

# How physically active are South Asians in the United Kingdom? A literature review

C. M. Fischbacher, S. Hunt and L. Alexander

## Abstract

**Background** Moderate physical activity is protective against coronary heart disease (CHD) and diabetes, both important public health problems among UK South Asian (Indian, Pakistani and Bangladeshi) ethnic groups. We assessed the evidence that physical activity is lower in South Asian groups than in the general population.

**Methods** We carried out a systematic literature review of studies describing levels of physical activity and fitness in UK South Asians using MEDLINE, EMBASE, the Cochrane databases, hand searching of relevant journals and review of reference lists.

**Results** We identified 12 studies in adults and five in children. Various methods were used to assess physical activity and fitness, but all the studies reported lower levels among South Asian groups. The differences were substantial, particularly among women and older people. For example, the Health Survey for England found that Indian, Pakistani and Bangladeshi men were 14, 30 and 45 per cent less likely than the general population to meet current guidelines for physical activity. Limited information was provided about translation and adaptation of questionnaires.

**Conclusions** Levels of physical activity were lower in all South Asian groups than the general population and patterns of activity differed. No studies used validated measures. Insufficient attention has been paid to issues of cross-cultural equivalence. With these caveats, low levels of physical activity among UK South Asian ethnic groups may contribute to their increased risk of diabetes and CHD. Closer attention to validity, translation and adaptation is necessary to monitor changes and assess the effectiveness of interventions to increase physical activity.

**Key words:** physical activity, physical fitness, South Asians, cardiovascular disease, diabetes

## Introduction

People living in the United Kingdom who were born in the Indian sub-continent (the countries that are now India, Pakistan and Bangladesh) have substantially higher mortality from coronary heart disease (CHD) and stroke<sup>1</sup> and people of Indian, Pakistani and Bangladeshi ethnicity have a greater prevalence of diabetes and central obesity than the general population.<sup>2,3</sup>

Regular moderate physical activity, such as brisk walking or similar levels of exertion, is associated with a 30–50 per cent

reduction in the risk of CHD<sup>4</sup> as well as reductions in obesity, diabetes<sup>5</sup> and stroke.<sup>6</sup> Current guidelines recommend at least 30 min of moderate activity on most days of the week.<sup>7</sup> More vigorous activity is associated with increases in protective high-density lipoprotein (HDL) cholesterol, but there is conflicting evidence about whether it further reduces CHD risk compared with moderate activity.<sup>8</sup> Physical activity (body movement) needs to be distinguished from physical fitness (the capacity to undertake physical activity), but physical fitness, although less studied, is also associated with a reduced risk of CHD.<sup>9</sup> Discussion of physical activity often focuses on sport, but for most people daily activities such as occupational, household, do-it-yourself (DIY) or gardening activities contribute a much larger proportion of daily activity and energy expenditure.

Information about physical activity is usually obtained from questions asking about the frequency of light, moderate or vigorous physical activity during a defined period. Alternatively, respondents are asked to recall all activities undertaken in occupational, household, leisure and sporting categories and standard classifications are used to assign these activities to intensity categories. The validity of questionnaires as a measure of activity and energy expenditure has been assessed using pedometers, movement sensors, heart rate monitoring and methods using doubly labelled water.<sup>10,11</sup>

Levels of physical activity have been reported to be lower among those of Indian, Pakistani and Bangladeshi ethnic origin than among the general population in the United Kingdom.<sup>1</sup> However, it is not clear whether this conclusion takes into account sampling methods, translation and cross-cultural adaptation of survey instruments and other linguistic and cultural

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**Table 1** Studies of levels of physical activity and physical fitness in UK South Asians: study setting and design

