

# Promoting physical activity among South Asian women with coronary heart disease and diabetes: what might help?

Janani Sriskantharajah and Joe Kai

Sriskantharajah J and Kai J. Promoting physical activity among South Asian women with coronary heart disease and diabetes: what might help? *Family Practice* 2007; **24**: 71–76.

**Background.** People of South Asian origin have higher mortality and morbidity from coronary heart disease (CHD) and diabetes than those of European origin. However, physical activity, of established value in primary and secondary prevention, appears lower among South Asians.

**Objective.** To explore influences on, and attitudes towards, physical activity among South Asian women with CHD and diabetes to inform secondary prevention strategies.

**Methods.** Exploratory qualitative study with women aged 26–70 years of varying South Asian ethnicity, religion and socio-economic background with CHD and/or non-insulin-dependent diabetes were recruited from primary care practices in the UK.

**Results.** The beneficial use of physical activity to improve and limit progression of their disease was largely unrecognized by the women interviewed. They were uncertain what type and level of physical activity was appropriate and safe for them. They operated their own threshold for physical activity in relation to their condition, which they were afraid to exceed. Specific guidance from health professionals was lacking. Respondents emphasized the cultural importance of being active day to day, rather than the 'Western' concepts of organized exercise. However, women's principal motivations and attitudes towards physical activity, to lose weight, socialize and maintain independence, were culturally similar to 'majority' populations.

**Conclusions.** Better health professional guidance on appropriate physical activity, its health benefits and its safety is needed for this highly at-risk group. Promoting informal moderate-intensity physical activity may help. Strategies should avoid any tendency to overemphasize cultural barriers noting greater similarities than differences between cultural groups.

**Keywords.** Coronary heart disease, diabetes, exercise, physical activity, South Asian.

## Introduction

People of South Asian origin (people with ancestral origins in the Indian subcontinent including Pakistan, India, Bangladesh and Sri Lanka) in the UK have considerably higher mortality and morbidity from coronary heart disease (CHD) and diabetes compared with the European-origin population.<sup>1</sup> The causes of this are not fully understood. However, risk factors more common in South Asians, which are postulated as important, include obesity, low high-density

lipoprotein cholesterol and insulin resistance.<sup>1</sup> These can all be improved by physical activity<sup>2,3</sup> but South Asians are identified as less physically active than Europeans, with studies reporting far less participation in recreational physical activity.<sup>4,5</sup>

The case to promote physical activity in South Asian communities for primary and secondary prevention of CHD and diabetes has been made for over a decade.<sup>5</sup> For those with existing cardiovascular disease or diabetes, physical activity reduces both mortality and symptoms, and improves disease control and

Received 5 May 2006; Revised 11 October 2006; Accepted 10 November 2006.

School of Community Health Sciences, Graduate Medical School, University of Nottingham, Derby DE22 3DT, UK. Correspondence to Joe Kai; Email: joe.kai@nottingham.ac.uk

© 2006 The Author(s)

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/2.0/uk/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

quality of life.<sup>6,7</sup> Yet there remains little evidence of successful interventions among South Asian groups.<sup>5,8</sup> These are urgently needed, given a global ‘epidemic’ of cardiovascular disease in South Asian populations.<sup>1</sup>

Promoting physical activity among South Asian women may pose particular challenges, with cultural differences typically identified as contributing.<sup>4,9</sup> Research suggests that they undertake less physical activity or recreational exercise than others<sup>4,9</sup> and that cultural barriers, such as religious modesty or avoidance of mixed-sex activity, and fear of going out alone inhibit participation.<sup>4,10</sup> For women from these communities with existing CHD or diabetes, there is likely to be much to gain from engaging in physical activity and much to lose from failure to do so. However, understanding of beliefs and attitudes towards physical activity among this highly at-risk group is lacking. To gain such understanding, we undertook a qualitative study to explore these issues and guide health promotion efforts.

## Methods

### Sampling

Respondents were sought from three general practices in the UK (single-handed inner-city, urban and suburban practices) that identified South Asian women with CHD and/or non-insulin-dependent diabetes. Patients with severe physical, learning or psychiatric disability or who were considered unsuitable for interview by the practice were excluded. Participants were approached and sampled purposively on the basis of differing disease, disease severity, age, ethnicity, religion and socio-economic background using the knowledge of their GP. Subsequent sampling sought to maximize the variety of, and to test, patient perspectives.

