

RESEARCH REPORT

Leisure time exercise and personal circumstances in the working age population: longitudinal analysis of the British household panel survey

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Objectives: Investigate the impact of social, economic, and family circumstances on participation in weekly leisure time exercise.

Design: Longitudinal regression analysis of the British household panel survey.

Participants: 9473 people (4521 men and 4952 women) giving 27 881 person years of responses across eight years and four survey waves.

Main results: There was considerable variation among people in regular exercise participation over time. Having children was associated with a reduced likelihood of exercise for both men and women, although there were sex differences in this association according to the age of the youngest child. For both men and women working long hours was associated with a reduced likelihood of exercise, as was having a lower grade job. Retired men and women were more likely to exercise, as were those who attended a fee paying school. There was no strong independent association between household income and exercise.

Conclusions: For most people, participation in leisure time exercise "comes and goes" rather than being something they always or never do. Those with time pressures from work or domestic life are less likely to participate in leisure time physical activity. There are important sex differences in the impact of having children, with women experiencing longer term detrimental effects. Working long hours reduces leisure time exercise participation. Opportunities for physical activity as part of our daily working routines should be increased.

An expert review conducted for the chief medical officer for England highlights the role of physical activity in preventing and treating a range of physical and mental health conditions.¹ Its target, for adults to accumulate at least 30 minutes of moderate activity, five or more times per week,¹ was set because of the significant health benefits seen for those achieving at least this level in comparison with sedentary persons.^{2–3} However, only a minority of UK adults reach this level.^{4–5} Furthermore, around a quarter of the adult population do not take part in any monthly moderate activity.^{4–5} There is a widely seen inverse dose-response relation between physical activity/fitness and a number of health outcomes.² This suggests that even small changes in activity may lead to some health benefits for sedentary adults although further work is needed to establish minimum beneficial levels.³

Leisure time physical activity is an important component in leading an active life,¹ particularly given the decreased levels of activity associated with employment and housework in "post-industrial", mechanised countries.⁶ It is associated with a decreased risk of premature mortality^{7–8} and is particularly protective against coronary heart disease.^{7–9} Increasing levels of leisure time and other physical activity has become a public health priority.¹ However, evidence for the efficacy of behavioural interventions is mixed.^{10–13} Much research exploring social, psychological, physical, and environmental factors associated with participation in various forms of physical activity exists, but longitudinal perspectives in this work are particularly lacking.¹⁴ Longitudinal research is important as a person's participation in physical activity may vary considerably over time and over the life course. Data from the 1958 British birth cohort study show that over an eight year period, a third of men and women decreased,

and a third increased, their leisure physical activity participation.¹⁵ Even small increases in physical fitness in middle age may reduce premature mortality risk.¹⁶ Understanding how variation and change in social circumstances influence participation in physical activity will be crucial to designing and targeting effective interventions and increasing overall levels of participation in the population.¹⁷ Two of the most commonly reported barriers to exercise participation are lack of leisure time and lack of socioeconomic resources.¹⁸ While time use surveys show that it is the most advantaged in post-industrial societies (in terms of education, income, and occupation) who have the least leisure time per day, how the available leisure time is actually used also varies by social and economic group.^{19–20} Recent cross sectional analysis of the Whitehall II study showed lower levels of physical activity among those working longer hours and those in lower status occupations.²¹

To assess the impact of social and family circumstances (which may influence leisure time), and the impact of lack of socioeconomic position on exercise we studied the associations of weekly leisure time exercise with employment, socioeconomic position, and having children. Our data permitted a longitudinal perspective. Previous studies of physical activity have tended to rely on covariates measured at one point in time when assessing influences on physical activity, even when the measures of activity may themselves be longitudinal.^{22–24} Thus, while longitudinal studies of exercise behaviour exist, they often fail to take account of the fact that family and economic circumstances change, as well as exercise behaviour. In contrast this study explores change in exercise and in covariate characteristics. We carried out longitudinal modelling of four waves of data collected from 1996/7 to 2002/3 as part of a major panel survey.

METHODS

Data

The British household panel survey (BHPS) conducts annual interviews of a representative sample of adults aged 16 or over. Face to face interviews are conducted with every adult in selected households. In 1991 the initial sample included 10 264 adults in 5511 households. Response rate for households was 74%. Non-response attrition from one wave to the next is very low. People joining households of original sample members are included in the study. Since 1996, every two years participants have been surveyed on their leisure activities. Detailed information on the study's methodology is given elsewhere.²⁵ Our analysis was limited to those aged 18 to 64 and excluded anyone still in secondary education. Overall, 9473 people replied to the leisure time exercise question in the four survey waves across the eight years giving 27 881 person years of responses for pooled analysis. There were 18 158 periods where people gave responses in consecutive waves. Missing values across the variables of interest reduced the model sample size by 6% to 26 110 person years. To be included in our analysis it was not necessary for people to have answered in all four waves.