First author and date of publication	Location, date of field work	Source of sample	Definition of ethnicity	Response rate	No. of participants and age-group
Knight, 1992 <sup>12</sup>	Bradford, 1989	Occupational	Name and self-report (stated origin)	Asians 83%, non-Asians 71%	110 male factory workers (63% Pakistani Muslims, 31% Gujarati Hindu) compared with 156 workers from a non-Asian background, all aged 20–65
McKeigue, 1992 <sup>13</sup>	Southall, 1988–1990	GP lists	Interviewer assessment of name, country of birth, appearance and direct enquiry	South Asians 62%, Europeans 66%	1712 South Asians: Sikh (52%), Muslim (15%), Punjabi Hindu (11%) Other (22%), 1761 Europeans aged 40–69
Dhawan, 1994 <sup>14,40</sup>	Manchester/New Delhi, 1988–1990	Hospital referrals (cases) GP lists (controls)	NR	NR	83 Punjabi men with CHD/80 Punjabi men randomly selected as controls from GP lists; 87 white CHD cases and 81 white controls from GP lists; 30 CHD cases and 30 controls in New Delhi: mean age 49.5–56.7
Rudat, 1994 <sup>15</sup>	England, 1991–1992	PAF	Self-report	Indians 56%, Pakistanis 43%, Bangladeshis 36%	1017 Indians, 935 Pakistanis and 667 Bangladeshis aged 16–74
Williams, 1994 <sup>16</sup>	Glasgow, 1987–1988	electoral and valuation rolls	Name search	British Asians 80%, non-Asians 58%	173 South Asians (mainly Punjabi); 344 non-Asians, all aged 35
Shaukat, 1995 <sup>17</sup>	Leicester, 1992–1993	Sons of referred CHD cases	Grand-parental origin	Indians 94%, north Europeans NR	89 Punjabi/Gujerati Indians, sons of CHD cases; 82 sons of North European CHD cases; all aged 15–30
Pomerleau, 1999 <sup>18</sup>	Southall and Brent, London, 1990–1991	GP lists	Interviewer assessment of name, country of birth, appearance and direct enquiry	South Asians 62%, Europeans 58–66%	291 South Asian (mainly Punjabi Sikh) 303 Afro-Caribbean and 559 European women aged 40–69
Health Education Authority, 2000 <sup>19</sup>	England, 1994	PAF	Self-report using an open question to respondents	Indian 71%, Pakistani 79%, Bangladeshi 81%	3381 adults aged 16–74 from South Asian groups (Indian 1063, Pakistani 1145, Bangladeshi 1173)
Health Survey for England '99, 2001 <sup>20</sup>	England, 1999	PAF	Self-report, respondents selecting from a predefined list	87, 87, 90 and 92% for Indians, Pakistanis, Bangladeshis and general population	3642 South Asian adults (1283, 1263 and 1096 from Indian, Pakistani and Bangladeshi groups) and 13586 from general population all aged 16 and over
Lean, 2001 <sup>21</sup>	Glasgow, NR	Birth records	Name and country of birth	76%	Punjabi women, migrant (n = 63) and born in UK (n = 56) compared with women from general population (n = 50) all aged 20–42
Riste, 2001 <sup>22</sup>	Manchester, NR	GP lists	Name search, birthplace of grandparents, or if not known, self-selected from list	65%	471 Europeans and 132 Pakistanis aged 35–79 years
Hayes, 2002 <sup>23</sup>	Newcastle upon Tyne, 1993–1997	GP lists	Name search, birthplace of grandparents and self-report	South Asians 67%, Europeans 64%	684 South Asians (259 Indian, 305 Pakistani, 120 Bangladeshi) and 825 Europeans aged 25–74 from a stratified population sample in Newcastle
<i>Studies in children and young people</i> Hardy, 1985 <sup>24</sup>	NR	College of commerce, sampling method NR	NR	NR	32 'Anglo-Saxons' aged 16–18 years and 27 Indians aged 16–23 and born in the UK, all male
Rogers, 1997 <sup>25</sup>	Camden and Islington, London, 1994–1995	School registers	Defined by parents of participants	White 52%, Bangladeshi 39%	50 whites and 41 Bangladeshis aged 12 years
Williams, 1998 <sup>26</sup>	Glasgow, 1992	Secondary schools	Name search	Overall 71%	334 South Asians (majority Punjabi) and 490 non-Asians all aged 14–15
Bettiol, 1999 <sup>27</sup>	England and Wales, 1992/1993	Stratified random sampling of employment exchange areas	NR	67% overall, response rates not reported separately for ethnic minorities	171 Indian subcontinent and 273 white English children aged 9 years
Woodfield, 2002 <sup>28</sup>	Birmingham, date NR	Secondary schools	Based on description in school records	NR	203 whites and 57 Asians aged 11–14 years

CHD, coronary heart disease; GP, general practitioner; MI, myocardial infarction; NR, not reported; PAF, postal address file.

factors. We reviewed published reports to examine the consistency and validity of these findings, the extent of the difference between these South Asian groups and the majority ethnic population and evidence for heterogeneity within South Asian groups.

