventions, particularly within socially excluded sectors of the population who have the highest prevalence of physical inactivity.

References

- Ashenden, R., Silagy, C. and Weller, D. (1997). A systematic review of the effectiveness of promoting lifestyle change in general practice. *Family Practice* 14: 160-76.
- Berlin, J. A. and Colditz, G. A. (1990). A meta-analysis of physical activity in the prevention of coronary heart disease. *American Journal of Epidemiology* 132: 639-46.
- Centres for Disease Control and Prevention (2001). Increasing physical activity: a report on recommendations of the Task Force on Community Preventive Services. *Morbidity and Mortality Weekly Report* 50 (RR18): 1-16.
- Department of Health (1996). *Strategy Statement on Physical Activity*. London: Department of Health.
- Department of Health (1999). *National Service Framework for Mental Health*. London: Stationery Office.
- Department of Health (2000a). *Health Survey for England 1998*. London: Stationery Office
- Department of Health (2000b). *National Service Framework for Coronary Heart Disease*. London: Department of Health.
- Department of Health (2000c). *The NHS Cancer Plan*. London: Stationery Office.
- Department of Health (2001a). *The NHS Plan: a plan for investment, a plan for reform*. London: Stationery Office.
- Department of Health (2001b). *National Service Framework for Diabetes*. London: Stationery Office.
- Department of Health (2001c). *National Service Framework for Older People*. London: Stationery Office.
- Department of Health (2001d). *Exercise referral systems: a national quality assurance framework*. London: Department of Health.
- Department of Health (forthcoming, 2004). Chief Medical Officer's Report: Physical Activity and Health. London: Stationery Office.
- Dishman, R. K., Oldenburg, B., O'Neal, H. and Shephard, R. J. (1998). Worksite physical activity interventions. *American Journal of Preventive Medicine* 15: 344-61.
- Dunn, A. L., Andersen, R. E. and Jakicic, J. M. (1998). Lifestyle physical activity interventions. History, short- and long-term effects, and recommendations. *American Journal of Preventive Medicine* 15: 398-412.
- Eakin, E. G., Glasgow, R. E. and Riley, K. M. (2000). Review of primary care-based physical activity intervention studies: effectiveness and implications for practice and future research. *Journal of Family Practice* 49: 158-68.
- Eaton, C. B. and Menard, L. M. (1998). A systematic review of physical activity promotion in primary care office settings. *British Journal of Sports Medicine* 32: 11-6.
- Hillsdon, M. and Thorogood, M. (1996). A systematic review of physical activity promotion strategies. *British Journal of Sports Medicine* 30: 84-9.
- Huang, Y., Macera, C. A., Blair, S. N., Brill, P. A., Kohl, H. W. 3rd and Kronenfeld, J. J. (1998). Physical fitness, physical activity, and functional limitation in adults aged 40 and older. *Medicine and Science in Sports and Exercise* 30: 1430-5.

Kelly, M. and Speller, V. (2003). *Moving towards evidence based practice: the work of the Health Development Agency*. London: Health Development Agency. www.hda.nhs.uk/evidence/EIP_Jan03.pdf

King, A. C., Rejeski, W. J. and Buchner, D. M. (1998). Physical activity interventions targeting older adults. A critical review and recommendations. *American Journal of Preventive Medicine* 15: 316-33.

Lawlor, D. A. and Hanratty, B. (2001). The effect of physical activity advice given in routine primary care consultations: a systematic review. *Journal of Public Health Medicine* 23: 219-26.

Millward, L. M., Morgan, A. and Kelly, M. P. (2003). *Prevention and reduction of accidental injury in children and older people. Evidence briefing*. London: Health Development Agency.

Simons-Morton, D. G., Calfas, K. J., Oldenburg, B. and Burton, N. W. (1998). Effects of interventions in health care settings on physical activity or cardiorespiratory fitness. *American Journal of Preventive Medicine* 15: 413-30.

Taylor, W. C., Baranowski, T. and Young, D. R. (1998). Physical activity interventions in low-income, ethnic minority, and populations with disability. *American Journal of Preventive Medicine* 15: 334-43.

Thorogood, M., Hillsdon, M. and Summerbell, C. (2001). Changing behaviour. In: *Clinical Evidence: a compendium of the best available evidence for effective health care* 6: 31-49. British Medical Journal Publishing Group.

US Department of Health and Human Services (1996). *Physical activity and health: a report of the Surgeon General*. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

Vuori, I. M., Oja, P. and Paronen, O. (1994). Physically active commuting to work: testing its potential for exercise promotion. *Medicine and Science in Sports and Exercise* 26: 844-50.

