Factors associated with non-participation in a physical activity promotion trial

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Running title: Non-participation in a physical activity trial.

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Abstract: 296 words
Summary

Background. Non-participation can bias outcome in intervention studies of physical activity.

Objectives. To compare characteristics, knowledge and attitudes to physical activity in participants and non-participants of a physical activity intervention trial in primary care.

Study design. Cross-sectional survey.

Methods. Patients aged 40-64 years were recruited opportunistically during surgery visits in an inner city general practice, Newcastle-upon-Tyne, UK. Attitudes to physical activity, views of its health benefits and barriers to participation were elicited in interviews with participants, and by postal questionnaire from non-participants. GP held data were used to compare anthropometry and lifestyle between groups.

Results. Of 842 eligible patients, 276 (33%) refused outright (non-volunteers) and 566 volunteered for the intervention study, of which 353 (42%) attended a baseline assessment and 213 (25%) subsequently defaulted. The initial refusal rate was relatively higher amongst men, smokers and those with addresses in more deprived areas. Response rate to the postal survey of non-volunteers was 45%. Compared with participants the non-volunteers were more likely to be an adult carer and to report poorer health, and less likely to have had higher education or have children living at home. Far more non-volunteers considered they already did enough exercise to maintain health. Non-volunteers had slightly less knowledge of the benefits of physical activity, attached far less importance to it in maintaining health and were more likely
to cite ‘fear of leaving their home unattended’, ‘do not enjoy exercise’ and ‘poor health’ as barriers to exercise, and less likely to cite ‘no-one to exercise with’.

**Conclusion.** Recruitment of ‘hard to engage’ individuals requires careful phrasing of the message to focus on their personal goals and to address gaps in their knowledge about physical activity and the principal barriers they perceive. Differential uptake across population subgroups could lead to a widening of health inequalities.

Key words. Physical activity, primary health care, bias, non-participation.
Introduction

There is compelling scientific evidence that an active lifestyle maintains health and prolongs life.\(^1\) The association is considered causal\(^2,3\) and shows a dose-response relationship, with the intensity, duration and frequency of physical activity (PA) determining the nature and level of health benefits.\(^4\) Significant improvements to public health may be achieved by adopting a moderate level of physical activity and this is reflected in recent guidance from the UK government.\(^5\) Primary care is an important sector for encouraging people to adopt a more active lifestyle\(^5,6\), but the cost effectiveness of interventions to increase physical activity is critically dependent on uptake.\(^7\) Characteristics of non-attenders for health checks in primary care have been described\(^8,9\) whereby, for example, men and smokers are the ‘hard to engage’ groups. Similar findings have been noted in interventions promoting physical activity.\(^10,11\) But, to inform the evidence base there is need for information on the knowledge, views and attitudes of those in disadvantaged groups resistant to health messages to improve recruitment.\(^5\) For example, it is already established that attitudes to healthy lifestyles, including habitual exercise, differ between social classes.\(^12\) Such information could be used when planning recruitment strategies and when assessing the degree of study response bias. Health professionals also need a detailed understanding of the motivating factors that encourage people to exercise and the principal barriers that inhibit them\(^13\) because overcoming barriers is an important component of the behaviour change process.\(^14\) Barriers may be described as internal, such as lack of motivation, or external, such as lack of transport.\(^15\) The distinction is important as external barriers are more amenable to change and people
who cite only internal barriers are less likely to change exercise behaviour than those who cite external barriers. To help interpret and plan other studies we have investigated the characteristics and attitudes of people who declined to join the Newcastle Exercise Project (NEP), a randomised controlled trial of interventions to promote PA in Newcastle-upon-Tyne.