### Data generation

One-to-one, semi-structured interviews were conducted with respondents in their own homes by JS, a woman of South Asian origin, using a flexible interview schedule. This was piloted and refined with two respondents, with broad topic areas developed from the study aim and previous research.<sup>10,11</sup> Respondents were encouraged to discuss freely what was important to them in relation to physical activity, their illness and their lives. Interviews lasted between 1 and 2 hours, and were audio taped and transcribed verbatim. They were conducted largely in English, except those with three women where an interpreter was used.

### Analysis

We employed constant comparison, in which data were collected and analysed concurrently,<sup>12</sup> enabling emergent themes and ideas to be incorporated and explored in subsequent interviews, to develop categories and themes. Coding was developed and agreed by

TABLE 1 Description of sample

Characteristic	Number of women (n = 15)
Age (years)	
26–40	2
41–60	8
61–70	5
Self-defined ethnicity	
Indian	5
Pakistani	4
Bangladeshi	1
East African Asian	2
Sri Lankan	3
Religion	
Hindu	5
Sikh	3
Muslim	7
Employment status	
Employed	4
Homemaker/child care/carer	9
Unemployed/retired	2
Formal education	
None	4
Left school at/before 16 years of age	8
Degree	3
Husband's occupation	
Manual	8
Non-manual	6
Unemployed	1
Physical activity: at least one 20-minute session in the past week of the following	
Light exercise (e.g. walking to shops/work)	15
Moderate exercise (e.g. swimming, cycling)	4
Vigorous exercise (e.g. aerobics session)	2
Diagnosis (range of time since diagnosis)	
CHD (1–10 years)	9
Non-insulin-dependent diabetes (4 months–14 years)	8

discussion between both authors (physician and clinical professor of primary care) as analysis proceeded. New data were used and deviant cases sought to assess the integrity of the categories identified. By the 15th interview, no new themes or categories were emerging. To check validity of our interpretation, we sent each participant a summary of results, which we discussed with her by telephone. This confirmed and helped further refine analysis. Table 1 describes our eventual study sample. The mean age of women was 52 years and they had lived in the UK for between 15 and 40 years.

## Results

### Perceived harm threshold limits activity

Following diagnosis of diabetes or heart disease, women's experience of symptoms during activity, and anxiety about provoking them, exerted a strong influence upon their attitudes towards activity and their behaviour. Physical symptoms included chest pains, breathlessness, dizziness, drowsiness, body pains and fatigue. For many, these symptoms would occur doing housework or

everyday walking, and physical activity was usually stopped with their onset. Respondents talked of what they held to be their own threshold or 'body's limit' for physical activity beyond which harm or deterioration in their condition might result. For most, this had a moderating effect upon the type and degree of physical activity they felt able to undertake (see Box 1).

Women felt afraid and vulnerable to potential harm were they to exceed this threshold. All women expressed this fear and had made a conscious decision not to do 'too much'. As a consequence, many lacked confidence, or were apprehensive to undertake any significant physical activity alone (ranging from walking to aerobics) in case a harmful event occurred. They preferred the reassurance of being accompanied or having an 'exercise partner'. For example, "When I start walking, if I feel off breath I'm scared, I come back home. I said I don't want to walk my own. If somebody's with me, walking like me who'll keep me company walking, I don't mind at all to walk."<sup>[6]</sup>

#### *Insufficient guidance from health professionals about suitable activity*

Women's threshold for, and feelings of, vulnerability to harm operated within a context of considerable uncertainty about what activity was appropriate and safe in relation to their illness. Most respondents felt ignorant in this regard, compounding their lack of confidence and limiting their activity. Indeed, two women had discontinued everyday activities such as housework, because either they or their relatives had thought it unsuitable.

While health professionals were seen to be a key source of information, women found the advice they had been offered to be consistently wanting. In contrast to considerable nutritional advice from dieticians, they had typically received cursory and general exhortations 'to just do more exercise' as part of other health consultations in primary and secondary care. Rather, they sought more detailed and specific guidance about appropriate exercise (see Box 2).

Several women had thus accessed other sources of information through the media, for example copying exercises shown on British and Asian TV channels, often adapting them to lighter exercises that they could do at home and felt confident in doing.

