NIHR HTA Programme

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The NIHR Evaluation, Trials and Studies Coordinating Centre (NETSCC), based at the University of Southampton, manages evaluation research programmes and activities for the NIHR

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I. PROJECT TITLE: A multi-centre randomised controlled trial comparing the effectiveness of enhanced motivational interviewing with usual care for reducing cardiovascular risk.

II. HOW THE PROJECT HAS CHANGED SINCE THE OUTLINE PROPOSAL WAS SUBMITTED

1. Additional co-investigators: Peter Whincup, Professor of Cardiovascular epidemiology, St George's University of London to add expertise in clinical epidemiology in cardiovascular disease and its risk factors as these are our main outcomes; and Nicole de Zoysa, clinical health psychologist King's College Hospital, to strengthen expertise in health psychology and training of health trainers.
2. Increase in sample size from 1,314 to 1704 as a) power of study increased to 90% as recommended by the HTA b) we have now adjusted for partial clustering in group intervention; and c) we have reduced the effect sizes to capture modest changes that are relevant at a population level as well as individual level and d) decreased significance level to control for multiple testing.
3. Change of primary hypotheses to be more closely aligned to the commissioning brief which is to reduce weight, increase physical activity and improve diet in those at high of cardiovascular disease.
4. Intensity of treatment reduced -to 10 sessions of shorter duration (in individual arm) over 12 months- to keep costs to minimum, to focus on building momentum of therapy, to make intervention more translational, and encourage participation.
5. Role of third sector changed to supervision and collaboration as government policy changes have reduced the funding for Thamesreach and they are unable to offer substantial resources at present.
6. Costs have increased by 50% to research costs of ~£2m-this is because the sample size has increased, we have included extra co-investigators, we have improved the quality of measurement of outcome measures and we have increased the number of health trainers and research workers so that the study can start and finish in a timely manner.
7. Stratification: the randomisation will take place after stratifying by practice and then by ethnicity (white versus African/Caribbean/South Asian/Chinese) and no longer stratifying by Primary Care Trust (PCT) level. This is as a result of our feasibility work (discussions with Public Health leads for each PCT) who identified that there was marked variation in the implementation of Health Checks and uptake by GPs.
8. Usual care: our feasibility work also identified that GPs would not welcome additional workload such as completing a standardised module on the management of risk factors for cardiovascular disease (CVD) so we have removed this. Lack of standardisation of usual care will be now addressed by randomisation within practice.
9. Milestones: the HTA suggested we were optimistic and we agree. We have increased the recruitment period to 12 months but have still been able to keep within the 4 years.

Since the conditional offer was made:
Since funding conditionally awarded we have made changes to the exclusion criteria to incorporate the feedback of the referees and increase the generalisability of the study findings. The revised exclusion criteria are: established CVD disease; severe mental illness such as psychosis, learning disability, dementia and cognitive impairment; registered blind; housebound or resident in nursing home; unable to move about independently; > 3 falls in past year; pregnancy, and advanced cancer; morbid obesity BMI >50 kg/m2; current participation in a weight loss programme. When in doubt we will seek the GP opinion and approval.
We have also increased the Patient Public Involvement (PPI) component by recruiting patient researchers who will be required to help improve the components of the intervention, network within local communities and provide local information. Whilst we will not be able to provide them with a salary they will receive training and an honorarium.

III. PLANNED INVESTIGATION

1: Research Objectives

The overall aim is to compare in a randomized controlled trial the effectiveness and cost-effectiveness of two formats of an enhanced motivational interviewing intervention, group and individual, with usual care, in reducing weight and increasing physical activity in people at high risk of cardiovascular disease over a 24 months follow up.

Primary objective:
To examine whether group enhanced motivational interviewing delivered by health trainers is more

effective than usual care in reducing weight and increasing physical activity 24 months later.

Secondary objectives:

a) secondary hypotheses:

i: to examine whether individual enhanced motivational interviewing delivered by health trainers is more effective than usual care in reducing weight loss or increased physical activity 24 months later

ii: to examine whether group enhanced motivational interviewing is more cost-effective than individual motivational interviewing, and usual care, in terms of quality-adjusted life years gained over the 24 month follow-up period

iii; to examine whether individual and group enhanced motivational interviewing delivered by health trainers are more effective than usual care in reducing the cardiovascular disease risk score.

b) to develop a manual based on motivational interviewing enhanced by a set of operationalised and highly teachable behaviour change techniques particularly around maintenance of healthier behaviours.

c) to conduct a process evaluation:

i: to determine the relative strengths between the different component parts of the enhanced motivational interviewing intervention

ii: to assess the fidelity of the intervention using rating scales and thematic contents analysis of sessions.

2: Existing Research

Epidemiology of cardiovascular disease and its risk factors

Cardiovascular disease (CVD) is the most common cause of death (and premature death), morbidity and disability in middle-aged and older people both in the UK and in other developed countries. In the UK it accounts for 22% of all male deaths and 16% of all female deaths. The commonest form of CVD, coronary heart disease (CHD), accounts for 94,000 deaths in the UK each year. Cardiovascular disease is highly preventable. Many of the major determinants of CVD are modifiable, including cigarette smoking, a diet high in saturated fat, obesity, sedentary lifestyle, hypertension and diabetes.[1-4] The risks of CVD vary markedly between ethnic groups. In England and Wales, compared with the general population, mortality from coronary heart disease is 50% higher in South Asians and is 50% lower in Africans and Caribbeans whereas mortality from cerebrovascular disease is highest in Africans and Caribbeans and higher in South Asians when compared with Europeans.[5]

Although CVD remains the most common cause of death in developed nations, mortality rates have been falling, both for CHD and stroke. Between 1981 and 2000, CHD mortality in the UK fell by 62% in men and 45% in women).[6] Studies based on cohorts[7] and prediction models[6] suggested that falls in the prevalence of cigarette smoking and a decline in population blood pressure levels were important contributors to this decline. However, declines in non-HDL cholesterol (a major risk factor for CHD) were small, while physical activity levels showed no appreciable improvement and the prevalence of adiposity and obesity increased. Thus, while it is clear that population-wide changes in modifiable risk factors can bring about substantial benefits, recent changes in blood lipids (particularly non-HDL cholesterol) have been limited and rising levels of physical inactivity and obesity (and type 2 diabetes) have undermined rather than enhanced declines in CHD mortality.[6, 7] Further efforts are needed to bring about positive changes in these factors.

The evidence for dietary interventions

Systematic reviews of randomized controlled trials (RCT) of generic dietary advice interventions have generally found small effects compared with no or minimal advise in healthy adults on mean total cholesterol and LDL cholesterol levels and small reductions in blood pressure but HDL cholesterol and triglyceride levels were unchanged. Most studies were in the United States with a short average duration of 10 months.[8] Compared with usual care, dietary instruction interventions produce modest weight losses and these diminish over time.[9]

The evidence for increasing physical activity

Physical inactivity increases overall mortality and the risk of many diseases including CVD and diabetes.[10] The Department of Health advises adults to perform at least 30 minutes of at least moderate intensity physical activity on 5 or more days weekly, in at least 10 minute bouts, for optimum health benefits.[10] Moderate intensity activity makes one warm, increases breathing and heart rate, but still allows talking. Walking is the commonest of physical activity in adults and is promoted as a near perfect exercise as it has the lowest risk of harm and is now UK public health policy.[11 12]

In England 39% of men and 29% of women self-report achieving the recommended physical activity levels.[13] However objective assessment of physical activity using accelerometers in a sub-sample of the Health Survey for England found that only 5% of men and 4% of women aged 35 to 64 years and 5% men and 0% of women aged 65 years or more achieved the recommended levels.[13] A Cochrane review of 17 RCTs reported moderate positive short term increases in physical activity but findings were limited since most studies used self-report measures in motivated volunteers.[14] There is mounting evidence that the use of pedometers as a method of self monitoring aids can increase physical activity and improve health in the short term.[15] Social support and cognitive behaviour therapy (CBT) strategies rather than health education alone are now recommended in older adults.[16]

Multiple risk factor interventions

Several reviews and meta-reviews have repeatedly observed that interventions that target multiple modifiable risk factors (improving diets, decreasing weight and increasing physical activity) are more effective than targeting a single risk factor, if they target populations at high risk for CVD and use a psychological theoretical framework. The Cochrane Heart Group systematic review observed that techniques based on instruction and information such as workshops, lectures, provision of written material, assignments, shopping tours and cooking sessions were associated with small improvements in lipid levels and reducing blood pressure especially when embedded in a theoretical framework related to behaviour change.[17]

The evidence for motivational interviewing

Motivational interviewing (MI) pioneered behaviour change therapies.[18] It is designed to strengthen an individual's motivation and movement towards a specific goal by eliciting and exploring a person's own arguments for change. MI is characterized by 3 key theoretical constructs about communication: collaboration (as opposed to confrontation); evocation (as opposed to didactic reasoning) and patient autonomy (as opposed to authoritative style). The key skills in MI are the ability to express empathy (which includes understanding the patient's ambivalence towards changing behaviour), support self efficacy, roll with resistance and develop discrepancies between the patient's values and current behaviours. The appeal of MI is that it is brief, can be delivered by a range of health providers and has a competency framework. Systematic reviews and meta-analysis have consistently shown that MI techniques have a moderate effect on diet and exercise (effect sizes (d) of 0.53 standard deviations in 4 RCTs).[19] In another meta-analysis of RCTs, weight reduction had a significantly large pooled effect (d=0.72) with a smaller but still significant pooled association for reducing cholesterol (d=0.27) although the number of trials were few.[20]

The limitation of MI is that its effects can be short-lived. In an HTA funded RCT, we observed that MI alone was not associated with improved glycaemic control in people with type 1 diabetes but adding CBT skills to the MI intervention improved its effectiveness significantly.[21] During the process evaluation, we found that MI helped people to become more ready to change their behaviors but the change was less likely to be implemented without additional support.[22] However the evidence for enhancing MI with CBT is not consistent as the landmark Combine Study (Combined Pharmacotherapies and Behavioral Interventions for Alcohol Dependence) did not demonstrate increased abstinence in those receiving the psychological intervention.[23].