Methods

Details of the methods used in the NEP have been published. Over 12 months, patients aged 40-64 years were recruited opportunistically by one of the authors (JH) working in one general practice (list size 11,400) situated in a socio-economically disadvantaged inner city area of Newcastle-upon-Tyne. The practice population was predominantly white (>99%). The researcher approached the patients whilst attending their primary care physician (general practitioner, GP). The study was explained to them in the waiting area and, during their consultation, their GP determined their suitability to participate in the study using a checklist of medical exclusions. These included stroke, transient ischaemic attack or myocardial infarction within the last 12 months, recent cardiac surgery, heart disease (e.g. poorly controlled angina, arrhythmia, severe heart failure, aortic valve disease), blood pressure above 180/105 mm Hg, asthma or chronic obstructive pulmonary disease, inability to perform an exercise test as part of the baseline assessment (e.g. orthopaedic or rheumatic conditions that would make it impossible to pedal a bicycle, on medication with Beta-blockers that would make the exercise test uninterpretable due to a blunted cardiac response). Additional medical exclusion criteria were severe
mental illness or learning disability, known terminal illness or anaemia with a
haemoglobin less than 10 g/dl. After the consultation, those not excluded on medical
grounds were invited to join the study providing they were not already engaged in
habitual vigorous activity at least three times a week over the previous six months.
Volunteers were given an appointment for a baseline assessment at which informed
consent was obtained. Those who failed to attend the assessment were offered up to
two further appointments and classified as defaulters if they did not attend. Those
who attended the baseline assessment (participants) had a structured interview
seeking information on level of habitual activity, lifestyle and socioeconomic factors
including uptake of benefits. Participants also completed a questionnaire on general
health, self-perceived activity and fitness levels, personal benefits of PA, views of its
general health benefits and barriers to participation. Questions were taken from the
Allied Dunbar National Fitness Survey \(^{17}\), the Newcastle Health and Lifestyle Survey \(^{18}\)
and the Health Survey for England. \(^{19}\) The 12-point General Health Questionnaire was
used as an indicator of psychological morbidity. \(^{20}\) Measurements at the assessment
included height and weight.

Summary scores were created reflecting overall knowledge of the health benefits of
regular physical activity and the perceived personal benefits that it could bestow. The
knowledge score was the number of correct responses given out of 12 statements
about PA (for example, “a short walk everyday is better than no exercise at all”).
Response choices for each statement were agree / disagree / not sure. The score for
personal benefits was derived from 11 statements (for example, “do you think regular
vigorous exercise could help you have fun”). Each response was scored +1 if PA was considered helpful, -1 if PA was not considered helpful and 0 if the respondent was ambivalent.

Fifteen of 16 barriers cited were classified as ‘internal’ or ‘external’. One barrier, ‘fear of leaving their home unattended’, was dropped from the classification because it could be considered either internal (e.g. a subjective fear) or external (e.g. an objectively assessed risk). Respondents were subdivided into those citing no barriers, internal only, external only and ‘mixed’ barriers.

Sex, postcode, age at consultation, smoking habit (current smoker or non-smoker), height and weight (as measured by the practice nurse) and the most recent date on which each item was recorded was obtained from the GP database. Data were extracted for those who refused to join the trial (non-volunteers), those who volunteered and attended their baseline assessment (participants) and those who volunteered but defaulted (defaulters). The number of consultations with the GP or practice nurse 28 days before and 28 days after the recruitment date was recorded as an indicator of the severity of the patient’s presenting illness.

Body Mass Index (BMI) was calculated as (weight, kg) / (height, m)^2 and used to calculate the proportion of patients overweight (BMI ≥ 25) and obese (BMI ≥ 30). The Townsend deprivation score (TDS) for the patient’s enumeration district (ED) of residence (1991 census) was derived by matching each patient’s postcode to the
closest ED. The TDS is based on car ownership, home ownership, unemployment rate and an index of overcrowding within an area. Patients were assigned to a quartile derived from the sample of patients.

The GP data were checked for accuracy against those data recorded in the same patients who attended a baseline assessment; GP data were used throughout.

Postal survey of non-volunteers.

A postal survey was undertaken among those who had refused outright to join the trial (non-volunteers) at the end of the 12 month opportunistic recruitment period. The questionnaire was that self-completed by participants, supplemented by additional questions on smoking habit, carer responsibilities and socioeconomic measures. A question was added to identify those who would still not take part in case their circumstances had changed between the time of recruitment and receiving the questionnaire. Non-responders were sent one postal reminder at three weeks.