APPENDIX 1

Search strategy

October 2001

Interventions to encourage physical activity

Limits

English language only

1996 to date

Human

NOT developing countries

Database checklist

	Version/service	File name
Cochrane Library	2001/3	Clib1.txt Clib2.txt Clib3.txt
DARE admin database	26/10/01	Dare.txt
'Wider Public Health' report	26/10/01	Wph1.htm Wph2.htm Wph3.htm
TRIP	26/10/01	Trip1.htm
HTA database	26/10/01	Hta.htm
SIGN	26/10/01	Sign40.pdf Sign8.pdf
Health Evidence Bulletins Wales	26/10/01	None
National Guideline Clearinghouse	26/10/01	Cg1.htm Cg2.htm Cg3.htm Cg4.htm Cg5.htm
NCCHTA website	26/10/01	Ncchta1.htm
NICE web pages	26/10/01	None
REFER	26/10/01	Refer1.htm
National Research Register	Issue 2001/3	Nrr1.txt Nrr2.txt
Clinical Evidence	Issue 4	photocopy
EMBASE (last five years)	26/10/01	Embase.txt
PsycINFO (2001)	31/10/01	Psychphys.txt
Sociological Abstracts	26/10/01	Socabs.txt

NOTES

Some search interfaces are relatively unsophisticated and extensive strategy searching is not possible. In those cases a range of high-level terms will be identified and used to search the resources, or publications lists will be scanned (for example with NCCHTA and SIGN websites). As far as possible results are supplied in a tagged format that can be loaded into Reference Manager. This, however, may be more problematic when dealing with web pages and pdf files. These will be copied via email to HDA.

Search terms

Searching notes:

This search has not looked systematically for reviews on the effectiveness of physical activity as an intervention for overall health and specific health problems. However, some reviews that cover those topics but may also have some treatment of the issue of encouragement and maintenance of activity have been included.

1 Cochrane Library (2001/3) (searched 19/10/01)

1. (((((PROMOT* or UPTAKE) or ENCOURAG*) or INCREAS*) or START) NEAR (PHYSICAL next ACTIVITY))
2. (((((PROMOT* or UPTAKE) or ENCOURAG*) or INCREAS*) or START) near EXERCISE)
3. (((((PROMOT* or UPTAKE) or ENCOURAG*) or INCREAS*) or START) near (((AEROBICS or CIRCUITS) or SWIMMING) or AQUA*))
4. (((((PROMOT* or UPTAKE) or ENCOURAG*) or INCREAS*) or START) near ((JOGGING or RUNNING) or CYCLING))
5. (((((PROMOT* or UPTAKE) or ENCOURAG*) or INCREAS*) or START) NEAR (((KEEP next FIT) OR (FITNESS NEXT CLASS*)) OR YOGA))
6. (((((PROMOT* or UPTAKE) or ENCOURAG*) or INCREAS*) or START) near WALKING)
7. (((((IMPROV* or PROMOT*) or ENCOURAG*) or INCREAS*) or ENHANCE*) near FITNESS)
8. (((((#1 or #2) or #3) or #4) or #5) or #6) or #7)
9. (((((PROMOT* or UPTAKE) or ENCOURAG*) or INCREAS*) or START) near SPORT*)
10. (((DECREAS* or REDUC*) or DISCOURAG*) near (SEDENTARY or DESKBOUND))

((#8 or #9) or #10)

11. EXERCISE*:ME

12. PHYSICAL-FITNESS*:ME

13. HEALTH-PROMOTION*:ME

14. HEALTH-EDUCATION*:ME

15. (#12 or #13)

16. (#14 or #15)

17. (#16 and #17)

18. (#11 or #18)

Cochrane reviews are saved in clib1.txt, protocols in clib2.txt and DARE abstracts in clib3.txt

2 DARE admin database (searched 26/10/01)

s physical(w)activity or exercise or aerobics or circuits
s swimming or aqua\$ or jogging or running or cycling
s keep(w)fit or fitness(w)class\$ or yoga or walking
s fitness or sport or sports or sedentary or deskbound
s s1 or s2 or s3 or s4
s 1993/dat or 1994/dat or 1995/dat
s s5 and not s6

Results saved in file dare.txt

3 'Wider Public Health' Report (searched 26/10/01) www.york.ac.uk/inst/crd/wph.htm

Chapter on CHD and stroke has sections on exercise promotion. Saved in file wph1.htm