A taxonomy of behaviour change techniques

The epidemic of modifiable risk factors for CVD, and the limitations of current models of lifestyles interventions (mostly information giving or advice or brief motivational interviewing) in particular their short-term effects, is leading to a search for more sophisticated and targeted behavioural interventions.[24] For instance, systematic reviews of the components of behavioural interventions that appeared to be most effective in improving diet and physical activity were based on self regulatory behaviours such as goal setting, self monitoring, giving feedback, utilizing social support, and motivational interviewing. Interventions based on a psychological theory, such as the Theory of Planned Behaviour (TPB)[25] were more effective, as were those for high risk populations. There is less evidence to support the case for any minimum threshold of intensity, mode of delivery, intervention provider and setting.[17, 24, 26] Strategies to prevent relapses and to increase the maintenance of healthier lifestyles over longer periods remain poorly understood and understudied. Evaluating interventions in the context of a taxonomy of behaviour change techniques and an intervention map offer a framework that is easier to teach, test, replicate and translate.[25-27]

Cardiovascular risk

We will utilize pre-existing NHS techniques for identifying patients who are at high risk of developing cardiovascular risk. GP electronic patient record systems such as EMIS and VISION use the most up-to-date health check indices (smoking, age, ethnicity, cholesterol etc) in its calculation of CVD risk. In addition, we will seek to recruit patients who have received a high risk score using the NHS health check.

The NHS Health Checks programme is part of the Department of Health's long term vision for the future of public health in England.[28] It offer checks to all those aged 40 -74 years without a known diagnosis of vascular disease with the aim of primary prevention of heart disease, stroke, diabetes and kidney disease and reduce health inequalities. The risk assessment includes collection of demographic data, family history, smoking status, cholesterol, blood pressure and a diabetes filter using computerised risk engines such as QRISK, QRISK2 or the Framingham. An individualized management plan is then given according to the risk assessment to support lifestyle changes such as referral to smoking cessation, exercise prescriptions, lifestyle advice and signposting to local resources. Usual care does vary between the primary care trusts (PCTs) depending on local needs, priorities and resources.

The role of health trainers

A key tool in addressing health inequalities is the deployment of health trainers into the public health workforce. They are usually drawn from the local community they serve and trained in a variety of settings with national accreditation (www.nice.org.uk/Guidance/PH6). Health trainers'/**healthy lifestyle facilitators** roles include identifying clients from hard to reach, disadvantaged groups, work 1:1 with them to assess their lifestyle and wellbeing, identify problem areas, setting goals, supporting behaviour change and monitoring and review their clients' progress. Their potential to deliver more sophisticated interventions, including in a group format, has yet to be studied.[29]

Summary

The potential large benefits at the population level from further modest downshifts by modifying diets, reducing weight and increasing physical activity are considerable. Identifying the most effective intervention targeting lifestyle changes remains a challenge for researchers and policy makers. MI is an intervention that has broad appeal for its collaborative patient centred style, brevity, evidence base and deliverable by multiple providers. The effects of MI could be enhanced by embedding it into a taxonomy of specific health behaviour change techniques, such as setting personal goals, delivering skills via self guided materials, offering physical tools to self monitor such as pedometers, offering guidance and feedback.. The relative effectiveness of group versus individual remains uncertain but the former offers 'automatic' social support and may be more cost-effective. We propose to compare the effectiveness of 10 pre-specified behaviour change techniques (integrating MI with CBT and underpinned by the TPB and Social Cognitive theory) in improving diets, reducing weight and increasing physical activity in those at high risk of CVD over 24 months.

We propose to compare the effectiveness of 10 pre-specified behaviour change techniques in improving diets, reducing weight and increasing physical activity in those at high risk of CVD over 24 months in two format, group or individual, with usual care.

3: Research Methods

Design

This is a 3 parallel arm multi-centre randomised controlled trial for people screened as at high risk for CVD. As participants of the group enhanced motivational interviewing arm, but not in the other two arms, are clustered within groups we have a partially clustered (or nested) design. Randomisation will be stratified first by general practice and second by ethnicity (white and African/Caribbean/ south Asian/Chinese) within practice. The advantage of stratification is that it will ensure that variations in usual care at PCT and at practice level (such as use of different CVD risk engines) will be controlled for by design while ethnicity will also be reasonably well balanced between treatment groups. We will request International Standard Randomised Controlled Trial Number (ISRCTN) registration as part of the NIHR Portfolio studies.

Setting

The South London Health Innovation and Education Cluster (HIEC) will be used as the setting. We have chosen the HIEC because it includes 11 PCTs across South London (Bexley, Bromley, Croydon, Greenwich, Kingston, Lambeth, Lewisham, Richmond & Twickenham, Southwark, Sutton & Merton, Wandsworth) that are linked to each other by an educational and training infrastructure and inherent in this infrastructure is an efficient method for recruitment. To date, 10 PCTs have officially agreed to collaborate (see supporting documents). The south London HIEC has additional advantages: the population is nearly 3 million residents; nearly a quarter of the south London HIEC is either of African, Caribbean or South Asian, origin ensuring that these high risk groups for CVD are represented in the study population; it spans the range of population densities, urbanization and socioeconomic profiling; we will recruit from research naïve surgeries and this will increase their productivity and profile; the same framework can be reused for rapid dissemination of our findings; it will be cheaper than a multi-centre study across the UK as research resources can be shared across adjacent PCTs

during periods of varying workload; the same PCTs constitute the south London cardiac and stroke network (www.slcsn.nhs.uk) which is collaborating with this study. A limitation is that the south London sample may not be representative of the rest of the UK and not address the health inequalities between the north and south of the UK. However, there are many pockets of health inequalities within south London that mirror the rest of the UK and we are unique in being the only geographical setting that has significant proportions of Africans, Caribbeans and South Asians to address ethnicity in the design (http://data.london.gov.uk).

Target population

The case definition includes adults age 40-74 years who screen positive for high CVD risk on the NHS Health Checks, defined as having a 20% or higher chance of having a fatal or non fatal cardiovascular event over the next ten years and not known to have cardiovascular disease or to be on the diabetes, kidney, atrial fibrillation or stroke register. In the South London HIEC, all PCTS have/will be implementing the Health Checks by the end of 2011. There is little data available to estimate the size of the target population. We used the pilot data from Lambeth and Wandsworth which had 30% and 58% response rates respectively to their first wave of invitations giving an average response/uptake rate of 40%. We estimated that about a third of patients who do ultimately take up the invitation for a Health Check will have a CVD risk score of >20% bearing in mind that the risk increases markedly for the older adult. Based on an approximate 600,000 adults age 40-74 years registered in practices with list sizes **>5000k** within the HIEC and not on a disease register, then we estimate approximately 11,350 potentially eligible people per year to recruit from. Assuming a conservative participation rate of 25% into this study the target population is sufficiently large enough to achieve our sample size of ~1,700 participants.

Study criteria

The inclusion criteria are: being fluent in conversational English; permanent residents and planning to stay in the UK at least ¾ of year. In our local experience of conducting epidemiology and clinical trial studies, 5% of the African, Caribbean and South Asian population are itinerant which increases the risk of attrition, non-completion of the intervention and difficulty of measuring post-randomization factors.

The exclusion criteria are: established CVD disease; severe mental illness such as psychosis, learning disability, dementia and cognitive impairment; registered blind; housebound or resident in nursing home; unable to move about independently; > 3 falls in past year; pregnancy, and advanced cancer; morbid obesity BMI >50 kg/m2; current participation in a weight loss programme. When in doubt we will seek the GP opinion and approval.

Screening and recruitment

The sampling frame will be GP practices with list sizes greater than **5,000** patients. This represents around a quarter to third of all practices in the HIEC PCTs. To recruit patients from every practice in the HIEC is not cost beneficial as smaller practices are less likely to be operational with the Health Checks and to have fewer patients to recruit from. Unless there is a Health Checks register, patients with CVD score >20% risk will be identified by screening the databases using a search strategy based on a range of terms including READ codes which will be validated and tested for test-retest reliability before inception. The GP **or the health care provider completing the health check** will invite those who have a CVD risk score >20% to participate in the study and after the patient has given permission to be contacted a researcher will invite the patient into the study.

Baseline data

This will be collected prior to randomisation

Sociodemographic: data on age, gender, self-report ethnicity and migrant generation status, occupational status, educational attainment, marital status, literacy will be collected.

Biomedical: weight, height, body mass index, waist circumference, lipids and HbA1c. We are not measuring fasting glucose as it is not essential to the current diagnosis criteria for diabetes. Weight will be measured in light clothing, without shoes on the Class 3 Tanita SC240 weighing digital scale to 0.01 kg for weight and body fat composition. Height will be measured to 0.1 cm using using SECA stadiometers with the supported stretch stature method. These will be used to calculate body mass index (weight/height^2, kg/m^2).Waist circumference will be measured horizontally halfway between the lowest rib and the upper prominence of the pelvis using a non-extensible steel tape against the bare abdomen. Blood pressure and resting heart rate will be measured with the Omron 1025 digital BP monitors using standardised procedures of the average of 2 readings 1 minute apart while seated. The QRISK2 score will be the research measure of CVD risk.