Analysis

General practice computerised patient data were used to compare age, sex, anthropometry, smoking habit and Townsend deprivation scores between participants, defaulters and non-volunteers. Separate analyses were undertaken comparing the participants and the combined group of defaulters and non-volunteers (non-participants). The questionnaire replies were used to compare social characteristics, general health, self-perceived activity and fitness level, attitudes to PA,
knowledge of the benefits of PA and the reported barriers to it between participants and non-volunteers.

All data were analysed using SPSS. 22 Statistical procedures included comparison of proportions using the Chi-square test, comparison of means using two-tailed t-test (paired and unpaired), comparison of distributions using the Mann Whitney test, and the calculation of mean and 95% confidence interval (CI) of the differences between groups. In all analyses P<0.05 was accepted as significant.

Ethical approval was obtained from the Newcastle joint NHS-University Research Ethics Committee.

**Results**

Over the 12 month study 1296 individuals were approached opportunistically (44.4% of registered patients aged 40-64); 26 were excluded because they were already sufficiently active and 428 were excluded on medical grounds, principal reasons being inability to pedal a cycle due to orthopaedic or rheumatic disease (n=128), patient on treatment with beta-blockers (n=96) or patient has asthma or COPD (n=46). Hence, 842 were judged eligible to participate but, of these, 276 (33%) declined the invitation outright (non-volunteers), and a further 213 patients (25%) accepted the invitation but did not attend their baseline assessment (defaulters). Thus, overall, 353 patients (42%) entered the intervention study (participants) (Fig 1).
Completeness and quality of the GP data

Data from the GP database were available for about 95% of the 842 eligible patients (Fig 1). The median interval between the last date on which information was updated and the recruitment date was 2.0 years (range 0-6.7 years); for 136 patients (16%) the interval between measurements exceeded 3 years. The distribution did not differ significantly between the participants, defaulters and non-volunteers (P=0.6). The anthropometry and lifestyle data recorded at the baseline assessment (participants) were compared with that extracted from the GP database on the same patients. Both sets of anthropometry data were available for 329 patients (93%). Compared with the project data, the practice data under-estimated height, weight and BMI by, on average, -0.7 cm (95% CI -1.0 to –0.4 cm), -1.3 kg (95% CI –1.9 to –0.7 kg) and –0.3 kg.m\(^{-2}\) (95% CI –0.5 to –0.02 kg.m\(^{-2}\)). The agreement between the datasets for smoking habits was high overall with 91% of the patients classified in the same smoking category.

Comparison of GP data across levels of participation.

The largest differences between participants and all those who declined (non-volunteers and defaulters) were noted for smoking habit and for the proportion with addresses in the least affluent areas (Table 1). For example, current smokers comprised 36% of participants but 51% of those who declined or defaulted. There was little evidence for a difference in the proportion of males between participants and non-participants but the initial refusal rate was significantly greater in men
(136/357=38%) than in women (140/485=29%). The difference in proportions was 9% (95%CI 3% to 16%).

Insert Table 1 near here.

**Postal survey of non-volunteers**

Completed questionnaires were received from 123/276 (45%) non-volunteers (Fig 1). Using GP data those who did not complete the questionnaire (non-responders) were younger than responders by an average of 1.9 years, were more likely to be a smoker (60% versus 45%) and to have addresses in more deprived areas (34% versus 18%).

**Questionnaire replies: comparison of participants with non-volunteers.**

Twenty non-volunteers (10 men) stated that they would now take part if offered the chance to do so; their replies were discarded and the subsequent analysis confined to the remaining 103 respondents (43 men, 60 women) whose replies were compared with those of the participants.

**Personal circumstances.**

Compared with participants the non-volunteers were more likely to be an adult carer and less likely to have children living at home or to have had higher education (Table 2). The proportion of non-volunteers with an abnormal GHQ score (≥ 4) was less than that amongst the participants but self-reported poor health was more common (Table 2). There was little evidence of differences in self-reported activity or fitness levels
but non-volunteers were far more likely than participants to consider they already did enough exercise to maintain fitness (Table 2).