## Methods

### Search strategy

We defined South Asian ethnicity as referring to people with ancestral origins in India, Pakistan or Bangladesh. We used the collective term 'South Asian', while recognizing the heterogeneity of this grouping and reporting separate results whenever these were available. In relation to descriptions of ethnicity we retained the terms used by the authors of published papers. We searched electronic databases, hand searched relevant journals and reviewed reference lists from retrieved papers. The search strategy is described in Appendix 1. We included studies that reported descriptions of patterns of physical activity, estimates of total energy expenditure or levels of physical fitness and which reported results for South Asian ethnic groups separately. The search was limited to papers in English and to studies of populations living in the United Kingdom. As indicators of study quality we assessed the representativeness and completeness of the study samples, the validity of the measures used for ethnicity, physical activity and fitness, the methods used to translate and adapt questionnaires for use in South Asian groups and the precision of the results reported. Study eligibility was assessed and data extraction carried out by one author (C.F.) and study quality assessed by all authors.

## Results

We found twelve studies examining physical activity in adults among Indian, Pakistani, Bangladeshi and 'white', 'European' or general population groups.<sup>12-23</sup> These were carried out between 1987 and 1999 and had overall response rates between 58 and 90 per cent (Table 1). One was a case-control study which included controls sampled from general practice lists<sup>14</sup> and the remainder were cross sectional. Three covered all of England,<sup>15,19,20</sup> two were carried out in London,<sup>13,18</sup> five elsewhere in England<sup>12,14,17,22,23</sup> and two in Glasgow.<sup>16,21</sup> Ten studies obtained samples broadly representative of the general population: three of these used the postal address file (PAF) for sampling,<sup>15,19,20</sup> five used general practice lists,<sup>13,14,18,22,23</sup> one used birth registration<sup>21</sup> and one the electoral roll.<sup>16</sup> Of the two others, one was occupationally based<sup>12</sup> and one studied the sons of cases referred to hospital.<sup>17</sup> Ethnicity was defined by the respondent,<sup>12,15-17,19,20,22,23</sup> on the basis of name and country of birth,<sup>21</sup> or was assessed by an interviewer.<sup>13,18</sup> The basis for classification was not specified in one study.<sup>14</sup> Three studies were restricted to men<sup>12,14,17</sup> and two to women,<sup>18,21</sup> the other seven included both men and women.

Five other studies were of children or young people.<sup>24-28</sup> Three of these reported levels of physical activity<sup>25,26,28</sup> and two reported levels of physical fitness.<sup>24,27</sup> All had cross sectional designs and three<sup>25,26,28</sup> used school lists as a sampling frame.

### Methods of assessing physical activity or fitness

Some studies were based on a single question such as whether the respondent undertook any physical activity to maintain their health,<sup>15</sup> how often respondents undertook vigorous exercise (defined as being physically active for at least 20 min associated with breathlessness and sweating),<sup>16</sup> whether respondents participated in sport or other recreational exercise (intensity not defined)<sup>21</sup> or whether they did exercise for at least 20 min at least once per week.<sup>14</sup>

Other studies asked about more extensive lists of physical activities. Only limited details were provided in the papers reviewed, but most study reports mentioned sports and leisure activities,<sup>12,13,17-20,22,23</sup> while others included household activities such as housework, DIY activities and gardening,<sup>19,20</sup> occupational activity,<sup>13,18,20,22,23</sup> travel,<sup>13,18,19</sup> specific questions about walking,<sup>13,17-20,23</sup> climbing stairs<sup>19</sup> and about caring for others.<sup>19</sup> In some cases the questions were specifically related to the previous 7 days<sup>17,22</sup> or 4 weeks.<sup>19,20</sup> Some studies used published data on the energy cost of specific physical activities to group activities into categories of energy cost (from inactive to vigorous)<sup>12,19,20,23</sup> and one also estimated total daily energy expenditure.<sup>13</sup>