Lifestyles:

i) smoking status: if current how many cigarettes/day, ex-smoker (for how many years) and never

smoked. We will collect and store blood samples for later measurement of cotinine levels.
ii) alcohol intake will be measured using the Alcohol Use Disorders Identification Test.[30]
iii) physical activity will be measured objectively using the Actigraph GT3X accelerometer, a tri-axial sensor movement sensor which also records step counts. The Actigraph instrument has been validated in comparison with doubly labeled water.[31] The participant and the outcome assessor are blind to the readings. Participants will be given verbal and written instructions: how to attach the accelerometer, to remove when sleeping or when it might get wet or during contact sports, to wear the accelerometer for seven consecutive days, and keep to their normal routine. Participants will be included in all analyses if they have completed at least four weekdays of accelerometer monitoring. We will ask participants to keep a log of activities including sedentary ones to assist with the qualitative interpretation of the data.
iv) dietary intake will be assessed using four approaches. A standardized multiple-pass 24-hour dietary recall will be carried out as it can be more objective and more reliable as a measure of change in intervention studies; data will be entered and nutrient intakes obtained using a standard validated computerized interview software programme. Researchers will be trained to follow a standardized protocol, ask neutral probing questions to encourage recall of food items, and taught about different methods of food preparations and brands in different cultures. Portion size will be assessed food photographs to estimate daily calorie intake.[32] The European Prospective Investigation of Cancer food frequency questionnaire will be used to collect information on usual intakes of a wide range of food items.[33] Total and non-HDL cholesterol will be measured as a proxy biomarker of change in dietary fat intake.

Psychological:
i) health beliefs about diet, exercise, perceptions of risk for developing CVD and related conditions will be measured by the Brief Illness Perception Questionnaire adapted for perception of risk.[34] Self-efficacy measures for diet and physical activity will be included as psychological processes we are seeking to change during the intervention.[35]
ii) depressive symptoms using the 9-item Patient Health Questionniare[36] as depression is associated with worse outcomes in CVD.[37]
iii) Health Foundation Segmentation model that measures people's psychological traits towards health behaviours which the Department of Health intends to apply to its future health promotion and social marketing programmes to support specific behaviours.[38]

Research workers will be trained in conducting standardised anthropometric measures with repeated training and supervision at quarterly intervals to ensure reliability. They will be trained by a dietician in the coding of different cultural foods and neutral probing techniques for improving recall. All equipment will be calibrated daily.

Randomisaton and allocation concealment

Randomisation of participants, stratified by practice and ethnicity, will be conducted by the data manager from an independent Clinical Trials Unit (King's College London) using a computer generated randomisation blocks of random sizes. Allocation concealment will be ensured as the randomisation list will be held in password-locked computer and ACCESS programme. The data manager can only reveal to himself and then the researcher the next allocation after entering the details of the next participant recruited. As this is a complex intervention, it is not possible to conceal to the allocation to the participants or the health trainers. Assessors and technicians will be blind to the allocation for the primary and secondary outcomes. There is a small inevitable risk that allocation will be revealed to the outcome assessors which we will aim to minimise by asking participants not to reveal their allocation.

Planned interventions

Group 1: Usual care

GPs participating in the surgery will be expecting to follow their local Health Check pathway for those who have a CVD risk score >20%.

Group 2: Usual care and group enhanced motivational interviewing

Theoretical framework:

The intervention will be based on TPB[39] for initiation of behaviour change. The TPB states that in order to change behaviour, people need to form an intention. Intention formation is influenced by three constructs: i) expected value or positive attitude (people see the value in making the change); ii) subjective norm (significant others and peers also value the change); iii) self efficacy (people believe they are capable of making the change).

Our intervention will tap into all three constructs using principles and techniques from MI[18], CBT[40] and social cognitive theory[41] (Figure 1). MI will be used to support participants in forming healthy intentions. MI is a directive focused non-judgemental person-centred counseling style that aims to work with resistance around behaviour change. It aims to support the commitment to change and the belief or self efficacy that change can happen.

Hobbs and Sutton highlight the gap between translating intention into action and illustrate how CBT can be applied to bridge this gap.[40] For this intervention, techniques from CBT will be used to support the transition from intention to action, and action to maintenance.[42] Identifying and challenging unhelpful thoughts or thinking styles can promote more positive emotions and behaviours (see angina plan at www.anginaplan.org.uk). For example,

'When I get breathless after some exercise (bodily sensation) this means I am going to damage my heart (incorrect cognition)' or

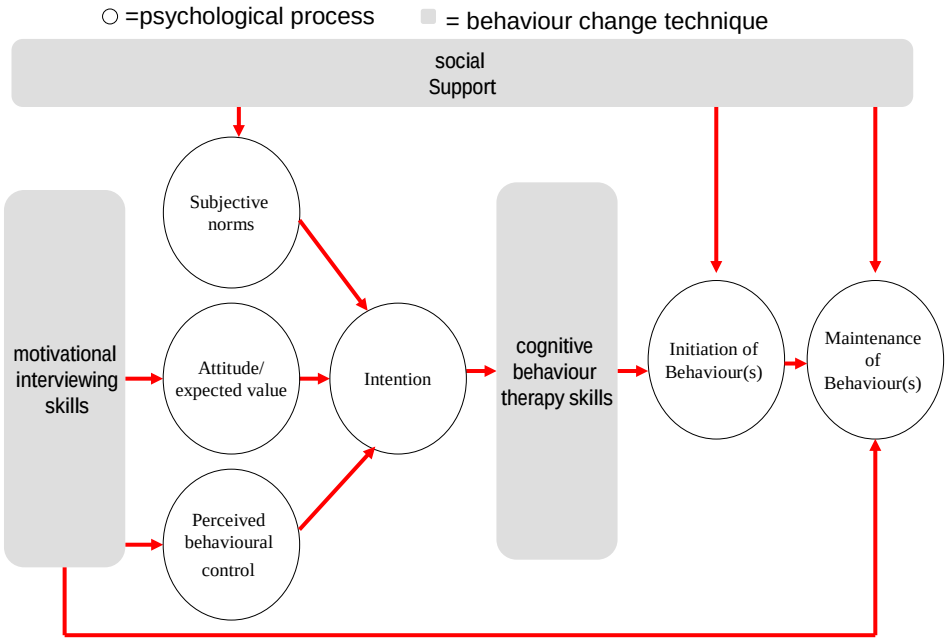
'I have eaten one doughnut (behaviour) –I might as well eat the whole bag (all or nothing cognition)'.

Social cognitive theory emphasizes the importance of significant others in shaping people's behaviours. The TPB also highlights this aspect through the 'subjective norm' construct. In our intervention, social networks from the participants own life and/or group members (in the group arm) will be actively utilized to provide practical and emotional support and opportunities for modeling health behaviours during all phases of the intervention.

Manual

We will conduct a scoping study to identify manuals published in English in the last 5 years for interventions that aim to improve diet and/or physical activity in the peer reviewed and grey literature. The aim is to map the quality, contents and cultural diversity of these manuals to inform the content of our intervention. The clinical psychologist will devise the intervention based on the synthesis of scoping study and on our expertise in developing lifestyles interventions. It will be piloted to a purposive group of 10 people with high risk of CVD using thematic content analysis of audiotaped sessions. We will use an iterative process to draft the manual and refine the technology over 2-3 cycles. The manual will be in two parts. Part 1 will be the training manual and the curriculum. It will contain the aims of, and rationale for, the intervention and the teaching methods to be used to train the health trainers: medical information on CVD and related disorders such as obesity and type 2 diabetes, and their risk factors; current medical management of these risk factors; description and training in 10 behaviour change techniques based on motivational interviewing skills training and from CBT and social cognitive theory.[27] Part 2 will be used by both the health trainer and the participant and constitutes the progamme of sessions; worksheets for each session with key learning points; a menu of self monitoring techniques; instructions on how to apply them eg pedometers; free text for individualized goal setting; and information about the nature, course and management of CVD and its risk factors. The literacy level of Part 2 will be set at around age 7 years.

Figure 1: Intervention map of enhanced motivational interviewing for CVD risk scores > 20%



Programme

The programme will consist of 10 sessions spread quarterly over 12 months. The intensive phase will consist of 6 weekly sessions at the beginning of the first quarter. The first 3 sessions will focus on physical activity and the second 3 sessions on diet. The maintenance phase will consist of 4 sessions delivered at 3, 6, 9 and 12 months. Each session will be structured to deliver a minimum amount of information using specific techniques. The contents will focus on early setting of new goals and early targeting of maintenance techniques. Those randomised to the group enhanced motivational interviewing will be encouraged to use the peer learning and peer support environment to facilitate change during the intensive phase and maintenance phase. Each group will have a maximum of 10-11 participants and sessions will last 90 minutes. The intervention will be delivered in local venues such as community halls and health centres. In between sessions and during the follow up participants will be encouraged to communicate with each other (in group arm) and health trainer (both individual and group). We will include novel methods and teaching aides to supplement the delivery of behaviour change techniques such as visual aids of food labels/cue cards, exercise demonstrations, video/audio material of patient testimonials, behavioural surveys, activity based learning around menu planning, cooking workshops. We will use a range of e-technology tools (mobile texts, social networking sites, skype, iPhone apps). At the last session, participants will be encouraged to send in self monitoring data during the second 12 months of follow up as they wish which will be followed up by tailored communication by the health psychologist. The 10 behaviour change techniques are categorized as: MI: i) active listening (verbal communication using Open questions, Affirmations, Reflections, Summaries (OARS) and non verbal communication); ii) managing resistance; iii) directing change; iv) supporting self-efficacy; v) elicit-provide-elicit (to check understanding of health information) and

CBT: vi) CBT formulation (highlighting role of thoughts in maintaining unhealthy behaviours); vii) goal setting; viii) behavioural experiments; ix) implementation intentions (the 'if…then…'situation); x) relapse prevention strategies such as concurrent recovery monitoring.