Insert Table 2 near here
Knowledge of the appropriateness of exercise.

Non-volunteers had slightly less knowledge overall than participants on the benefits of exercise as measured by the summary score (Table 3). The proportion of participants giving the correct response to individual statements tended to be greater than that amongst the non-volunteers (Table 3). Despite a slightly higher summary score the participants had equally poor knowledge regarding some issues, for example, the appropriateness of exercise for those with heart disease or pregnant women.

Views on personal benefits of exercise.

Participants and non-volunteers differed in their views of the personal benefits of exercise. Overall, the non-volunteers had a much lower summary score calculated from the 11 statements reflecting the personal benefits of exercise (Table 4).

Insert Table 3 near here

Insert Table 4 near here

Barriers to exercise.

The median number of barriers cited by both participants and non-volunteers was 2 (P=0.46, Mann-Whitney test). However, non-volunteers were more likely than participants to cite ‘fear of leaving their home unattended’, ‘do not enjoy exercise’ and ‘poor health’ as barriers to exercise, whereas they were less likely to cite ‘no-one to exercise with’ (Table 5). Amongst those who cited any barriers the proportion citing
only ‘internal’ barriers was greater for the non-volunteers than for the participants (30/93, 32.3% versus 67/295, 22.7%, difference in proportions 9.6%, 95% CI -0.6% to 19.7%, P=0.064).

Insert Table 5 near here

Discussion

Main findings

Analysis of GP-held data showed that those who did not participate in a trial promoting PA in middle-aged patients attending their primary care physician were more likely to be smokers and have addresses in more disadvantaged areas. These findings are in keeping with the general experience of others regarding the uptake of health checks in UK general practice and recruitment into exercise programmes.10,11

Analysis of questionnaire replies suggested that non-volunteers were less likely to have had higher education compared with participants. Although non-volunteers more often reported poorer general health proportionately fewer of them had GHQ scores suggestive of poor mental health compared with participants. In terms of dependents they were more likely to have adult carer responsibilities, but less likely to have young children living at home.
Although self-assessed fitness and activity levels were comparable between participants and non-volunteers far more non-volunteers considered they already did enough exercise to maintain fitness and far less of them recognised the health and other benefits of PA. In addition, although they cited a similar number of barriers there was a greater tendency, of marginal statistical significance, for non-volunteers to cite only internal barriers (P=0.064). In the general population in the UK the principal barriers to exercise are lack of time, poor motivation and negative self-image. However, barriers cited vary by age group and socio-economic status. In the present study the most commonly cited barriers related to self-image and time constraints. When contrasting the barriers to exercise quoted by participants and non-volunteers more of the non-volunteers reported ‘poor health’, ‘do not enjoy exercise’ (both internal barriers) and ‘fear of leaving their home unattended’, and fewer of them cited ‘having no one to exercise with’ (an external barrier). This may accord with the observations of Ziebland and colleagues who analysed barriers in relation to subsequent change in exercise behaviour in 695 people aged 35-64. Respondents who stated they would like to do more exercise but, initially, had cited only internal barriers were less likely to report increased activity levels at follow-up 3 years later (odds ratio 0.6, 95%CI 0.4, 0.8) compared with those who reported ‘external only’ or ‘mixed’ barriers.

**Strengths and weaknesses of the present study**

We used GP held data supplemented by questionnaire replies obtained by comparable methods to compare demographic characteristics between volunteers and non-
volunteers. The validity of these comparisons depended on the coverage and quality of the GP records. Coverage was better than 90% but the information was often dated. Despite this, a comparison between the GP data and that collected in the same 353 individuals who collaborated in the project suggested that, overall, the GP records were reliable for the present purposes. Where inter-observer differences in measurements did exist the magnitude was of little practical relevance.

We recovered GP data on the defaulters but did not include them in our postal survey of non-volunteers as the focus of this part of our study was to compare attitudes and beliefs about PA between the participants and those who refused outright.