#### Box 1 *Perceived harm threshold*

You should do the exercise that your body takes, that's what I do ... You can go through a heart attack very easily if you have chest pains<sup>[5]</sup>

I don't know whether it's too much, but I'm very cautious not to exert myself ... I don't want to push myself and have a stroke.<sup>[11]</sup>

I would like to do [exercise] but only if my body allows me ... you can't exercise if your body can't take it.<sup>[1]</sup>

#### *Weight loss, maintaining independence and socializing perceived as main benefits of exercise*

Achieving weight loss, in order to improve body image and physical appearance, was seen as the primary aim and benefit of increasing physical activity by most women of all ages. They shared a strong dislike of being, or becoming, overweight, chiefly due to its negative effect on their physical appearance. Role models, such as close relatives and friends who had successfully lost weight, provided further active motivation for several women (see Box 3).

For older women, over 60 years of age, the maintenance of their mobility and independence was prioritized as the greatest benefit arising from, and motivation for being, physically active. Taking walks, for example, was undertaken more with this in mind than any gain for other health problems. For two women who had suffered a myocardial infarction, maintaining independence in this way assumed greater significance as family members concerned about potential harm had restricted most of their previous physical activity, including housework (see Box 3).

In contrast, women did not talk of any specific benefits of exercise to their condition, describing its advantages in general terms of overall health gain. Physical benefits perceived by most included relief of body

#### Box 2 *Insufficient guidance from health professionals*

We don't know what exercise we will do, isn't it?<sup>[9]</sup>

I want somebody coming and talk with me—you do this exercise and do like that. This one I want.<sup>[3]</sup>

He [health professional] just says ... just do more exercise that's it ... the doctors and the health advisors they don't give you the proper information. They don't push you ... it would help ... if [we] had people telling [us] how to do exercise.<sup>[7]</sup>

#### Box 3 *Perceived benefits of exercise: weight loss, maintaining independence and socialising*

I only go for the exercise to lose the weight and make my body better. Lose the weight and make me good looking, you know.<sup>[6]</sup>

I have always been very conscious of this exercise bit because I never wanted to be fat ... you don't want to have a big figure or anything ... because I'm short and I'm very conscious of the weight, so the only way to keep it off is exercise.<sup>[11]</sup>

I said to myself, I'm not going to be physically incapacitated ... I want to, as long as I live, I want to be independent and fit ... and don't want to be dependent physically on anybody. I hate that.<sup>[12]</sup>

Cos if I don't walk or don't do exercise, I'll stop doing everything then. Cos I couldn't do anything then.<sup>[4]</sup>

I'm bound to walk into somebody I know and that's my main motivation to getting out.<sup>[13]</sup>

Normally if I don't do exercise or something, you think your body's stiff, it's all stiff, and after you've exercised you feel lighter. You feel lighter and spongier.<sup>[5]</sup>

stiffness, aches and pains, with some referring to the ‘working out’ of the body’s muscles. Reduction of stress was noted by some, particularly by those in paid employment. However, principal motivations to walking were relaxation and refreshment from getting out of doors, a change of scenery and in particular as a form of socializing with other women.

*Some understanding of benefit of exercise to improve and limit illness*

A desire to use physical activity to limit the progression of their condition was highlighted by those who had an extensive family history of cardiovascular problems and diabetes, with several close family members dying prematurely of such conditions. Some described how their own experience of developing disease complications, that of similarly affected relatives and friends, or fear of needing more extensive treatment (such as insulin injections) had encouraged them to exercise (see Box 4).

*Exercise beyond daily work seen as a ‘selfish’ activity*

Women referred to the lack of a tradition in their culture of ‘Western’ exercise such as sport, noting that no one among their relatives did any form of such exercise. Rather, women laid emphasis upon sustaining active lives and their culture’s disapproval of being idle. This was intimately bound up with their identities as women—as homemakers, as carers of children and other relatives or in their other work. Thus, they perceived their attendance to daily work as appropriate and valued physical activity that was expected of them in the care and nurture of others, or their contribution to family income, for example, “I keep myself going. I never sit during the day. Never. I walk about in the shop and doing this and this. I never sit—standing during the day.”<sup>[2]</sup>