Table 1: Proposed programme of sessions

	INTENSIVE PHASE
SESSION 1: PHYSICAL ACTIVITY Week 1	Aim: introduce intervention + increase perceived value of making changes Examples of delivery: elicit patient view and increase motivation by reinforcing change talk;, instruction on use of pedometer; goal setting around activity
SESSION 2: PHYSICAL ACTIVITY Week 2	Aim: increase extrinsic reward (social context) & reduce intrinsic barriers Examples of delivery: enlisting social support in increasing physical activity; review pedometer feedback; prompt implementation intentions
SESSION 3: PHYSICAL ACTIVITY Week 3	Aim: To maintain physical activity changes Examples of delivery: Discuss lapse triggers such bad weather, muscle pains; prevention strategies such as self monitoring of progress; feedback; social support
SESSION 4: DIET Week 4	Aim: To increase perceived value of making dietary changes Examples of delivery: elicit-provide-elicit re benefits and missing information; instruction on use of food diaries; goal setting on dietary changes
SESSION 5; DIET Week 5	Aim: to support making activity changes in social context Examples of delivery: enlist social support -identifying family, friends and work colleagues to improve diets; instructions on cue cards
SESSION 6: DIET Week 6	Aim: To maintain dietary changes Examples of delivery: discuss relapse triggers such cravings, mood, stress and prevention strategies such as implementation intentions
	MAINTENANCE PHASE
SESSION 7 3 months	Aim: Feedback obstacles & rewards Examples of delivery: review of goals problem solving; implementation interventions; feedback via e-technologies

SESSION 8 6 months	Aim: Feedback obstacles & rewards Examples of delivery: review of goals problem solving; implementation interventions; feedback via e-technologies
SESSION 9 9 months	Aim: Feedback obstacles & rewards Examples of delivery: review of goals problem solving; implementation interventions; feedback via e-technologies
SESSION 10 12 months	Aim: to plan long term maintenance of lifestyle changes Examples of delivery: social support such as tailored communications; maintenance contract for long term change; feedback on self monitoring

Training the health lifestyle facilitator

The **healthy lifestyle facilitator** will be at NHS Band 3 level. They will be employed by King's College Hospital and seconded as appropriate to the PCT. We will recruit 8 full time equivalent **healthy lifestyle facilitators** (approximately 1 per PCT) **for one year full time and one year part time**. We will aim to attract local people such as established volunteer health trainers or people with CVD and embed the intervention into the community. The training programme will last 2-3 months full time. The teaching techniques we will use to train the health trainers will be mostly practical with role play, observe training videos, working though case scenarios, supervision of training cases, audio-visual feedback using Smartyoutube, working individually and in groups, rating scales for self-supervision and for competency, and training by Thamesreach on signposting to local social welfare resources. They will be given a group of 5-10 patients to deliver the first 6 intensive sessions and receive individual supervision by clinical psychologist (NDZ). The health trainer will be ready to administer the intervention when they have achieved competency in MI.[43] **Healthy lifestyle facilitators (HLFs)** will be expected to offer sessions between 8am -9pm as flexibility to participants in full time work or have carer roles. Cultural and religious awareness will be built in. During the intensive phase, weekly supervision will be given in groups of 5 health trainers where caseload and contents of sessions will be reviewed by the health psychologist (KW) with the aim of checking adherence to the manual and this will become monthly supervision during the maintenance phase. We will adapt existing competency frameworks for behaviour change techniques to this study.[44-46] There will be a protocol for redlining if the health trainer falls below the performance criteria for protocol adherence s/he is prohibited from taking on new cases until adherence can be demonstrated to improve.[44]

Group 3: Usual care and individual enhanced motivational interviewing

This will have the same components as group 2 but the components will be delivered individually. There will be no opportunity/expectation/guidance for participants to form groups with each other in between sessions. Sessions will last 30 minutes. We have kept the number of sessions the same and reduced the duration of each session to approximately match for attention in the two groups.

Measurement of outcomes

Interim and outcome assessments will be collected by research workers using standardized approaches in both intervention and control groups. Outcome assessments focus on objective measurements (weight change, accelerometer-based physical activity measures, blood lipids, HbA1c). All laboratory analyses will be carried out by technicians blind to allocation. The main outcome will be treatment differences between the arms at 24 months, with an interim assessment at 12 months.

Primary outcomes: differences in weight (kilograms) and in physical activity (number of timed steps) between arms. Weight and physical activity will be measured using the same methods as at baseline.

Secondary outcomes: differences in: lipids, blood pressure, HbA1c, physical activity (average number of steps/day on accelerometer) and CVD risk and in smoking status will be measured.

Associated outcomes

We will measure health beliefs and depression at 12 and 24 months as measures of processes. We will record the numbers of fatal and non-fatal CVD events and hospital admissions via the Hospital Episodes Statistics database.

Costs

The main perspective for the economic evaluation will be that of the health care system. The EQ-5D will be used to generate quality-adjusted life years (QALYs) for use in the economic analyses.[47] Secondary analyses will take into account costs for other agencies and will include lost

employment costs. Intervention costs will be calculated taking into account staff time involved in being trained and delivering interventions, overhead costs and sessions provided. For the group intervention the costs will be apportioned over attendees. Other service use will be measured at baseline and 12- and 24-month follow-up using an adapted Client Service Receipt Inventory. Costs will be calculated by combining service use data with information on unit costs.[48]

Adverse events

A serious adverse event is defined as an untoward occurrence that is related to the intervention and is unexpected. All serious adverse events and laboratory values will be reviewed by the trial manager and the PI will be responsible for reporting any adverse events related to the study to the Research Ethics Committee using the National Research Ethics Service guidance (www.nres.npsa.nhs.uk/applications/after-ethical-review/safetyreports). We will register the participants in the study with the NHS register after obtaining informed consent to link our records with mortality and Hospital Episodes Statistics data.

Ethical issues and trial supervision

The trial protocol will be submitted for ethical review to a Research Ethics Committee. The Trial Steering Committee (TSC) will provide overall trial supervision supported by the Data Monitoring and Ethics Committee (DMEC). Professor Steve Iliffe, Professor of Primary Care of the Elderly, University College London has accepted the lead role of chairperson for the TSC and Professor Betty Kirkwood, Head of International Epidemiology, London School of Hygiene and Tropical Medicine, has accepted the lead role of chairperson for the DMEC. The main ethical consideration is to ensure that the risk of harm to participants is minimized and that they are fully informed of any risks. We will take into account literacy and cultural sensitivities in obtaining informed consent. Other ethical considerations are ensuring that recruitment and informed consent are handled in such a way that potential participants are not put under pressure to take part and that confidentiality is preserved.

The database that contains the patients' names addresses and unique identifier will held by the Clinical Trials Unit, Institute of Psychiatry, KCL and accessible only by the trial manager and the principal investigator. All other data will be stored separately in a locked room where patients can only be identified by their unique study identifier and electronic data will be password protected.

Risks and benefits for trial participants and society

In general regular physical activity is associated with improved health outcomes and this outweighs the risk of sedentary lifestyles. However sudden increases in vigorous physical activity in otherwise sedentary individuals is associated with a higher risk of myocardial infarction and of musculoskeletal injuries which may be pertinent as we are intervening in a group that is at high risk for CVD. However, one of the components of behaviour change techniques is to deliver the message that physical activity should be increased in a graded manner rather than suddenly. We will be discouraging excessive and/or sudden changes to lifestyles. We consider this risk to be small and it will be minimized by excluding subjects with existing CVD.

There is a small risk that some participants may undergo rapid weight loss. Rapid weight loss or fasting may pose a risk by reducing body fluids, preventing the body from burning fat and increases metabolism of lean muscle mass, and diarrhoea and fatigue. Weight loss could worsen frailty by accelerating the usual age-related loss of muscle that leads to sarcopenia but combining weight loss with increased physical activity can actually ameliorate frailty.[49] Importantly, our intervention is based on healthier diets, and gradual and sustainable weight loss as opposed to commercial weight loss programmes.

Our study is powered to detect changes which may be modest at the individual level, but would have an important impact if occurring at the population level.[50]

Obtaining informed consent

Once we have Research Ethics Committee approval, GP staff will conduct the searches using our guidance and invite potential participants to give permission for the research workers to contact them. Research workers will invite potential participants to meet them in the surgery, and they will be given verbal and written information about the study and at least a week to think about participating. We will invite patients who are eligible but decline participation to give informed consent to collect baseline data to assess the generalisability of our findings.

Time period for retention of trial documentation

A copy of patient consent forms will be kept for 12 months after the study has ended. Personal data that are identified by patient name or address will be destroyed 3 years after the study has ended. Other trial records will be archived for 7 years after the trial ends before being destroyed.

The Medicines for Human Use (Clinical Trials) Regulations 2004

Not applicable.

Sample size

Table 2 illustrates the distribution of sample sizes (without dropout) for two conservative effect sizes and significance levels. To interpret these we need to multiply the effect sizes by the standard deviation (SD) of the change in our outcome variables to obtain differences in change between two arms.