For some variables there is a lack of precision in the results whereby the confidence intervals are wide and the data consistent with both little or no difference between the groups, as well as a difference of practical importance. There is also the possibility of response bias. Our postal survey of non-volunteers had a response rate of 45% overall, which was better than that obtained in another study of non-attenders. Poor literacy may have contributed to the low response though we were unable to assess if this was the case. The GP-held data showed that those who responded to the survey under-represented smokers and those living in more disadvantaged communities and were, on average, slightly younger. Thus, the sample of responders was not fully representative of all non-volunteers so the differences between participants and non-volunteers may have been underestimated. Finally, our study was research-driven and any differences noted between those willing, or not willing to
take part in a research study may not necessarily indicate willingness to participate in PA interventions in primary care.

*Implications for clinical practice and future research.*

Many health promotion programmes aim to reduce an unhealthy behaviour such as smoking. Promoting exercise is unusual in that, to achieve health gain, the patient must actively do something and find the time and motivation to do it. Thus, it is perhaps not surprising that recruitment into, and adherence to exercise programmes is difficult to achieve. We recruited 353 middle-aged patients from a pool of 1296 approached (uptake 27%) with 454 (35%) excluded on medical and other grounds. The proportion excluded was artificially high as we were constrained due to our study protocol whereby we had to exclude those patients unable to do the baseline bicycle ergometer test because of orthopaedic or rheumatic disease or because they were taking beta-blockers. These reasons accounted for 49% of those excluded. In practice, such patients, and possibly others currently excluded for medical reasons (e.g. asthma and COPD) could benefit from increased PA and could be considered eligible for future trials. The proportion that declined outright and that initially volunteered but later failed to attend the baseline assessment was 38% (489/1296). If the exclusion rate due to medical conditions was halved the potential recruitment rate into a similar PA promotion trial could approach 50% for middle-aged persons. This could contribute to meeting the Government’s targets for promoting PA in sedentary individuals but is unlikely to guarantee achievement of the target by itself. Instead, additional strategies will be required for persons in this age group.
The potential benefits to public health from an increase in the population's physical activity levels are high but our findings, and those of others suggests that those high risk groups most likely to benefit from interventions are least likely to take part in them. Effective recruitment of sedentary individuals is a challenge for primary care professionals. Differential uptake with respect to smoking, being in poor health or living in poorer neighbourhoods may further widen health inequalities. Recruitment strategies need to be multifaceted and address any differences in attitudes to PA and knowledge of its health benefits among the target population. In the present study the non-volunteers differed most markedly from participants in their attitudes on the role of PA in promoting health. They also differed in their knowledge of the benefits of exercise, for example, in preventing osteoporosis. Presentation of the message about PA needs to address the negative attitudes displayed by many individuals whereby PA is associated solely with sport. The strategy should seek to circumvent personal barriers and allow persons to join a programme when their personal circumstances permit. In the present study 20 of the non-volunteers (10 of them men) who returned postal questionnaires stated that, at the time of receiving the questionnaire, they would join the programme if the offer was still available. This shows that a significant minority of patients who initially decline to participate were not entirely resistant to the objectives of a PA intervention.

Those who refuse to take part in health promotion trials can introduce material selection bias and limit the applicability of results to the original target population.
Our findings contribute to the evidence base on the likely impact of non-attendance in a PA trial and have demonstrated the level of negative views and attitudes held by a substantial proportion of the population. Further research is warranted in this subgroup of patients around other aspects such as self-efficacy which has been shown to be important in enrolment into worksite programmes.\textsuperscript{33,34} The present findings can help inform the design, delivery and evaluation of PA interventions to improve uptake and achieve the potential health gain.
Acknowledgements

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Funding

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Competing interests: none.
REFERENCES