Five studies mentioned that the questions about physical activity had been translated<sup>15,16,19,20,23</sup> and four of these mentioned checking or back translation.<sup>15,16,19,23</sup> Two studies indicated that the interviewer was able to translate questions.<sup>12,22</sup> The five remaining studies did not provide any details about translation or adaptation of the questionnaire.<sup>13,14,17,18,21</sup> One study reported validation of the questionnaire using a pedometer<sup>17</sup> and one study reported validation of the questions in their original (but not their adapted) form.<sup>22</sup> The 10 remaining general adult population studies did not report the validity of the questions used to assess physical activity.

Three of the five studies in children assessed physical activity.<sup>25,26,28</sup> Two used asked about usual levels of activity<sup>25,26</sup> and one used a 4 day diary to estimate median energy expenditure using an instrument previously validated in a white population.<sup>28</sup> The remaining two studies in children assessed physical fitness using bicycle ergometer tests,<sup>24,27</sup> and one also used a measure of grip strength.<sup>24</sup>

### Levels of physical activity

The findings of the studies are summarized in Table 2. With the exception of the first Health Education Authority (HEA) survey<sup>19</sup> (which did not include an ethnic comparison group) all of the studies reported lower levels of physical activity in South Asian groups than in the general population or white groups. The differences were substantial, with the proportion of respondents reaching specified levels among various South

Asian groups being ~50–75 per cent of that in Europeans regardless of the method of assessment or the criteria for higher activity levels. The study that reported the smallest difference in activity levels<sup>16</sup> was restricted to younger respondents (although the difference was still statistically significant), while the largest differences were between ‘Europeans’ and Pakistanis<sup>22</sup> and for specific activities such as sports or cycling.<sup>18</sup>

All four of the studies that provided comparative information about separate South Asian ethnic groups reported substantial variations.<sup>15,19,20,23</sup> Bangladeshis had the lowest and Indians the highest levels of activity in three of these studies.<sup>15,19,20</sup> In the fourth study levels of physical activity in Bangladeshis were around half of those in Indians.<sup>23</sup>

Five studies provided comparative information separately for men and women.<sup>15,16,20,22,23</sup> The largest, the 1999 Health Survey for England, found greater differences in physical activity level between South Asian groups and the general population in women than in men.<sup>20</sup> Bangladeshi women in particular had very low levels of physical activity, reporting 35 per cent of the level of activity of women from the general population (only 21 per cent of whom achieved recommended levels of physical activity). Lower levels of physical activity in Indian, Pakistani and Bangladeshi compared to the general UK population were more marked in women in the first HEA survey<sup>15</sup> in relation to sporting activities (for Indians, Pakistanis and Bangladeshis) and general activities (for Indians and Bangladeshis only). Hayes<sup>23</sup> results showed that the pattern of lower levels of activity compared to ‘Europeans’ was more marked among women in Indians and less marked among women in Pakistanis, with similar patterns in Bangladeshis. Riste *et al.*<sup>22</sup> reported larger ethnic differences in women for manual tasks but not for the proportions physically active three times weekly. In contrast to these studies Williams<sup>16</sup> reported a slightly smaller ethnic difference in women than men in relation to the proportion taking regular vigorous exercise.

Two studies provided information on activity levels by age and ethnic group.<sup>15,20</sup> As expected, both studies reported lower levels of physical activity in older respondents in all ethnic groups. However, the Health Survey for England reported that differences between younger and older respondents were greater among Indian women and Bangladeshi men and women than among corresponding general population groups.<sup>20</sup> For example, 13 per cent of Bangladeshi women aged 16–34 but only 1 per cent of those 55 and older reported a high level of physical activity. Similarly, 18 per cent of Indian women aged 16–34 but only 2 per cent of those 55 and older were highly active. The corresponding figures for women in the general population were 26 and 11 per cent. Similar findings for Bangladeshi men and women were reported by the first HEA survey.<sup>15</sup> For example, 17 per cent of Bangladeshi women aged 16–29, but none of those 50–74 years, undertook sporting activities, while the corresponding figures for women in the general population were 50 and 24 per cent.