The power calculation of our main outcome variables-change in physical activity, weight and total cholesterol- are based on a) a meta-analysis of RCTs observed that the use of pedometers increased physical activity by 2,500 steps/day (SD 2,700)[15]; b) study by Morgan et al (2009)[51]and Whincup (personal communication based on British Regional Heart Study data) which reported a standard deviation for weight change of 5kg and c) Whincup (personal communication based on British Regional Heart Study) which reported a SD of change in total cholesterol change of 1.0 umol/l.

We have selected a very conservative effect size of 0.25 (expressed as the difference in units of pooled SDs, d) which translates to an ability to detect a difference between two groups of 675 steps/day (physical activity), 1.25 kg weight and 0.25 umol/l total cholesterol. We calculated the sample size to detect these differences in our primary hypotheses, weight and physical activity at 90% and two tailed alpha 0.025 to take account of multiple comparisons. We took into account clustering effect within the group intervention (intraclass correlation coefficient=0.05) by using the user-written STATA function Clsampsi (version 1.9) which calculates the optimal sample size in presence of differential clustering effects [52] . We estimated 1,420 participants and at a drop out of 20%, 1,704 participants in total. For those taking the average number of steps of 10,000/day and for those only achieving 5000 steps/day this represents approximately 7% and 14% increase respectively.

Assuming a common SD of the change score of 5 on the Framingham risk engine[53]we would also have 90% power at p=0.025 to detect a difference in change between two arms of 1.25, which would represent a ~5% reduction in the 10 year CVD risk.

Table 2: Distribution of sample sizes at 90% power by significance level and effect size (d)

	p=0.05				p=0.025				p=0.01			
d	G	I	U	Total	G	I	U	Total	G	I	U	Total
0.25	460	369	369	1438	540	440	440	1704	650	527	527	2046
0.33	270	211	211	830	320	249	249	982	380	304	304	1186

G=group intervention and includes clustering effect (intraclass correlation coefficient=0.05); I=individual intervention; U=usual care; Total= includes 20% dropout.

Statistical analysis plan

A description of the sample will be presented using means and their standard deviations (SD) or counts (proportions). Baseline characteristics of refusers and drop-outs will be compared with participants who complete the study.

An intention to treat analysis will be conducted using STATA 11. The differences in treatment effect between the three arms at 12 and 24 months of this partially nested design will be analysed using mixed effects models with pre-randomisation values as a covariate.[54] Stratification variables (practice as random effect and ethnicity as fixed effect) and other possible confounder (such as gender, PCT) will be included as further covariates. This approach provides valid inferences under the assumption that the missing data mechanism can be ignored (or missing at random). Further sensitivity analysis will be carried out to assess the effect of relaxing the missing at random assumption to allow informative dropout, that is letting missingness also depend on the unobserved value [55].

Healthcare costs will be compared between the three groups. Given that the data are likely to be skewed we will use bootstrapping methods to estimate 95% confidence intervals around the mean cost differences. Costs including social care and lost employment will also be compared between the groups. The lost employment costs will be based on days lost from work and average wage rates. However, there is a danger of double counting between QALYs and lost employment and therefore the cost-effectiveness analyses will be based on the health service perspective. QALYs will be calculated from the EQ-5D administered at baseline, 12- and 24-month follow-up. Area under the curve methods will allow us to calculate the QALY gain over the entire follow-up period. If costs are higher for one group compared to another and QALY gains are greater we will then construct an incremental cost-effectiveness ratio to show the cost per extra QALY gained. There will be uncertainty around cost and QALY estimates and this will be explored using cost-effectiveness planes generated from 1000 bootstrapped resamples of the data for each of the three comparisons. Finally, we will generate cost-effectiveness acceptability curves, using the net-benefit approach and bootstrapping, to indicate the probability that any of the three approaches is the most cost-effective for different values placed on a

QALY gain. The range of values used will be £0 to £100,000. This includes the threshold that is used by the National Institute of Clinical Excellence and Health of £20-30,000.

Process evaluation

The overall aim is to identify, describe, and where appropriate quantify, factors and processes that affect the delivery, receipt and outcome of the study to aid the interpretation and translation of the observed findings. Process data will be analysed before outcome data wherever possible to reduce bias in interpretation. The main themes will be:

Reach: the extent to which the intervention reached out to eligible participants will be assessed by comparing the reasons given why GPs agree and decline to participate. We will also assess participation and attrition biases- some patients who have declined to participate in the RCT may be willing to give written informed consent to collect baseline data. We will also invite patients who complete <50% of sessions to attend a focus group to give feedback on the programme.

Quality (fidelity): we will measure adherence and competence. Adherence is the extent to which the therapist applies the techniques prescribed in the manual and avoids those proscribed. For MI we will use the Motivational Interviewing Treatment Integrity which counts the number of MI techniques used[43] and for an overall assessment of competency we will adapt emerging competency frameworks.[44-46] There is no consensus as to number and order of sessions that should be analysed.[22] Considering the potential massive volume of material we will audiotape sections of 25% of all sessions selected randomly.

Subgroup analyses will be conducted to compare variations in outcomes by different models of usual care at the PCT level, depression status, ethnicity and gender and interactions between ethnicity and gender.

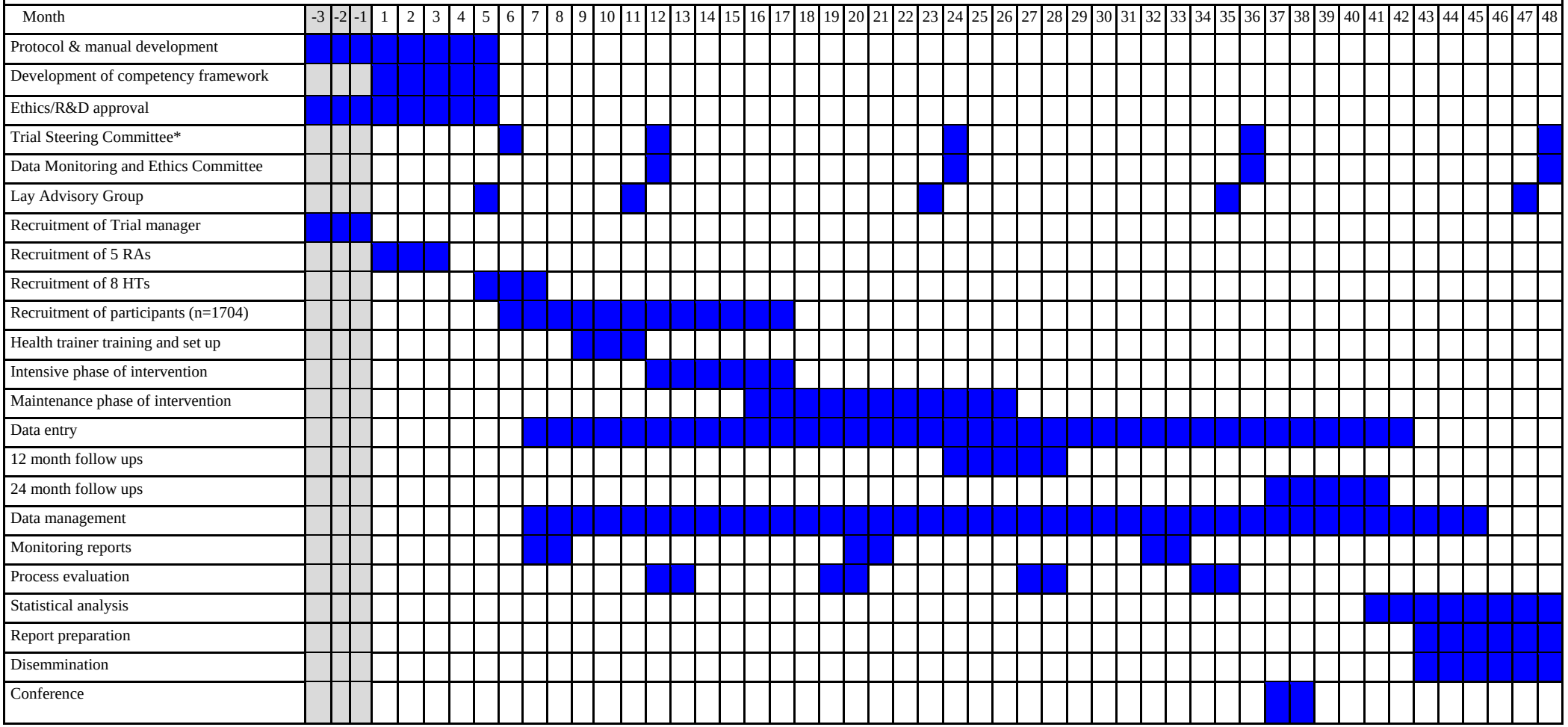
Processes of change: we will conduct meditational analyses to identify whether changes in weight and physical activity were associated with changes in health beliefs, by the number of sessions (doses) attended. We will scan copies of self-monitoring worksheets to measure adherence to the intervention. Supervision checklists and interviews with health trainers will be used to assess which behavior change techniques are popular, why and for which lifestyle behaviour. We will administer a detailed process questionnaire at 15 months that requires all randomized participants to list in both open ended and structured questionnaires which techniques they had found most useful as well as standardized structured questionnaires on their appraisal of the techniques, level of satisfaction with the interventions in their allocated groups. We will include usual care in order to assess the similarity and differences with the intervention as there maybe some overlap.