Table 1 GP data: comparison of participants, defaulters and non-volunteers.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Participants</th>
<th>Defaulters</th>
<th>Non-volunteers</th>
<th>P-value</th>
<th>Difference (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (Men)</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>0.017</td>
</tr>
<tr>
<td>Smoking (Current)</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Body Mass (BMI &gt;=25)</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>0.72</td>
</tr>
<tr>
<td>Body Mass (BMI &gt;=30)</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>0.14</td>
</tr>
<tr>
<td>&gt;1 consultation d</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>0.83</td>
</tr>
<tr>
<td>Deprivation e (Lowest SES quartile)</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>0.026</td>
</tr>
<tr>
<td>Age</td>
<td>n</td>
<td>Mean (SD)</td>
<td>n</td>
<td>Mean (SD)</td>
<td>0.014</td>
</tr>
</tbody>
</table>

a $\chi^2$ test of common proportions in participants, defaulters and non-volunteers.
b Non-participants (defaulters + non-volunteers) minus participants.
c $P<0.05$
d Consultations 28 days either side of recruitment date.
e from Townsend deprivation score (SES: socioeconomic status)
Table 2 Questionnaire data: comparison of participants and non-volunteers.

<table>
<thead>
<tr>
<th></th>
<th>Participants</th>
<th>Non-volunteers</th>
<th>Difference (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n=353)</td>
<td>(n=103)</td>
<td></td>
</tr>
<tr>
<td>Age in years: mean (SD)</td>
<td>51.4 (7.0)</td>
<td>52.8 (7.1)</td>
<td>1.4 (-0.1 to 3.0)</td>
</tr>
<tr>
<td>Home owner (%)</td>
<td>57</td>
<td>47</td>
<td>-10 (-21 to 1)</td>
</tr>
<tr>
<td>Car owner (%)</td>
<td>59</td>
<td>56</td>
<td>-3 (-14 to 8)</td>
</tr>
<tr>
<td>Phone at home (%)</td>
<td>91</td>
<td>92</td>
<td>1 (-5 to 7)</td>
</tr>
<tr>
<td>Employed (%)</td>
<td>43</td>
<td>42</td>
<td>0 (-11 to 11)</td>
</tr>
<tr>
<td>Job seeker (%)</td>
<td>12</td>
<td>8</td>
<td>-4 (-11 to 3)</td>
</tr>
<tr>
<td>Higher education (%)</td>
<td>11</td>
<td>3</td>
<td>-8 (-14 to −1)</td>
</tr>
<tr>
<td>Married or cohabiting (%)</td>
<td>75</td>
<td>67</td>
<td>-8 (-18 to 2)</td>
</tr>
<tr>
<td>Any children (&lt;16 years) at home (%)</td>
<td>24</td>
<td>12</td>
<td>-13 (-22 to −4)</td>
</tr>
<tr>
<td>Adult carer (%)</td>
<td>20</td>
<td>31</td>
<td>10 (1 to 20)</td>
</tr>
<tr>
<td>Retired or long-term sick (%)</td>
<td>33</td>
<td>35</td>
<td>3 (-8 to 13)</td>
</tr>
<tr>
<td>Abnormal GHQ score (score &gt;=4) (%)</td>
<td>32</td>
<td>20</td>
<td>-12 (-22 to −2)</td>
</tr>
<tr>
<td>Self-reported health (fair, bad or v bad) (%)</td>
<td>42</td>
<td>54</td>
<td>12 (1 to 23)</td>
</tr>
<tr>
<td>Self-reported fitness (Fit or fairly fit) (%)</td>
<td>72</td>
<td>73</td>
<td>2 (-8 to 11)</td>
</tr>
<tr>
<td>Self-reported activity pattern (very or fairly active) (%)</td>
<td>73</td>
<td>77</td>
<td>4 (-6 to 14)</td>
</tr>
<tr>
<td>Do enough exercise now to keep fit (%)</td>
<td>28</td>
<td>62</td>
<td>34 (24 to 44)</td>
</tr>
</tbody>
</table>

*a* Non-volunteers minus participants.