Three studies provided details of the pattern of specific phys-

ical activities by ethnic group. The Health Survey for England reported low levels of heavy manual and DIY activities among Indian (19 per cent), Pakistani (12 per cent) and Bangladeshi (5 per cent) men compared to men in the general population (30 per cent).<sup>20</sup> Fast or brisk walking was also less commonly reported (corresponding figures 19, 17 and 18 per cent versus 28 per cent). Only 10 per cent of Bangladeshi women reported participation in sports and exercise compared to 33 per cent in the general population. Only 5, 5 and 3 per cent of Indian, Pakistani and Bangladeshi women reported heavy manual work and DIY compared to 12 per cent of women from the general population.<sup>20</sup> Pomerleau *et al.*<sup>18</sup> reported that ‘South Asian’ (mainly Sikh, Punjabi or Gujarati speaking Hindu) women were less likely to cycle or take part in sports, although they were more physically active at work. Hayes *et al.*<sup>23</sup> reported that Indians, Pakistanis and Bangladeshis engaged in a more restricted range of sporting and leisure activities than white ‘Europeans’, but that football, rugby and swimming were popular among the South Asian groups.

Of the five studies in children and young people, the three examining physical activity reported lower levels in Bangladeshis<sup>25</sup> and in ‘Asians’<sup>28</sup> compared to whites and in ‘British Asians’<sup>26</sup> (mainly Punjabi speakers) compared to non-Asians. The two studies of physical fitness reported lower levels in Indians compared to ‘Anglo-Saxons’<sup>24</sup> and in young people originating from the Indian sub-continent compared to white English.<sup>27</sup>

Studies of physical activity or fitness among patient groups were not included in this review, but are summarized in Appendix 2.

## Discussion

All the studies reviewed reported lower levels of physical activity and physical fitness in Indian, Pakistani and Bangladeshi ethnic groups compared to the general population or those defined as ‘whites’ or ‘Europeans’. The size of the differences reported varied across studies, but were substantial, broadly consistent, and not clearly related to the method of measurement, the definition of physical activity or the geographical location. Since the definition of a beneficial level of physical activity was not directly comparable between most studies we did not attempt a quantitative summary of study results. The smallest ethnic difference was reported from Glasgow (fieldwork in 1987/1988) and the largest from Manchester (published in 2001), but small numbers in both studies and differences in the methods used make it hazardous to suggest a clear time trend.

All four studies that examined individual South Asian ethnic groups found heterogeneity, with Bangladeshis having generally the lowest levels of physical activity and Indians the highest. Among Indians, Pakistanis and Bangladeshis, levels of physical activity were particularly low among women and older people.