Outcome and covariate measures

Leisure time exercise

Participation in leisure time exercise was measured by a single interviewer administered question: "We are interested in the things people do in their leisure time, I'm going to read out a list of some leisure activities. Tell me how frequently you do each... play sport or go walking or swimming?" Respondents chose from five response categories; at least once a week, at least once a month, several times a year, once a year or less, and never/almost never. For this analysis we dichotomised respondents into weekly (those answering at least once a week) or not weekly (those choosing any of the other four categories) exercisers.

Measures of work

An employment status variable recorded whether respondents were in paid employment at each wave and, if so, how many contracted and overtime hours were worked per week on average (not in paid employment, less than 30 hours, 30 to 48 hours, and over 48 hours).²⁶ The retired and students were also identified, as was the average weekly time spent on housework, itself a source of physical activity.

Socioeconomic situation and education

Individual social class was based on the most recent occupation and coded using eight summary categories of

the UK's National Statistics Socio-Economic Classification (NS-SEC).²⁷ School type was based on the last school attended (fee paying compared with non-fee paying). Highest academic qualification was coded using six categories, from none through to degree level. Gross annual household income was derived by the BHPS team from the detailed information collected. Some missing values were imputed.²⁵ We adjusted income levels for differences in household composition, using the McClement's scale,²⁵ and inflation, to 1996 values, using the retail price index.²⁸ Finally, income was divided into quintiles for the whole sample.

Family status

To assess any impact of having children on exercise participation, we derived the age of the person's youngest child (including step and adopted children) living in the household (variable categories: no children; youngest aged under 1; aged 1 to 4; 5 to 11; 12 to 15; 16 to 17; 18 plus). Models were also adjusted for marital status.

Health

To control for any impact of ill health, three self reported measures were included: general health in comparison with a person of similar age (categories excellent and good compared with fair to very poor), the general health questionnaire 12 item version (a measure of possible psychiatric morbidity, with scores of four or greater being coded a "case"²⁹), and whether the respondent indicated that their health limited their daily activities. To control for a possible impact of primary health advice the number of reported consultations with a general practitioner in the preceding 12 months was included. Smoking behaviour was measured by the number of cigarettes smoked daily (non-smoker, 0 to 5, 6 to 10, 11 to 15, 16 to 20, more than 20). Alcohol consumption and dietary habits were not surveyed. Data on respondents' weight and height were not available; body mass index could not be controlled for in this analysis. All models also controlled for age and year of interview.

Analysis

Data were pooled. Logistic random effects regression modelling was carried out in Stata (StataCorp, release 9, College Station, TX, 2005). Such models account for non-independence of observations given the repeated measurement of individuals. They permitted the exploration of differences between individuals and changes among individuals over time.³⁰ Separate models were fitted for men and women.

Table 1 Participation in leisure time exercise

	% Not participating	% Participating	Number
Total person years	45.6	54.4	27881
All participants	% Not participating in exercise in at least 1 of the 4 survey waves 64.6	% Participating in exercise in at least 1 of the 4 survey waves 74.5	9473
Participants answering all four waves only	% Not participating in exercise in any of the 4 survey waves 19.3	% Participating in exercise in all survey waves 25.4	4846
All two year periods starting with the person not exercising	% Not participating in exercise at end of the two year period 68.2	% Participating in exercise at the end of the two year period 31.8	8473
All two year periods starting with the person exercising	26.5	73.5	9685

Table 2 Adjusted* odds ratios for participation in weekly leisure time exercise; odds ratios and 95% confidence intervals for employment, socioeconomic position and having children