Chapter on MENTAL HEALTH: Social and economic interventions has sections on exercise. Saved as file wph2.htm

Chapter on EDUCATION: Health Promotion – General effectiveness of health education/health promotion has sections on health promotion in different environments including the workplace. Saved as wph3.htm

4 TRIP (www.tripdatabase.com) (searched 26/10/01)

physical activity

exercise

aerobics or circuits or swimming or aqua

jogging or running or cycling or fitness or yoga

walking or sport or sedentary or deskbound

One record was saved as trip1.htm

5 HTA database (<http://nhscrd.york.ac.uk/>) (searched 26/10/01)

Note: Truncation is automatic.

physical activity or exercise or aerobics or circuits or swimming or aqua

jogging or running or cycling or fitness or yoga or walking or sport or sedentary or deskbound

Records saved in file hta.htm

6 SIGN (www.sign.ac.uk/guidelines/published/index.html) (searched 26/10/01)

Lipids and the primary prevention of coronary heart disease.

Document saved as sign40.pdf

Obesity in Scotland: integrating prevention with weight management. Document saved as sign8.pdf

7 Health Evidence Bulletin Wales (searched 26/10/01)

There is a bulletin on cardiovascular disease primary prevention but it says little on successful promotion of exercise.

8 National Guidelines Clearinghouse (www.guideline.gov/index.asp)

'physical activity'

exercise

fitness

sedentary

housebound

aerobics or circuits or swimming or aqua or jogging or running or cycling or fitness or yoga or walking or sport

Potentially relevant items saved as files cg1.htm, cg2.htm, cg3.htm, cg4.htm and cg5.htm

9 NCCHTA (www.hta.nhsweb.nhs.uk) (searched 26/10/01)

Health promoting schools and health promotion in schools: two systematic reviews, 1999; 3 (22). Executive summary saved as ncchta1.htm

10 NICE (www.nice.org.uk/nice-web) (searched 26/10/01)

exercise
physical activity
sport
sedentary or deskbound
aerobics or circuits or swimming or aqua or jogging or running
or cycling or fitness or yoga or walking or sport

No records were retrieved.

11 REFER (www.doh.gov.uk/research/rd3/information/findings.htm#refer) (searched 26/10/01)

exercise or physical activity or sport or sedentary or deskbound
or aerobics or circuits or swimming or aqua or jogging or
running or cycling or fitness or yoga or walking or sport

Exercise and health. (HB32) saved as refer1.htm

12 National Research Register (Issue 2001/3)

((((EXERCISE or AEROBICS) or CIRCUITS) or SWIMMING) or AQUA*)
(JOGGING or RUNNING) or CYCLING)
(((FITNESS or YOGA) or WALKING) OR (KEEP next FIT))
(PHYSICAL next ACTIVITY)
((SPORT or SEDENTARY) or DESKBOUND)
(((#1 or #2) or #3) or #4) or #5)
EXERCISE*:ME
PHYSICAL-FITNESS*:ME
(HEALTH-EDUCATION*:ME or HEALTH-PROMOTION*:ME)
(#7 or #8)
(#9 and #10)
(#6 or #11)
(((REVIEW or OVERVIEW) or META-ANALY*) or METAANALY*)
OR (META next ANALY*)
(#12 and #13)

Two records were saved in files nrr1.txt and nrr2.txt

13 Clinical Evidence (issue 4)

Pages 24-26 (copied and attached) explain which interventions
increase physical activity in sedentary people.