IV DISSEMINATION AND TRANSLATION

We will submit papers using to leading journals using Consolidated Standards of Reporting Trials. We will present our findings at public health, cardiology and primary care conferences. A full report with the executive summary will be sent to all NHS authorities to assist in dialogues on improving the deliver of the Health Checks. As the study is set within the HIEC we will disseminate the findings very rapidly to translate the findings into modifications of the Health Check pathways. We will share the findings across the national community of HIECs. We will engage with local organizations including third sector, patient participation groups, local newspapers and neighbourhood organizations such as the church and mosque to disseminate our findings. Data sharing with potential collaborators will be encouraged.

IV PROJECT TIMETABLE

Table 3: Project milestone: Start date 1.6.2012 and shaded area represents 3 months countdown preparatory period for senior investigators



V EXPERTISE

We have set up a multidisciplinary team that addresses all the scientific and practical considerations for the successful conduct of this study. We have international reputations and expertise in health psychology, clinical psychology, nursing, clinical epidemiology of long term conditions (obesity, depression and cardiovascular and diabetes), clinical trials, health economics of complex interventions, statistics in behavioral sciences, academic and commissioning primary care and in project management. Collectively we have a wealth of expertise in running large cohort, clinical trials of complex interventions and dissemination and translation into local services and training programmes, especially in the local multicultural setting. Our strength also lies in the collaboration between two teaching hospitals via the HIEC which will allow us to draw upon each other's strengths. In alphabetical order the specific expertise of the investigators are as follows:

Mark Ashworth is a Senior Lecturer in General Practice, King's College London, senior partner in a network of 14 practices across Lambeth and Southwark and lead GP commissioner for Southwark. He has extensive experience in primary care research from conducting RCTs, setting up and analyzing large databases including record linkage, in multiple health conditions and has detailed networking knowledge of the local issues in conducting research.

Derek Cook is Professor of Epidemiology, St George's University of London, with extensive experience of primary care studies and databases. His research is focused on chronic diseases, in particular CVD and diabetes. He is co-applicant on two NIHR applications to increase physical activity in adults and older people, one of which has been funded and another short-listed awaiting a decision.

Nicole de Zoysa is a senior clinical health psychologist with extensive experience in working in medical settings, including HIV/sexual health, cardiac rehabilitation and diabetes. She is trained in MI and CBT, experienced in manual development and training and supervising diabetes specialist nurses and practice nurses in MI and CBT skills (NIHR programme grant: Non-pharmacological approaches to improving diabetes outcomes).

Anne Greenough is Professor of Neonatology and Clinical Respiratory Physiology. Her research focuses on prevention and treatment of chronic conditions and she is currently PI on an NIHR HTA grant to determine which mode of ventilation in very prematurely born infants better prevents chronic respiratory morbidity. She is Chief Executive of the South London Health Innovation Cluster and has brought together more than 30 organisations across South London to faster diffuse innovation, upskill health care professions, test new models of cares and promote health and well being.

Khalida Ismail is Reader in the Psychiatry of Physical Illness, Institute of Psychiatry, King's College London and Consultant Liaison Psychiatrist at King's College Hospital NHS Foundation Trust. Her research interests are in the epidemiology of psychiatric disorders and psychological problems associated with adherence in diabetes and related disorders, and in developing and evaluating complex interventions to improve biomedical outcomes in long term conditions. She is experienced in running cohort studies in south London and clinical trials (ISRCTN5866792; ISRCTN77044517; ISRCTN75776892).

Paul McCrone is Professor of Health Economic, King's College London. His main focus is on conducting economic evaluations in the areas of psychosis, neurology, primary care and posttraumatic stress and is participating in a number of multi-site European studies. A particular interest is in the use of the net-benefit approach for assessing the cost-effectiveness of new interventions.

Daniel Stahl is Lecturer in Biostatistics, Department of Biostatistics, Institute of Psychiatry, KCL. He has extensive experience in the design and analysis of randomized clinical trials including in the study of long term conditions, meditational and other path and structural equation modelling analyses.

Janet Treasure is Professor of Psychiatry, Guy's Hospital, King's College London and international expert in eating disorders and in MI. She is a trainer in MI and has extensive experience of manual development, training different health providers and lay people and in the study of the epidemiology, biology and management of obesity, process evaluations and applying e-health technologies.

Peter Whincup is Professor of Cardiovascular Epidemiology, St George's University of London. His research focuses on understanding the reasons for ethnic, geographic and social variations in cardiovascular disease and type 2 diabetes cardiovascular disease and type 2 diabetes and the determinants of time trends in these diseases. He is the clinical director of the British Regional Heart Study, the Ten Towns Heart Health Studies and the Child Heart and Health Study in England (CHASE Study) and co-director of the British Women's Heart and Health Study.

Kirsty Winkley is Lecturer in Diabetes and Psychology, Programme Manager of an NIHR Programme Grant, diabetes specialist nurse, chartered health psychologist and has a PhD in health psychology. She has extensive experience in the management of medium scale cohort studies and multi centre RCTs in diabetes, and is very familiar with the south London primary care and research networks which will be crucial to the set up and efficient conduct of this study.

Collaborators:

Ten of the 11 PCTs Public Health Leads have confirmed in writing that they would like to collaborate with us. We will also be adopted by the Health Inequalities Research Network (HERON); we will have advisory service from Thamesreach third sector organization; we will work with ResearchWorks Ltd to consider the utility of the Healthy Foundations segmentation measure; the Primary Care Research Network, the Diabetes Research Network and the South London Stroke and Renal Network support this study (please see separate document of collaboration letters).

VI SERVICE USERS

We will continue to work with the scientific and practical resource that Users (consumers or patients as stakeholders) can offer and will continue to develop Patient Public Involvement (PPI) pathways with Professor Anne Greenough within the Health Innovation and Education Cluster (HIEC). Our current/enhanced strategy is as follows:

1. Feasibility studies: we held a focus group of 10 patients from the Lister Health Centre, Peck ham, SE15 which has one of the lowest deprivation indices in the UK. All patients were of African, Caribbean or South Asian ethnicity, first generation migrants and at high risk of CVD. We conducted a semi-structured interview to find out if the group could understood the rationale of the study, thought it was of value, would find talking therapy helpful in their motivation to change, preference for individual or group, attending sessions in working hours and any other points. The group did understand the concept of randomization and the reasons for the study and they were positively enthusiastic about it. They recognized daily stresses affected their lifestyle choices and wanted an opportunity to talk about this and to use this to try to be different. In other words, they welcomed wholeheartedly the opportunity of talking therapies. They preferred the individual format but could see the potential benefits of group interactions and learning from others. They wanted flexibility to fit around juggling work and carer responsibilities. They felt that not enough information was given to them about what was happening inside their bodies-for instance some were surprised to learn that their ethnicity genes made them at greater risk. They felt very strongly that better medical information rather than just being told take exercise or medication would give them more reasons to change. They also gave tips on how to recruit; they thought that by getting some patients on board, these could network in the local community eg giving leaflets. We have incorporated these comments into our intervention.

2. Patient researchers we would like to recruit a core group of patient researchers who will help to improve the contents of our intervention, network with local communities, provide local information. We will invite them as volunteers with honorary contracts within King's Health Partners. While we will not be able to pay a salary we will offer them training in research and administrative skills, opportunity to conduct research and contribute to analyses and manuscript preparation, networking opportunities such as access to resources within KHP. We will be looking to recruit people who can offer their time while looking for work, those recently retired, homemakers trying to improve their skills and confidence to return to the workplace. Our experience of volunteers, is that for some this has led to substantive employment.

3. Lay advisory group drawn from participating general practices: we will hold bi-annual meetings of a lay advisory group in parallel with the TSC. The participants of the focus group wanted to stay involved and we will also broaden the membership from across the HIEC PCTs this to be a purposive sample representing the diversity of the HIEC catchment population using strategies proposed by INVOLVE (www.invo.org.uk) and where appropriate we will offer training to members of the group.

4. Collaboration with HERON: The Health Inequalities Research Network (www.kcl.ac.uk/research/groups/heron) is aimed at people involved in action and research within the community. The network consists of health practitioners, public health researchers, community members (service users and community leaders) and representatives from selected local charities and community groups. The basic principle of the network is to develop and promote the interaction of health practitioners and community members in order to have a more collaborative approach to research and service provision within the community.

VII JUSTIFICATION OF SUPPORT

1. Investigator costs: the cost includes the time required for all investigators to prepare for and attend research meetings including travel time and prepare reports and manuscripts. Specifically:

KI: as the PI she will be responsible for the conduct, supervision, report writing and ultimately accountable for its research governance. As this work will be shared by KW, the costs have been kept at 5%.

KW: will work closely with the PI as the senior trial manager (initiating set up of the study, liaising with PCTs and Public Health, recruiting GPs, setting up collaboration with the research networks), supporting the psychologist in manual development and training of health trainers, recruitment and supervision of all staff, quality assurance of the data collection and implementation of the process evaluation.

NDZ: will develop the manual, curriculum and competency framework, train and supervise the health trainers and contribute to the process evaluation. NDZ is Band 8 and the costs reflect her full time role for the set up of the intervention and training of health trainers for the first 6 months.

JT: will oversee the development of the intervention, contribute to the training and network with the international MI community for further resources and dissemination. She will lead on the process evaluation.

PM: will lead the health economics analyses and his costs are requested for the duration of the study as he will be responsible for supervising the research workers in the health economics data collection and preparation of the HTA report and manuscripts for publication. His cost also includes 20% of research assistant for 6 months to derive unit costs (£9,244).