**Table 2** Studies of levels of physical activity in UK South Asians: measures and results

First author, date of publication	Questionnaire (range of areas covered)	Methods for translation, adaptation	Back translation	Method of administration	Validation of original or adapted instrument	Criteria and findings
Knight, 1992 <sup>12</sup>	Recall of light, moderate or strenuous leisure activities	Member of research team available to translate	NR	Self-administered	NR	'Regular' strenuous activity: non-Asian 16% (m); South Asian, 9% (m); 'regular' moderate activity: non-Asian, 44% (m); South Asian, 21% (m)
McKeigue, 1992 <sup>13</sup>	Frequency of activities related to work, travel, sports and leisure	NR	NR	Self-administered questionnaire checked by bilingual interviewer	NR	Weekly energy expenditure: Europeans, 4.2 MJ; South Asians, 3.0 MJ ( $p < 0.001$ for difference, SE and CIs NR)
Dhawan, 1994 <sup>14,40</sup>	Categorized respondents as sedentary or 'non-sedentary' (defined as standing most of the day at work or doing exercise for at least 20 min at least once per week)	NR	NR	NR	NR	'Non-sedentary' 'white' control participants, 34%; UK Punjabi control participants, 17%; New Delhi Punjabi control participants, 67%
Rudat, 1994 <sup>15</sup>	One question about activities undertaken to maintain or improve health	Translated by commercial agency	Questionnaire 'back-checked'	Face to face interview also collected through self-administered questionnaire	NR	Report general physical activity*: UK population, 22% (a), 17% (m), 19% (f); Indian, 12% (a), 12% (m), 5% (f); Pakistani, 8% (a), 8% (m), 8% (f); Bangladeshi, 5% (a), 4% (m), 4% (f). Report sporting activity: UK population, 39% (a), 43% (m), 37% (f); Indian, 29% (a), 36% (m), 15% (f); Pakistani, 24% (a), 26% (m), 10% (f); Bangladeshi, 20% (a), 18% (m), 2% (f)
Williams, 1994 <sup>16</sup>	Frequency of vigorous exercise	Translated by educational psychologist, piloted and checked with researchers	NR	Administered by bilingual interviewer	NR	Ever takes vigorous exercise: non-Asians, 59% (m), 44% (f); British Asians, 46% (m), 38% (f)
Shaukat, 1995 <sup>17</sup>	7 day recall of leisure time activities including walking, sports, cycling, recreational activity	NR	NR	Interview	Pedometer worn for 7 days	Composite PA index developed by authors: North Europeans, 13.7; Indians, 8.5. Daily distance walked (pedometer): North Europeans, 2.39 km; Indians, 1.78 km
Pomerleau, 1999 <sup>18</sup>	Frequency of activities related to work, travel, sports and leisure	NR	NR	Self administered and checked by bilingual interviewer	NR	Walk more often than sit at work: Europeans, 49% (f); South Asians, 62% (f); walk >2.5 km/day: European, 43% (f); South Asian, 21% (f); cycle: European, 5% (f); South Asian, 0% (f); participate in sports: European, 20% (f); South Asian, 1% (f)
Health Education Authority, 2000 <sup>19</sup>	Recall of activities during the previous 4 weeks (based on 1989 ADNFS questionnaire)	No details of translation method, but translations were 'cross-checked' between agencies (p15)	NR	Face-to-face interview	NR	Report 30 min moderate activity at least 5 times per week: Indians, 33% (m), 17% (f); Pakistanis, 29% (m), 14% (f); Bangladeshis, 26% (m), 18% (f). Indians had highest and Bangladeshis lowest levels of participation in sport, caring activities, use of stairs, vigorous activity