14 EMBASE (searched on Datastar 26/10/01)

1. ((PROMOT\$ OR UPTAKE OR ENCOURAG\$ OR INCREAS\$ OR START) NEAR (PHYSICAL ADJ ACTIVITY))
2. (PROMOT\$ OR UPTAKE OR ENCOURAG\$ OR INCREAS\$ OR START) NEAR EXERCISE
3. (PROMOT\$ OR UPTAKE OR ENCOURAG\$ OR INCREAS\$ OR START) NEAR (AEROBICS OR CIRCUITS OR SWIMMING OR AQUA\$)
4. (PROMOT\$ OR UPTAKE OR ENCOURAG\$ OR INCREAS\$ OR START) NEAR (JOGGING OR RUNNING OR CYCLING)
5. (PROMOT\$ OR UPTAKE OR ENCOURAG\$ OR INCREAS\$ OR START) NEAR ((KEEP ADJ FIT) OR (FITNESS ADJ CLASS\$) OR YOGA)
6. (PROMOT\$ OR UPTAKE OR ENCOURAG\$ OR INCREAS\$ OR START) NEAR WALKING
7. (PROMOT\$ OR UPTAKE OR ENCOURAG\$ OR INCREAS\$ OR START) NEAR SPORT\$
8. (DECREAS\$ OR REDUC\$ OR DISCOURAG\$) NEAR (SEDENTARY OR DESKBOUND)
9. 1 2 3 4 5 6 7 8
10. PHYSICAL-ACTIVITY#.DE.
11. EXERCISE#.DE.
12. HEALTH-EDUCATION#.DE.
13. (10 or 11) and 12
14. 9 or 13
15. META-ANALYSIS
16. METAANALYS\$.TI,AB.
17. META-ANALYS\$.TI,AB.
18. META ADJ ANALYS\$.TI,AB.
19. COCHRANE.TI,AB.
20. (REVIEW\$ OR OVERVIEW\$).TI.
21. PT=REVIEW
22. (SYNTHES\$ WITH (LITERATURE\$ OR RESEARCH\$ OR STUDIES OR DATA)).TI,AB.
23. (POOLED ADJ ANALYS\$).TI,AB.
24. (MEDLINE OR MEDLARS OR EMBASE OR CINAHL OR SCISEARCH OR PSYCHINFO OR PSYCINFO OR PSYCHLIT OR PSYCLIT).TI,AB.
25. ((HAND OR MANUAL OR DATABASE\$ OR COMPUTER\$) WITH SEARCH\$).TI,AB.
26. ((ELECTRONIC OR BIBLIOGRAPHIC\$) WITH (DATABASE\$ OR DATA BASE\$)).TI,AB.
27. ((REVIEW\$ OR OVERVIEW\$) WITH (SYSTEMATIC\$ OR METHODOLOGIC\$ OR QUANTITATIV\$ OR RESEARCH OR LITERATURE\$ OR STUDIES OR TRIAL\$ OR EFFECTIVE OR EFFECTIVENESS)).AB.
28. 15 16 17 18 19 20 21 22 23 24 25 26 27
29. 14 and 28
30. ..limit/lg=en

31. africa#.de.
32. asia#.de.
33. south-america#.de.
34. 31 32 33
35. 30 not 34

Results are saved in the file embase.txt

15 Sociological Abstracts (searched on Datastar 26/10/01)

1. ((PROMOT\$ OR UPTAKE OR ENCOURAG\$ OR INCREAS\$ OR START) NEAR (PHYSICAL ADJ ACTIVITY))
2. (PROMOT\$ OR UPTAKE OR ENCOURAG\$ OR INCREAS\$ OR START) NEAR EXERCISE
3. (PROMOT\$ OR UPTAKE OR ENCOURAG\$ OR INCREAS\$ OR START) NEAR (AEROBICS OR CIRCUITS OR SWIMMING OR AQUA\$)
4. (PROMOT\$ OR UPTAKE OR ENCOURAG\$ OR INCREAS\$ OR START) NEAR (JOGGING OR RUNNING OR CYCLING)
5. (PROMOT\$ OR UPTAKE OR ENCOURAG\$ OR INCREAS\$ OR START) NEAR ((KEEP ADJ FIT) OR (FITNESS ADJ CLASS\$) OR YOGA)
6. (PROMOT\$ OR UPTAKE OR ENCOURAG\$ OR INCREAS\$ OR START) NEAR WALKING
7. (PROMOT\$ OR UPTAKE OR ENCOURAG\$ OR INCREAS\$ OR START) NEAR SPORT\$
8. (DECREAS\$ OR REDUC\$ OR DISCOURAG\$) NEAR (SEDENTARY OR DESKBOUND)
9. PHYSICAL-FITNESS.DE.
10. HEALTH-EDUCATION.DE.
11. 1 2 3 4 5 6 7 8
12. 9 AND 10
13. 11 OR 12
14. ..LIMIT YEAR >1995
15. ..LIMIT LG=EN

Results are saved in the file socabs.txt

16 PsycInfo (SilverPlatter version was searched on records added in updates during 2001; Earlier record should form part of the DARE admin database)