In contrast, the notion of ‘exercise’ for oneself—beyond daily work—was perceived by some as a selfish activity, especially by older women. Such exercise demanded justification or sanction to occupy one’s time and resources, for example, “Because the doctor has told her she needs to walk more. So rather than buy

two pints [milk] in one day, she’ll just buy one pint, and then that means she’s got to go out the next day to get her other pint because she needs it.”<sup>[14]</sup>

*Discomfort with exercising in public*

Discussing more formal exercise, women from all religions said they were deterred from mixed-sex activities provided at sports and leisure centres, notably swimming, due to their own or their families’ concern over modesty. Rather than their faith specifically, much of this concern related to simply being very uncomfortable when their bodies were on display, for example, “Some women like, but myself I feel shame. I don’t want to go swimming because mans sitting down watching women . . ., I don’t like it at all.”<sup>[6]</sup> Nevertheless, only two respondents had attended women-only exercise sessions.

*Constrained by not being able to speak English*

The three women in our sample who spoke no English at all regarded language difficulties as a significant constraint prohibiting their participation in more formal exercise initiatives such as exercise classes and consequently had never attended such sessions. In a similar way, not being fluent in English and therefore potentially encountering problems if help was needed while out alone was mentioned as another constraint.

## Discussion

This exploratory study offers insights into what may hinder and promote physical activity among South Asian women with CHD and diabetes. While modest in scale, we are unaware of similar enquiry in this highly at-risk group. Our findings suggest there is much scope for improvement to meet South Asian women’s need for better information and guidance. Moreover, women’s motivations and attitudes towards physical activity were largely similar to ‘majority’ populations. Any tendency of health promotion strategies to overemphasize barriers of cultural difference,<sup>4,9,10</sup> which may promote defeatist attitudes among professionals, needs to be avoided. Our findings suggest that challenges and ways of enhancing physical activity may be more similar than different across cultural groups.

The results must be interpreted with regard to the study context and sample, noting South Asian women do not share a homogeneous culture or identity. However, we engaged a broad range of women with varying characteristics, their purposeful selection was enhanced by the knowledge of recruiting practices, data generation continued to saturation and we undertook validation with participants. All interviews were conducted by a woman of South Asian origin, with bilingual skills relevant to some women, which may have facilitated access to more personal accounts.

Box 4 *Exercise benefit to limit illness*

One of my brothers who got a bypass operation he walks now. He’s very weak but he walks now, and so he told me walking is very good for your health.<sup>[6]</sup>

. . . I just couldn’t walk. My feet were hurting me and I was affected so much that I couldn’t do anything. But what if I got more ill? My kidneys finish or something happens to me? I’m gonna be more worser aren’t I? So that made me go through [exercise].<sup>[5]</sup>

I was worried what would happen if I didn’t take my walk and I didn’t do my exercise . . . as to what diabetes would do to me in the long term.<sup>[13]</sup>

We recognize use of an interpreter with three respondents may have affected data generation and capture, and the potential influence of our own health professional backgrounds on their interpretation. However, we have attempted to lay emphasis upon participants' accounts and note 'medically desirable' attitudes to physical activity were not prominent.

#### *Potential of harm threshold*

Fear of provoking harm or symptoms constraining physical activity is consistent with that found in other groups.<sup>11,14</sup> Our findings among South Asian women with existing CHD and diabetes suggest that this fear may be further understood in terms of a 'harm threshold'. By exploring if this holds for an individual and acknowledging any attendant anxiety, the potential exists to use this concept expressed in people's own words (e.g. your body's limit) to encourage raising their threshold by promoting activity and giving reassurance about safety. Parallels might be drawn with enhancing physical fitness or tolerance, and thus quality of life. Recommending doing so accompanied by an exercise partner may help further allay women's sense of vulnerability identified here.

#### *Tackling low awareness and uncertainty*

Women's low recognition of the salience of increasing physical activity for their condition is of serious concern given its major potential as secondary prevention. This echoes previous research in primary prevention.<sup>4,13</sup> Moreover, there was consistent uncertainty among women about what type and level of activity was appropriate and safe in relation to their illness. Advice from professionals to 'just do exercise' was inadequate. More effective guidance for targeted secondary prevention is needed at community and individual levels, reinforcing primary prevention and awareness raising.<sup>15,16</sup> Specific reassurance and advice on appropriate physical activity in health encounters should be emphasized and regularly reviewed, as typically occurs with nutrition and weight. There may be potential for greater use of community peer educators,<sup>16</sup> staff working in cardiac rehabilitation, physiotherapy or exercise on prescription schemes<sup>8</sup> here.