*b* P<0.05
Table 3 Knowledge about exercise: Mean and SD of summary scores and percentage of respondents giving the correct response:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Participant (n=353)</th>
<th>Non-volunteer (n=103)</th>
<th>Difference (95%CI) a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary Score: b</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>-0.7 (-1.4 to -0.04) c</td>
</tr>
<tr>
<td>Statement:</td>
<td>Correct response d</td>
<td>% correct</td>
<td>% correct</td>
</tr>
<tr>
<td>Regular exercise can strengthen your bones and help prevent osteoporosis (brittle bones)</td>
<td>✓</td>
<td>64</td>
<td>45</td>
</tr>
<tr>
<td>It’s never too late to start exercising</td>
<td>✓</td>
<td>90</td>
<td>79</td>
</tr>
<tr>
<td>You need a lot of expensive equipment to get fit</td>
<td>✗</td>
<td>84</td>
<td>75</td>
</tr>
<tr>
<td>Regular exercise can help reduce your risk of having a stroke</td>
<td>✓</td>
<td>73</td>
<td>65</td>
</tr>
<tr>
<td>Regular exercise can help prevent heart disease</td>
<td>✓</td>
<td>79</td>
<td>72</td>
</tr>
<tr>
<td>Pregnant women shouldn’t exercise</td>
<td>✗</td>
<td>57</td>
<td>50</td>
</tr>
<tr>
<td>Sport is only for fit young people</td>
<td>✗</td>
<td>79</td>
<td>74</td>
</tr>
<tr>
<td>Vigorous exercise can be dangerous if you are not used to it</td>
<td>✓</td>
<td>77</td>
<td>72</td>
</tr>
<tr>
<td>Exercise must hurt to be any good</td>
<td>✗</td>
<td>69</td>
<td>65</td>
</tr>
<tr>
<td>Regular exercise is important if you want to lose weight</td>
<td>✓</td>
<td>81</td>
<td>78</td>
</tr>
<tr>
<td>A short walk everyday is better than no exercise at all</td>
<td>✓</td>
<td>93</td>
<td>93</td>
</tr>
<tr>
<td>People with heart disease shouldn’t exercise</td>
<td>✗</td>
<td>48</td>
<td>55</td>
</tr>
</tbody>
</table>

a Non-volunteer minus participant.

b range of scores 0 to 12 with higher scores indicating better knowledge.

c P<0.05

d ✓ = agree, ✗ = disagree
Table 4  Attitudes concerning the personal benefits of exercise: Mean and SD of summary scores and percentage of respondents showing positive responses.

<table>
<thead>
<tr>
<th>Exercise can help</th>
<th>Participants</th>
<th>Non-volunteers</th>
<th>Difference (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n=353)</td>
<td>(n=103)</td>
<td></td>
</tr>
<tr>
<td>Summary score b: Mean (SD)</td>
<td>6.6 (5.1)</td>
<td>1.9 (6.4)</td>
<td>-4.6 (-6.0 to -3.3)</td>
</tr>
<tr>
<td>to feel in good shape physically</td>
<td>87</td>
<td>49</td>
<td>-37 (-46 to -29)</td>
</tr>
<tr>
<td>to feel a sense of achievement</td>
<td>82</td>
<td>45</td>
<td>-37 (-46 to -28)</td>
</tr>
<tr>
<td>to learn new things</td>
<td>65</td>
<td>29</td>
<td>-36 (-46 to -26)</td>
</tr>
<tr>
<td>to maintain or improve your health</td>
<td>90</td>
<td>56</td>
<td>-34 (-41 to -26)</td>
</tr>
<tr>
<td>to look good</td>
<td>78</td>
<td>47</td>
<td>-31 (-41 to -22)</td>
</tr>
<tr>
<td>to relax, forget about your cares</td>
<td>60</td>
<td>30</td>
<td>-30 (-41 to -20)</td>
</tr>
<tr>
<td>to control or lose weight</td>
<td>81</td>
<td>54</td>
<td>-27 (-36 to -18)</td>
</tr>
<tr>
<td>to get out of doors</td>
<td>69</td>
<td>43</td>
<td>-27 (-37 to -16)</td>
</tr>
<tr>
<td>to have fun</td>
<td>64</td>
<td>37</td>
<td>-27 (-38 to -17)</td>
</tr>
<tr>
<td>to get together and meet others</td>
<td>63</td>
<td>38</td>
<td>-25 (-35 to -14)</td>
</tr>
<tr>
<td>to feel independent</td>
<td>48</td>
<td>25</td>
<td>-23 (-34 to -12)</td>
</tr>
</tbody>
</table>

a Non-volunteer minus participant.

b range of scores -11 to +11 with higher scores indicating positive attitudes to PA.

c P<0.05
Table 5 Individual barriers to exercise cited by participants and non-volunteers.