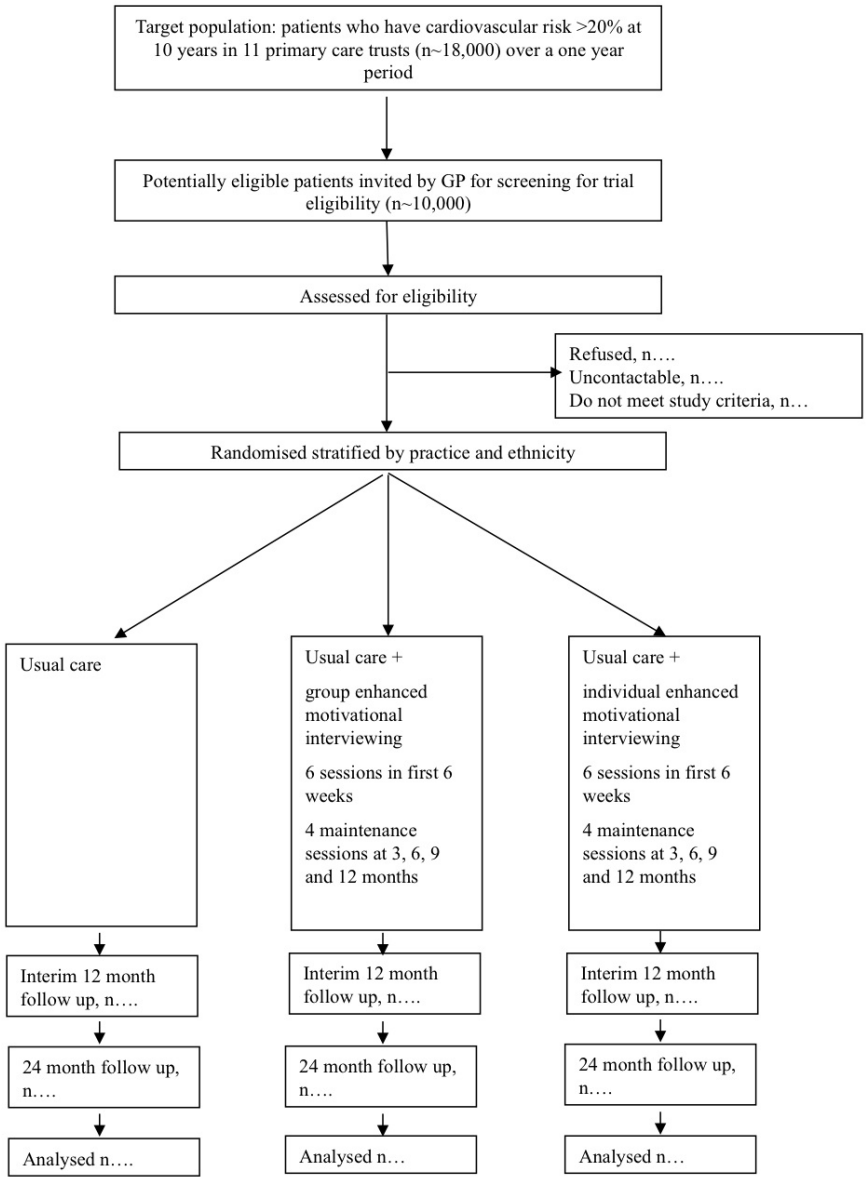
DS: the trial statistician has been costed as half day/week for duration of study as he will be preparing statistical plans, monitor the conduct of the study, conducting all the analyses, advising on data management, manuscript writing, attending TSC and DMEC meetings.

MA: will be involved in diplomacy, networking, advising and facilitating the study with the new commissioning groups in south London and on local resources for Health Checks.

DC: will be responsible for supervision and interpretation of outcome measures, in particular physical activity and contribute to monitoring of the conduct of the study.
PW: will be responsible for senior supervision of all aspects of CVD epidemiology, Health Checks and health services aspects of the study, such as interpretation of biomedical outcomes.
2. Trial manager: we are requesting a Band 5 trial manager. Attracting high calibre band 6 trial managers for complex intervention studies is difficult. Instead, employing a highly motivated junior trial manager who can be trained rapidly into the post is mutually more beneficial and less expensive especially as we have a senior trial manager (KW).
3. Research workers: we have requested for 5 research workers (3 for 2 years and 2 for 3 years). They will be MSc graduates ideally in behavioural sciences and mid point Band 5. We have estimated that each research worker can recruit on average upto 40 participants per month based on our estimates of optimal recruitment for the NIHR Programme Grant South London Diabetes (SOUL-D) cohort study which is assembling a new onset type 2 diabetes cohort of 1, 700 patients from primary care. We only need 2 workers for 3 years as in the third year, most patients will be in maintenance or second year of follow up. They will also conduct sections of the process evaluation.
4. Patient researchers: we aim to recruit 11 people,1 per PCT, and pay them an honorarium of £100 per month for either 1 day or 2 half days work. We would like to employ them for a period of 6 months for each year of the study.
5. Healthy lifestyle facilitators: we are requesting the cost of 8 full time equivalent **healthy lifestyle facilitators (HLF)** at level of Band 3-on average one per PCT. They will be employed for 18 months (2 months training, 4 months intensive delivery followed by last 12 months of maintenance). As their workload will reduce in the last 2 quarters we will retrain them to support data entry. As the HLF will be expected to deliver usual care for his/her PCT, they will also need to be trained in usual care for that PCT. We have estimated that this will be equivalent to £840 per HLF into usual care in City & Guilds level 3 Certificate for Health Trainers (based on the Lambeth Health Check model). This cost includes the facilitation fees, City and Guilds registration, City and guilds certificate, the marking of portfolios and feedback.
6. Non pay costs:
Anthropometric equipment: we are requesting i) Actigraph GT3X accelerometers (300 units) @ £60 each together with the belt and USB hubs for charging as these are the gold standard objective measure of physical activity. We are only requesting 300 as we will recycle them ii) portable SECA stadiometers @£53 each and Omron 1025 digital BP monitors @ 250 each, Tanita SC240 light portable weighing scales for weight and body fat @ £700 each plus £300 for GNOM software to download additional data (1 unit) and tape measures @ £3 each (5 units each-one for each research worker).
Delivery of intervention: 10 units of Olympus WS-550M voice recorders one for each health trainer (plus 2 spares) for self supervision and competency assessments; Sony Handycam (1 unit) for training, manual development and supervision; basic mobile phones for health trainers to tailor communication, feedback of self monitoring data in between sessions (10 units); Ymax Digi-Walker Sw-200 pedometers @£8 each (1100 units). Inexpensive, untested pedometers are not recommended as they will lead to user frustration and low intervention compliance.
Electronic equipment: 12 units of computers (5 laptops one for each research worker as some data collection will be computerized) and the remainder for trial manager, psychologist, and health trainers, and printers (7 units).
Office costs: we have estimated postage costs to patients at £3000; printing of study materials (manuals, questionnaires), £8000; graphic design and web site development and support.
Other data collection costs: we will need blood vials (£600) and HbA1c and Lipids pre and post intervention (post-intervention to be covered by NHS service support); phlebotomy courses for research workers (£1650 for 5 courses):
Participant costs: we will offer £10 gift vouchers following safe return of accelerometers and for supporting the study (we are collecting data at 3 time points per participant) (£51,000); travel costs for therapy sessions (£36,000).
Travel costs: we are requesting costs for research worker travel (£36,000-estimate based on our successful in house practice of 1/4th of monthly travel cards); travel for investigators, TSC, DMEC, patient advisory group, HERON and NETSCC welcome meeting (£3108);
Conference travel costs; accommodation and registration (£1929 x2 conferences, 1 in UK and 1 in Europe).
Meetings: subsistence for TSC, DMEC, lay advisory group, investigators (£4,600)
Clinical Trial Unit: database and randomization (£26,300)

VIII STUDY FLOW CHART

Figure 2: Study flow chart for HTA 10/62: An intervention to support diet and physical activity in people with high cardiovascular risk