#### *Sensitivity to patient motivations and cultural commonality*

Despite their CHD and diabetes, women's main motivation towards physical activity was to improve body appearance and weight control, alongside more general health gains such as relief of stiffness and social relaxation, in common with most other populations.<sup>10</sup> In older women, maintaining mobility and independence was prioritized. Health professionals may need to be sensitive to these motivations, while emphasizing the specific benefits of physical activity to improve disease and reduce complications to patients in this group.<sup>6,7</sup>

Family members could be overprotective, and placed limits on the affected individual's daily activities. This underlines both the role of family in adjustment to illness and need for education interventions to include the family. Some women's attitudes to, and motivations for, physical activity were influenced by their wider family's experience of similar disease. The potential for learning from 'experienced' relatives appears high.

#### *Being active day to day and benefits of informal exercise*

Influences on physical activity in this 'high-risk' sample of women, and among other minority populations, appear mostly similar to the general population.<sup>10,17</sup> Low levels of activity are related to lack of motivation alongside barriers such as poverty, transport, time and competing responsibilities. In South Asian people, further barriers may include language, racial harassment, dress codes and modesty and inappropriate facilities, e.g. separate-sex provision and privacy.<sup>10</sup> While some of these issues were raised by South Asian women here, their cultural emphasis upon an active day-to-day lifestyle may be most amenable to health promotion efforts.

Like work with other minority populations, we found women gave a low priority to physical activity as a leisure activity to be pursued in limited spare time when set against family and other obligations.<sup>10,11</sup> Women felt they were, by definition, engaged appropriately in physical activity from care-giving, house-keeping and workday activities. Being active as a woman was a strong cultural obligation. These attitudes may arguably be shared by other sections of the majority population. For South Asian women, it may have its roots in their communities' past rural and physically arduous lives, with migration to largely urban environments changing the nature of women's work. Physical activity has moved from being subconscious to a more conscious activity. Given the lack of a tradition of Western exercise identified here, and by others,<sup>10</sup> the promotion of informal physical activity, rather than more organized exercise such as sport with the range of barriers this presents, may allow activity levels to be increased in a culturally acceptable way.

In this context walking was women's most popular physical activity. Women here felt more confident undertaking this in the context of their disease; it was easily controlled and incorporated into their daily routine, and was accompanied by the benefits of meeting others. These findings resonate with evidence among the majority population that increasing walking in previously 'sedentary' women may be more successful as physical activity promotion.<sup>18</sup> In particular, there is greater success of interventions encouraging moderate rather than vigorous exercise in the general population.<sup>19,20</sup> For older women, our data suggest the additional promotion of mobility and future independence as another helpful message, especially as the UK's

relatively young South Asian population ages in the coming decades.<sup>4</sup>

#### *Implications for health promotion policy and further research*

This study suggests that the potential to enhance levels of physical activity in South Asian women and improve their secondary prevention of CHD and diabetes is high. Despite experiencing worse health outcomes and possibly greater potential to benefit from enhanced levels of physical activity, current health promotion practice for this group appears wanting. Proactive targeting of information is needed, combined with specific guidance and reassurance about safety of appropriate physical activity in health encounters. This should be sensitive to women's concerns and motivations, such as those identified here.

Further work should develop and evaluate physical activity promotion interventions in this group. Measures to improve access and reduce barriers to exercise and leisure activity for all sections of society,<sup>10,17,21</sup> including exercise on prescription schemes,<sup>8</sup> should not be ignored. This menu should include, for example, increased provision of women-only activity and greater availability of bilingual staff. However, barriers of cultural 'difference' may be overemphasized and induce a defeatist attitude among health promoters, at the expense of recognizing much that is shared with the challenges of promoting physical activity in the majority population.<sup>19,20</sup>

Similar to growing experience with the majority population,<sup>18,20</sup> this study suggests strategies that do not require attendance at a special facility and which promote both 'active' living and regular brisk walking for its specific health benefits and socially enjoyable outcomes may also chime with South Asian women. Approaches might build, for example, upon the potential of 'lay-led' walking schemes.<sup>20</sup> Such interventions should be integral to efforts to encourage 30 minutes of moderate-intensity physical activity into the daily routines of the general population.<sup>21</sup>

#### Acknowledgements

We thank study participants; Drs Pandit, Vamadevan, Rajah and their practice staff for their considerable help and interest in identifying respondents and Hilda Parker for helpful comments on the paper. Contributors: Both authors developed the research questions, design and analysis. JS undertook fieldwork supervised by JK who wrote this paper. Both authors are guarantors of the research.