<table>
<thead>
<tr>
<th>Internal Barriers:</th>
<th>Participants (n=351) (%)</th>
<th>Non-volunteers (n=101) (%)</th>
<th>Difference, % (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>do not enjoy exercise</td>
<td>16</td>
<td>30</td>
<td>14 (5 to 23)</td>
</tr>
<tr>
<td>poor health</td>
<td>15</td>
<td>29</td>
<td>14 (5 to 22)</td>
</tr>
<tr>
<td>too fat</td>
<td>21</td>
<td>14</td>
<td>-7 (-16 to 2)</td>
</tr>
<tr>
<td>too old</td>
<td>5</td>
<td>10</td>
<td>5 (-0.2 to 10)</td>
</tr>
<tr>
<td>Not the sporty type</td>
<td>47</td>
<td>50</td>
<td>2 (-9 to 14)</td>
</tr>
<tr>
<td>lack of time</td>
<td>29</td>
<td>32</td>
<td>2 (-8 to 12)</td>
</tr>
<tr>
<td>lack of energy</td>
<td>28</td>
<td>27</td>
<td>-1 (-11 to 9)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>External barriers:</th>
<th>Participants (n=351) (%)</th>
<th>Non-volunteers (n=101) (%)</th>
<th>Difference, % (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-one to exercise with</td>
<td>31</td>
<td>18</td>
<td>-13 (-23 to -3)</td>
</tr>
<tr>
<td>adult carer</td>
<td>13</td>
<td>19</td>
<td>6 (-2 to 13)</td>
</tr>
<tr>
<td>lack of suitable clothes /equipment</td>
<td>15</td>
<td>20</td>
<td>5 (-3 to 13)</td>
</tr>
<tr>
<td>lack of transport</td>
<td>19</td>
<td>21</td>
<td>2 (-7 to 11)</td>
</tr>
<tr>
<td>lack of facilities- residence</td>
<td>12</td>
<td>10</td>
<td>-2 (-9 to 5)</td>
</tr>
<tr>
<td>Lack of child care facilities</td>
<td>3</td>
<td>4</td>
<td>1 (-2 to 5)</td>
</tr>
<tr>
<td>lack of facilities- work</td>
<td>23</td>
<td>23</td>
<td>0 (-10 to 9)</td>
</tr>
<tr>
<td>lack of money</td>
<td>22</td>
<td>22</td>
<td>0 (-9 to 9)</td>
</tr>
<tr>
<td>Fear of leaving home unattended</td>
<td>5</td>
<td>16</td>
<td>11 (5 to 16)</td>
</tr>
</tbody>
</table>

* Non-volunteers - participants.
* P<0.05

Fear of leaving home unattended could be considered either an internal or external barrier and was considered separately.
Figure 1. Flow chart indicating relationship between the groups studied and data available.
All patients 40-64 years on GP register (n = 2914)

Approached in GP waiting area (n = 1296)

Eligible (n = 842)

Exclusions: medical (n=428), already sufficiently active (n=26)

Accept invitation (n = 566)

Declined invitation (n = 276)

Attended baseline assessment (n = 353)

Defaulted baseline assessment (n = 213)

GP data (n)
Townsend score (334)
Anthropometry (331)
Smoking status (339)

GP data (n)
Townsend score (206)
Anthropometry (199)
Smoking status (200)

GP data (n)
Townsend score (256)
Anthropometry (262)
Smoking status (265)

Interview questionnaire (n = 353)

Postal Questionnaire (n = 276 sent)

Responders (n = 123)

Non-responders & incomplete questionnaires (n = 153)

Would now take part (n = 20)

Would still not take part (n = 103)