IX REFERENCES

1. Prospective Studies Collaboration. Body-mass index and cause-specific mortality in 900,000 adults: collaborative analyses of 57 prospective studies. *Lancet* 2009;373(9669):1083-96.
2. Prospective Studies Collaboration. Age-specific relevance of usual blood pressure to vascular mortality: a meta-analysis of individual data for one million adults in 61 prospective studies. *Lancet* 2002;360:1903-13.
3. Prospective Studies Collaboration. Blood cholesterol and vascular mortality by age, sex, and blood pressure: a meta-analysis of individual data from 61 prospective studies with 55,000 vascular deaths. *Lancet* 2007;370:1829-39.
4. Kvaavik E, Batty G, Ursin G, Huxley R, Gale C. Influence of individual and combined health behaviors on total and cause-specific mortality in men and women: the United Kingdom health and lifestyle survey. *Arch Intern Med* 2010;170:711-8.
5. Wild S, McKeigue P. Cross-sectional analysis of mortality by country of birth in England and Wales 1970-1992. *BMJ* 1997;314:705-10.
6. Unal B, Critchley JA, Capewell S. Explaining the Decline in Coronary Heart Disease Mortality in England and Wales Between 1981 and 2000. *Circulation* 2004;109:1101-07.
7. Hardoon SL, Whincup PH, Lennon LT, Wannamethee SG, Capewell S, Morris RW. How Much of the Recent Decline in the Incidence of Myocardial Infarction in British Men Can Be Explained by Changes in Cardiovascular Risk Factors?: Evidence From a Prospective Population-Based Study. *Circulation* 2008;117:598-604.
8. Brunner E, Rees K, Ward K, Burke M, Thorogood M. Dietary advice for reducing cardiovascular risk: Cochrane Database of Systematic Reviews 2007.
9. Dansinger M, Tatsioni A, Wong J, Chung M, Balk E. Meta-analysis: the effect of dietary counseling for weight loss. *Ann Intern Med* 2007;147:41-50.
10. Chief Medical Officer. At least 5 a week: evidence on the impact of physical activity and its relationship to health. London, 2004.
11. Morris J, Hardman A. Walking to health. *Sports Med* 1997;23:306-32.
12. Ogilvie D, Foster CE, Rothnie H, Cavill N, Hamilton V, Fitzsimons CF, et al. Interventions to promote walking: systematic review. *BMJ* 2007;334(7605):1204.
13. Craig R, Mindell J, Hirani Ve. Health Survey for England 2008.Volume 1: Physical activity and fitness and Volume 2: Methods and documentation.www.ic.nhs.uk/pubs/hse08physicalactivity. London: The NHS Information Centre, 2009.
14. Hillsdon M, Foster C, Cavill N, Crombie H, Naidoo B. The effectiveness of public health interventions for increasing physical activity among adults: a review of reviews. . London: Health Development Agency, 2005.
15. Bravata DM, Smith-Spangler C, Sundaram V, Gienger AL, Lin N, Lewis R, et al. Using Pedometers to Increase Physical Activity and Improve Health: A Systematic Review. *JAMA* 2007;298:2296-304.
16. Cress M, Buchner D, Prohaska T, Rimmer J, Brown M, Macera C, et al. Best practices for physical activity programs and behavior counseling in older adult populations. *J Aging Phys Act* 2005;13:61-74.
17. Ebrahim S, Taylor F, Ward K, Beswick A, Burke M, Davey Smith G. Multiple risk factor interventions for primary prevention of coronary heart disease. . *Cochrane Database of Systematic Reviews,. DOI: 10.1002/14651858.CD001561.pub3.* 2011(Issue 1. Art. No: CD001561.pub3).
18. Miller W, Rollnick S. *Motivational interviewing: preparing people to change addictive behaviour.* 2nd ed. New York: Guildford Press, 2002.
19. Burke B, Arkowitz H, Mencola M. The efficacy of motivational interviewing: A meta-analysis of controlled clinical trials. *Journal of Consulting and Clinical Psychology* 2003;71:843-61
20. Rubak S, Sandbæk A, Lauritzen T, Christensen B. Motivational interviewing: a systematic review and meta-analysis. *Br J Gen Practice* 2005;55:305–12.
21. Ismail K, Thomas SM, Maissi E, Chalder T, Schmidt U, Bartlett J, et al. Motivational Enhancement Therapy with and without Cognitive Behavior Therapy to Treat Type 1 Diabetes: A Randomized Trial. *Ann Intern Med* 2008;149:708-19.
22. Ismail K, Maissi E, Thomas S, Chalder T, Schmidt U, Bartlett J, et al. A randomised controlled trial of cognitive behaviour therapy and motivational interviewing for people with Type 1 diabetes mellitus with persistent sub-optimal glycaemic control: A Diabetes and Psychological Therapies (ADaPT) study. *Health Technol Assess* 2010;14.
23. Anton RF, O'Malley SS, Ciraulo DA, Cisler RA, Couper D, Donovan DM, et al. Combined Pharmacotherapies and Behavioral Interventions for Alcohol Dependence. *JAMA* 2006;295(17):2003-17.
24. Baker MK, Simpson K, Lloyd B, Bauman AE, Singh MAF. Behavioral strategies in diabetes prevention programs: A systematic review of randomized controlled trials. *Diabetes Research and Clinical Practice*;91(1):1-12.

25. Azjen I. The theory of planned behavior. *Organizational Behavior and Human Decision Processes* 1991;50:179 - 211.
26. Greaves C, Sheppard K, Abraham C, Hardeman W, Roden M, Evans P, et al. Systematic review of reviews of intervention components associated with increased effectiveness in dietary and physical activity interventions. *BMC Public Health* 2011;11:119.
27. Abraham C, Michie S. A taxonomy of behavior change techniques used in interventions. *Health Psychology* 2008;27:379 - 87.
28. Department of Health. Putting prevention first. Vascular Checks: risk assessment and management London: Department of Health, 2008.
29. Carr S, Lhussier M, Forster N, Geddes L, Deane K, Pennington M, et al. An evidence synthesis of qualitative and quantitative research on component intervention techniques, effectiveness, cost-effectiveness, equity and acceptability of different versions of health-related lifestyle advisor role in improving health. *Health Technol Assess* 2011;15.
30. Saunders J, Aasland O, Thomas B, de la Fuente J, Grant M. Development of the Alcohol Use Disorders Test (AUDIT): WHO collaborative project on the early detection of persons with harmful alcohol consumption. *Addiction* 1993;88:791-804.
31. Plasqui G, Westerterp K. Physical activity assessment with accelerometers: an evaluation against doubly labeled water. *Obesity (Silver.Spring)* 2007;**15**:2371-9.
32. Nelson M, Haraldsdóttir J. Food photographs: practical guidelines I. Design and analysis of studies to validate portion size estimates. *Public Health Nutrition* 1998;1:219-30.
33. Welch A, Luben R, Khaw K, Bingham S. The CAFE computer program for nutritional analysis of the EPIC-Norfolk food frequency questionnaire and identification of extreme nutrient values. *Journal of Human Nutrition and Dietetics* 2005;18:99-116.
34. Broadbent E, Petrie K, Main J, Weinman J. The Brief Illness Perception Questionnaire. *Journal of Psychosomatic Research* 2006;60:631-37.
35. Chang M-W, Nitzke S, Brown RL, Baumann LC, Oakley L. Development and Validation of a Self-Efficacy Measure for Fat Intake Behaviors of Low-Income Women. *Journal of Nutrition Education and Behavior*;35:302-07.
36. Spitzer R, Kroenke K, Williams J. Validation and utility of a self-report version of PRIME-MD. The PHQ primary care study: primary care evaluation of mental disorders. Patient Health Questionnaire. *JAMA* 1999;282:1737-44.
37. Frasure-Smith N, Lesperance F, Talajic M. Depression following myocardial infarction. Impact on 6-month survival. *Journal of the American Medical Association* 1993;270:1819-25.
38. Department of Health. Ambitions for health: a strategic framework for maximising the potential of social marketing and health-related behaviour (www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_090348). London: Department of Health, 2008.
39. Azjen I. The theory of planned behavior. *Organizational Behavior and Human Decision Processes* 1991;50:179-211.
40. Hobbis ICA, Sutton S. Are Techniques Used in Cognitive Behaviour Therapy Applicable to Behaviour Change Interventions Based on the Theory of Planned Behaviour? *Journal of Health Psychology* 2005;10(1):7-18.
41. Bandura A. *Social foundations of thought and action: a social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall, 1986.
42. Varley R, Webb T, Sheeran P. Making Self-Help More Helpful: A Randomized Controlled Trial of the Impact of Augmenting Self-Help Materials With Implementation Intentions on Promoting the Effective Self-Management of Anxiety Symptoms. *Journal of Consulting and Clinical Psychology* 2011;79:123-8.
43. Moyers T, Marin T, Manuel J, Miller W. The motivational interviewing treatment integrity MITI code. Version 2.0 Available:http://casaa.unm.edu/download/miti.pdf, 2003.
44. Miller W, Moyers T, Arciniega L, Ernst D, Forcehimes A. Training, Supervision and Quality Monitoring of the COMBINE Study Behavioral Interventions. *J. Stud.Alcohol* 2005;Supplement No. 15:188-95.
45. Dixon D, Johnston M. Health Behaviour Change Competency Framework: Competences to deliver interventions to change lifestyle behaviours that affect health. www.healthscotland.com/uploads/.../14543-HBCC_framework1.pdf. Edinburgh: The Scottish Government, 2010.
46. Michie SC, S, West R. Indentifying evidence-based competencies required to deliver behavioural support for smoking cessation. *Annals of Behavioral Medicine* 2011;41:59-70.
47. Williams A. The Role of the EUROQOL Instrument in QALY Calculations: York: Centre for Health Economics, 1995.
48. Curtis L. Unit costs of health and social care. Canterbury: PSSRU, 2010.
49. Villareal DT, Chode S, Parimi N, Sinacore DR, Hilton T, Armamento-Villareal R, et al. Weight Loss, Exercise, or Both and Physical Function in Obese Older Adults. *New England Journal of Medicine*;364(13):1218-29.
50. Rose G. Sick Individuals and Sick Populations. *International Journal of Epidemiology* 1985;14(1):32-38.

51. Morgan P, Lubans D, Collins C, Warren J, Callister R. The SHED-IT Randomized Controlled Trial: Evaluation of an Internet-based Weight Loss Program for Men. *Obesity* 2009;17:2025 - 32.
52. Roberts C, Batistatou E. Clsampsi.Downloaded from http://personalpages.manchester.ac.uk/staff/Chris.Roberts/, 2010.
53. Wister A, Loewen N, Kennedy-Symonds H, McGowan B, Mccoy B, Singer J. One-year follow-up of a therapeutic lifestyle intervention targeting cardiovascular disease risk. *Canadian Medical Association Journal* 2007;177:859-65.
54. Bauer D, Sterba S, Hallfors D. Evaluating group-based interventions when control participants are ungrouped. *Multivariate Behavioural Research* 2008;43:210-36.
55. Carpenter J, Kenward M, White I. Sensitivity analysis after multiple imputation under missing at random: a weighting approach. *Stat Methods Med Res* 2007;16:259-75.