Health Survey for England '99, 2001 <sup>20</sup>	Recall of household, gardening, DIY and sports activities during the previous 4 weeks (based on 1989 ADNFS questionnaire)	Commercial translation agencies	NR	Interviewer administered in respondents' home	NR	Meet PA guidelines: general population, 33% (m), 21% (f); age-adjusted ratio: Indian, 0.86 (m), 0.67 (f); Pakistani, 0.70 (m), 0.63 (f); Bangladeshi, 0.55 (m), 0.35 (f)
Lean, 2001 <sup>21</sup>	Participation in sport or other recreational exercise	NR	NR	Interviewer administered	NR	Participate in sport or other recreational exercise: general population, 50% (f); British born South Asian, 23% (f); migrant South Asian, 17% (f) (estimated from figure 1 in their paper)
Riste, 2001 <sup>22</sup>	Recreational and occupational activity during the past week	NR	NR	Administered by bilingual interviewer	Report of validation of original questionnaire <sup>41</sup> but validity of adapted instrument NR	Physically active for 20 min at least 3 times per week: Europeans, 38% (m), 29% (f); Pakistanis, 7% (m), 5% (f); physically active in manual tasks: Europeans, 31% (m), 15% (f); Pakistanis, 10% (m), 3% (f)
Hayes, 2002 <sup>23</sup>	Range of work, sport and leisure activities, based on Pomerleau <sup>18</sup>	Translators and researchers conferred	Yes	Face-to-face administration by bilingual interviewer	No	30 min moderate activity most weekdays: European, 48% (m), 37% (f); Indian, 29% (m), 17% (f); Pakistani, 12% (m), 19% (f); Bangladeshi, 13% (m), 9% (f)
<i>Studies in children and young people</i> Hardy, 1985 <sup>24</sup>	NR	NR	NR	NR	NR	Maximal oxygen uptake l/min (cycle ergometer): European, 3.2; Indian, 2.6 ( $p < 0.01$ for difference); grip strength (kg): European, 47.4; Indian, 46.4 ( $p > 0.05$ )
Rogers, 1997 <sup>25</sup>	Asked about taking exercise outside school and about taking exercise at least twice a week	NR	NR	By interviewer	NR	Exercise outside school: white, 86%; Bangladeshi, 56%; exercise at least twice per week (of those reporting exercise outside school): white, 81%; Bangladeshi, 57%
Williams, 1998 <sup>26</sup>	No. of days per week with physical exercise for at least 20 min	NR	NR	Self-completion	NR	'Physical exercise' 20 min daily: general population, 40% (m), 20% (f); South Asian, 26% (m), 16% (f)
Bettiol, 1999 <sup>27</sup>	Socio-demographic and health but not physical activity questions	Translated, but details NR	NR	Self-completion by parents	NR	Unable to finish bicycle ergometer test: white English, 12% (boys), 12% (girls); Indian, 35% (boys), 36% (girls); PWC85% (W/kg): white English, 2.63 (boys), 2.13 (girls); Indian, 2.46 (boys), 1.89 (girls)
Woodfield, 2002 <sup>28</sup>	Four day recall of physical activities	NR, but may not have been adapted	NR	Interview administered to small groups	original instrument validated	Median estimated daily energy expenditure (kcal/kg/day): white, 38.5; Asian, 35.9; percentage in most active group: white, 36%; Asian, 14%

(a), all respondents ADNFS Allied Dunbar National Fitness Survey; CI, confidence interval; NR, not reported; (m), male; (f), female; PWC85%, power output against load at 85% of maximum heart rate; SD, standard deviation; SE, standard error.

\* Separate results for males and females are for the 30–49 age group only.

The conclusions, particularly those related to methodology, are based on the limited information provided by published reports. Studies may have collected more detailed information and may not have provided these details or details about translation and adaptation because of constraints of space. The focus of this review on UK populations means that the exclusion of non-English language studies is unlikely to have affected the results.

Only two studies reported validation of the physical activity questionnaire used.<sup>17,22</sup> In most cases it appears that existing questionnaires developed in English were translated for use in non-English speaking communities. An absolute requirement for studies which compare self-reported data across groups is that the questions asked must be conceptually and functionally equivalent and of similar salience to all the respondents.<sup>29</sup> Common understanding and interpretation of items is critical to the validity and reliability of the data obtained. Hunt and Bhopal<sup>30</sup> have recently drawn attention to the problems which can arise when questions designed by and for native English speakers are simply translated into other languages.

Most of the studies reviewed here gave minimal or no details of the translation procedures adopted or of measures taken to ensure the quality and appropriateness of the translated questions. Some stated that bi-lingual interviewers were available. Such 'on the spot' translations can mean that the researcher has no control over how questions are asked. This jeopardizes standardization. In the study by Williams *et al.*<sup>16</sup> the questionnaire was pre-translated into Hindu, Urdu and Punjabi by a single person and the translations checked by other bi-linguals. Bi-linguals differ from the populations whose languages they speak by education, by age, by health and socio-economic status and, often, by gender. In addition they tend to produce translations which are too formal and literary for less well-educated people.<sup>31</sup>

Bhopal *et al.*<sup>32</sup> demonstrated some of the problems arising for comparisons of prevalence data in national and local surveys of alcohol and tobacco use across ethnic groups and noted that recommended guidelines for translation and adaptation were not applied. These criteria involve extensive consultations with monolingual lay people and repeated field tests to assess an appropriate and equivalent level of language and understanding.