#### Declaration

Funding to pay for the Open Access Publication charges for this article was provided by Division of Primary Care at Derby, University of Nottingham.

Ethical approval: South Birmingham Local Research Ethics Committee, UK.

Conflicts of interest: None.

#### References

- Bhopal R. Epidemic of cardiovascular disease in South Asians. *Br Med J* 2002; **324**: 625–626.
- Tuomilehto J, Lindstrom J, Eriksson JG *et al.* Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *N Engl J Med* 2001; **344**: 1343–1350.
- Centers for Disease Control and Primary Prevention. Primary prevention of type two diabetes by lifestyle intervention: implications for health policy. *Ann Intern Med* 2004; **140**: 951–957.
- Johnson MRD. Perceptions of barriers to healthy physical activity among Asian communities. *Sport Educ Soc* 2000; **5**: 151–70.
- Hayes L, White M, Unwin N *et al.* Patterns of physical activity and relationship with risk markers for cardiovascular disease and diabetes in Indian, Pakistani, Bangladeshi and European adults in a UK population. *J Public Health Med* 2002; **24**: 170–178.
- Boule NG, Haddad E, Kenny GP, Wells GA, Sigal RJ. Effects of exercise on glycaemic control and body mass in type 2 diabetes mellitus. A meta-analysis of controlled clinical trials. *J Am Med Assoc* 2001; **286**: 1218–1227.
- Ades PA. Cardiac rehabilitation and secondary prevention of coronary heart disease. *N Engl J Med* 2001; **345**: 892–902.
- Carrol R, Ali N, Azam N. Promoting physical activity in South Asian Muslim women through 'exercise on prescription'. *Health Technol Assess* 2002; **6(8)**.
- Lip GYH, Luscombe C, McCarry M, Malik I, Beevers G. Ethnic differences in public health awareness, health perceptions and physical exercise: implications for heart disease prevention. *Ethn Health* 1996; **1**: 47–53.
- Rai DK, Finch H. *Physical Activity 'from Our Point of View.'* London: Health Education Authority, 1997.
- Eyler AA, Baker E, Cromer L, King A, Brownson R, Donatelle R. Physical activity and minority women: a qualitative study. *Health Educ Behav* 1998; **25**: 5640–652.
- Glaser BG, Strauss AL. *The Discovery of Grounded Theory.* New York: Aldine, 1967.
- Beishon S, Nazroo JY. *Coronary Heart Disease: Contrasting the Health Beliefs and Behaviours of South Asian Communities.* London: Health Education Authority, 1997.
- Brown J. Barriers to physical activity in people at risk of coronary heart disease. *Br J Nurs* 1999; **8**: 517–523.
- Rankin J, Bhopal R. Understanding of heart disease and diabetes in a South Asian community: cross sectional study testing the 'snowball' sample method. *Public Health* 2001; **115**: 253–260.
- Farooqi A, Bhavsar M. Project dil: a coordinated primary care and community health programme for reducing risk factors for coronary heart disease amongst the South Asian community of Leicester. *Ethn Health* 2001; **6**: 265–270.
- Chinn DJ, White M, Harland J, Drinkwater C, Raybould S. Barriers to physical activity and socio-economic position: implications for health promotion. *J Epidemiol Community Health* 1999; **53**: 191–192.
- Hillsdon M, Thorogood M. A systematic review of physical activity promotion strategies. *Br J Sports Med* 1996; **30**: 84–89.
- Harland J, White M, Drinkwater C, Chinn D, Farr L, Howel D. Newcastle exercise project: a randomized controlled trial of methods to promote physical activity in primary care. *Br Med J* 1999; **319**: 828–832.
- Lamb SE, Bartlett HP, Ashley A *et al.* Can lay-led walking programmes increase physical activity in middle aged adults? A randomised controlled trial. *J Epidemiol Community Health* 2002; **56**: 246–252.
- Department of Health. *At Least Five a Week: Evidence On the Impact of Physical Activity and Its Relationship to Health.* London: Department of Health, 2004.