"Physical-Fitness" in DE
 explode "Exercise"
 #1 or #2
 "Health-Promotion" in DE

"Lifestyle-Changes" in DE
 explode "Health-Education"
 #4 or #5 or #6
 #3 and #7
 ((promot* or uptake or encourag* or increas* or start) with (physical activity)) in ti,ab
 ((promot* or uptake or encourag* or increas* or start) with (exercise)) in ti,ab
 ((promot* or uptake or encourag* or increas* or start) with (aerobics or circuits or swimming or aqua*)) in ti,ab
 ((promot* or uptake or encourag* or increas* or start) with (jogging or running or cycling)) in ti,ab
 ((promot* or uptake or encourag* or increas* or start) with (keep fit or fitness class*)) in ti,ab
 ((promot* or uptake or encourag* or increas* or start) with (yoga or walking or fitness)) in ti,ab
 ((promot* or uptake or encourag* or increas* or start) with (sport)) in ti,ab
 (decreas* or reduc* or discourag*) with (sedentary or deskbound)
 #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16
 #8 or #17
 #18 and (LA = "ENGLISH")
 #19 and (UD > "20001227")
 meta analy* in ti,ab
 metaanaly* in ti,ab
 (synthes* with (literature* or research* or studies or data)) in ti,ab
 (review or overview) in ti
 (review or overview) in ab
 (systematic* or methodologic* or quantitative or research* or literature* or studies or trial* or effective*) in ab
 (medline or medlars or embase or scisearch) in ab
 pooled analys*
 (data with pool with studies) in ti,ab
 ((hand or manual or computer or electronic or database) and search*) in ti,ab
 ((electronic* or bibliographic*) with database) in ti,ab
 (peto or der simonian or dersimonian or fixed effect*) in ti,ab
 "Literature-Review" in DE
 "Meta-Analysis" in DE
 exact{LITERATURE-REVIEW-RESEARCH-REVIEW} in PT
 exact{META-ANALYSIS} in PT
 #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36
 #20 and #37
 #38 and (PO = "HUMAN")

Results were saved in the file psychphys.txt

APPENDIX 2

HDA Evidence Base – critical appraisal tool

Authors: _____

Title: _____

Source: _____

Relevance to topic			
Does this paper address your topic area?	Yes	No	Unsure
Circle the type of paper:			
• Systematic review			
• Meta-analysis			
• Synthesis			
• Literature review			
• Other review (please specify)			
Does it address (circle as appropriate)?			
• Effectiveness (interventions and treatments)			
• Causation			
• Monitoring and surveillance trends			
• Cost			
• Other (please specify)			
Transparency			
Does the paper have a clearly focused aim or research question?	Yes	No	Unsure
Consider whether the following are discussed:			
• The population studied	Yes	No	Unsure
• The interventions given	Yes	No	Unsure
• The outcomes considered	Yes	No	Unsure
• Inequalities	Yes	No	Unsure
Systematicity			
Do the reviewers try to identify all relevant English language studies?	Yes	No	Unsure
Consider whether details are given for:			
• Databases searched	Yes	No	Unsure
• Years searched	Yes	No	Unsure
• References followed up	Yes	No	Unsure
• Experts consulted	Yes	No	Unsure
• Grey literature searched	Yes	No	Unsure
• Search terms specified	Yes	No	Unsure
• Inclusion criteria described	Yes	No	Unsure
Is it worth continuing?	Yes	No	
Why/why not?			

Quality			
Do the authors address the quality (rigour) of the included studies? Consider whether the following are used:	Yes	No	Unsure
• A rating system	Yes	No	Unsure
• More than one assessor	Yes	No	Unsure
If study results have been combined, was it reasonable to do so? Consider whether the following are true:	Yes	No	Unsure
• Are the results of included studies clearly displayed?	Yes	No	Unsure
• Are the studies addressing similar research questions?	Yes	No	Unsure
• Are the studies sufficiently similar in design?	Yes	No	Unsure
• Are the results similar from study to study (test of heterogeneity)?	Yes	No	Unsure
• Are the reasons for any variation in the results discussed?	Yes	No	Unsure
What is the overall finding of the review? Consider: • How the results are expressed (numeric – relative risks, etc) • Whether the results could be due to chance (<i>p</i> -values and confidence intervals)			
Are sufficient data from individual studies included to mediate between data and interpretation/conclusions?	Yes	No	Unsure
Does this paper cover all appropriate interventions and approaches for this field (within the aims of the study)? If no, what?	Yes	No	Unsure
Relevance to UK			
Can the results be applied/are generalisable to a UK population/population group?	Yes	No	Unsure
• Are there cultural differences from the UK?	Yes	No	Unsure
• Are there differences in healthcare provision with the UK?	Yes	No	Unsure
• Is the paper focused on a particular target group (age, sex, population sub-group etc)?	Yes	No	Unsure
Accept for inclusion onto HDA Evidence Base?	Yes	No	Refer to third party
Additional comments			

Notes