Physical activity, exercise and leisure are known to be interpreted differently among people who speak the same language and there is little consensus, even among researchers, on what constitutes 'moderate' or 'vigorous' activity. This lack of clarity is likely to be compounded when disparities of language and culture are taken into account. We are not aware of studies describing the range of daily activities undertaken among people of Indian, Pakistani or Bangladeshi ethnicity. The aggregation of data from different language speakers must also raise doubts when the comparability of translations has not been ascertained.

All of these factors suggest the need for caution in interpret-

ing the results of published studies of physical activity among Indians, Pakistanis and Bangladeshis in the United Kingdom. It is not clear how much of the reported differences could be accounted for by these methodological weaknesses, but the size of the differences and the consistency of the results in different populations and using different methods suggest that it is unlikely that they could completely account for the findings of published studies.

Lower levels of physical activity among Indians, Pakistanis and Bangladeshis could contribute to their increased risk of CHD mortality through effects on obesity and insulin resistance or other mechanisms. The extent to which this could explain ethnic variation in CHD is uncertain, although being physically active is associated with a 30–50 per cent lower CHD risk.<sup>4</sup> Higher levels of physical activity are associated with higher levels of HDL cholesterol,<sup>33</sup> which is protective against heart disease. A further argument for the validity of the findings related to physical activity is that population-based studies in the United Kingdom have consistently found lower HDL cholesterol levels among South Asian ethnic groups than the general population, with the lowest levels among Bangladeshis and the highest among Indians,<sup>2,20</sup> consistent with the patterns of physical activity found in the studies reviewed.

These findings have implications for the design of interventions to increase levels of physical activity. The low levels of physical activity and fitness in the studies of children discussed above may be relevant to recent reports of insulin resistance among British South Asian children<sup>34</sup> and emphasize that efforts to increase activity should start early. Low levels of physical activity among older adults from South Asian ethnic groups argue against an exclusive focus on sport and in favour of interventions that emphasize moderate activities that can be incorporated into daily routines, such as walking. Among the South Asian groups, Bangladeshis may be at particular risk. Interventions need to take account of religious, cultural and social factors that determine the kinds of increased activity that might be feasible.

Future research needs to take account of the principles of cross-cultural adaptation for survey questionnaires. Information is also needed on the validity and reliability of translated and adapted survey instruments. More detailed information is needed about the daily patterns of activity among Indians, Pakistanis and Bangladeshis to establish whether there are important types of activity that are not being captured by existing questionnaires. Finally, if, as seems likely, low levels of physical activity are making an important contribution to the increased risk of CHD among those of Indian, Pakistani and Bangladeshi ethnicity, more research is needed about effective ways to increase levels of physical activity among these groups.

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## Appendix 1. Search strategy

We searched MEDLINE (1966–2002), EMBASE (1980–2002) and the Cochrane databases in April 2003 using the terms ‘exercise’, ‘physical activity’ and the truncated free text terms ‘India\$', ‘Pakistan\$', ‘Bangladesh\$’ and ‘ethnic\$’. We hand searched the *British Journal of Sports Medicine* (1974–2003), *Health Education Research* (1990–2003), *Health Promotion International* (2001–2003), *Journal of Applied Psychology*

(1993–2003), *Public Health* (1988–2003), *Journal of Public Health Medicine* (1990–2003), *Sociology* (1993–2003) and *Sociology of Health and Illness* (1998–2003).

## Appendix 2. Studies of physical activity among patient groups

We excluded five studies that examined levels of physical activity among patient groups rather than the general population. Lip *et al.*<sup>35,36</sup> studied 72 Asian (mainly Punjabi) women attending an antenatal clinic and 21 men admitted with acute myocardial infarction and with origins in the Punjab. Samanta *et al.*<sup>37</sup> reported physical activity levels among 456 South Asians attending a diabetic clinic and the UK PDS study reported physical activity levels among 534 South Asians with diabetes.<sup>38</sup> Dhanjal *et al.*<sup>39</sup> studied 28 Indo-Asians admitted with acute myocardial infarction. All of these studies reported lower levels of physical activity in South Asian than white patients. Further details of these studies are available from the authors on request.

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