	Women	p Value	Men	p Value
Employment status				
Paid employment—no hours	1		1	
Less than 30 hours	0.89 (0.76 to 1.04)	0.15	1.06 (0.76 to 1.48)	0.73
30 to 48 hours	0.55 (0.46 to 0.66)	<0.001	0.86 (0.68 to 1.08)	0.19
Over 48 hours	0.53 (0.4 to 0.69)	<0.001	0.63 (0.49 to 0.8)	<0.001
Not a student	1		1	
Student	0.84 (0.62 to 1.13)	0.24	1.77 (1.19 to 2.63)	0.005
Not retired	1		1	
Retired	1.49 (1.12 to 1.98)	0.006	2.56 (1.74 to 3.78)	<0.001
Socioeconomic position				
Household income—1 highest	1		1	
2	0.9 (0.76 to 1.06)	0.2	0.91 (0.77 to 1.09)	0.31
3	1.0 (0.84 to 1.19)	0.98	0.9 (0.74 to 1.08)	0.26
4	0.94 (0.78 to 1.13)	0.52	0.86 (0.7 to 1.05)	0.14
5 Lowest	0.94 (0.77 to 1.15)	0.55	0.83 (0.66 to 1.05)	0.12
NS-SEC Higher managerial/professional	1		1	
Lower managerial/professional	0.91 (0.7 to 1.19)	0.49	1.09 (0.89 to 1.35)	0.4
Intermediate occupations	0.79 (0.6 to 1.05)	0.1	0.98 (0.75 to 1.28)	0.87
Small employers/own account workers	0.96 (0.68 to 1.37)	0.83	0.72 (0.55 to 0.94)	0.02
Lower supervisory and technical	0.67 (0.48 to 0.94)	0.02	0.72 (0.56 to 0.92)	0.01
Semi-routine occupations	0.75 (0.56 to 1)	0.05	0.94 (0.72 to 1.23)	0.63
Routine occupations	0.85 (0.62 to 1.16)	0.31	0.91 (0.7 to 1.18)	0.48
Never worked	0.6 (0.37 to 0.97)	0.04	1.51 (0.81 to 2.81)	0.19
Highest academic qualification—degree	1		1	
HND or equivalent	1.01 (0.74 to 1.38)	0.95	1.11 (0.81 to 1.54)	0.51
A level or equivalent	0.93 (0.73 to 1.17)	0.53	0.98 (0.76 to 1.25)	0.85
O level or equivalent	0.87 (0.69 to 1.1)	0.25	0.97 (0.76 to 1.25)	0.83
CSE 2–5 or equivalent	0.67 (0.49 to 0.93)	0.02	0.97 (0.68 to 1.4)	0.88
None	0.68 (0.52 to 0.89)	0.005	0.83 (0.62 to 1.11)	0.21
School type—non-fee paying	1		1	
Fee paying	1.37(1.04 to 1.81)	0.03	1.22 (0.89 to 1.67)	0.22
Children				
No children	1		1	
Youngest aged under 1	0.89 (0.67 to 1.17)	0.4	0.57 (0.42 to 0.77)	<0.001
Youngest aged 1 to 4	0.68 (0.55 to 0.83)	<0.001	0.78 (0.62 to 0.97)	0.03
Youngest aged 5 to 11	0.69 (0.56 to 0.85)	0.001	0.97 (0.77 to 1.22)	0.79
Youngest aged 12 to 15	0.65 (0.51 to 0.83)	0.001	0.9 (0.68 to 1.18)	0.44
Youngest aged 16 to 17	0.71 (0.53 to 0.95)	0.02	0.96 (0.68 to 1.35)	0.8
Youngest aged over 18	0.78 (0.63 to 0.96)	0.02	1.06 (0.83 to 1.35)	0.65

*Adjusted for all variables in the table plus age, marital status, self rated health, general health questionnaire, health limits daily activities, GP consultations, smoking, year, and housework hours.

RESULTS

Rates of weekly exercise participation

Table 1 gives details of the rates of weekly exercise and information on changing behaviour. Exercise was reported in around 55% of the person years, and while about three quarters of all respondents were exercising in at least one wave, about two thirds were not doing so in at least one wave. Of those answering at all four waves, just less than a fifth reported not exercising weekly at any wave, while a quarter reported leisure time exercise at all waves. Of all those who reported exercising in one wave, just less than three quarters were still exercising at the next wave.

Table 2 reports fully adjusted odds ratios for the employment, socioeconomic position, and family status variables.

Employment

For men, working an average of over 48 hours a week was associated with reduced likelihood of weekly exercise, in comparison with those not in paid employment. For women, a similar effect was observed at greater than 30 hours per week. Being retired had a positive association with weekly exercise, as did being a male student.

Socioeconomic position

There was an unadjusted inverse association between household income and weekly exercise participation. This was significant for men but not women (results not shown). However, the association was attenuated after adjustment for other variables. Some weak associations between exercise

and social class were apparent although there was no simple gradient in this association. Having never worked was associated with a reduced likelihood of exercising among women, but not among men. For both men and women, being in the “lower supervisory and technical” social class was associated with a reduced likelihood of weekly exercise. For men, being in the “small employer and own account worker”, and “lower supervisory and technical” class was also associated with a reduced likelihood of weekly exercise.

Low educational attainment was associated with a reduced likelihood of exercise among women, but this association was not significant for men. For both men and women, having attended a fee paying school was associated with a greater likelihood of participation, relative to those from state funded schools, although for men the association was not significant.

Children

Being a parent of one or more children resident in the household was associated with a reduced likelihood of weekly exercise. However, there were interesting sex differences in this association. For men, significant effects were detected only when resident children were aged 4 or less. For women, significant effects were not seen when the youngest was aged under 1, but once the child was older the reduced likelihood of exercise persisted.

Smoking

The study confirmed the usual association between smoking and irregular exercise participation. For women, those

What is known on this topic?

Regular physical activity is beneficial to health, however only a minority of UK adults achieve recommended levels. Leisure time exercise is one important component of achieving an active lifestyle, particularly in industrialised societies where daily life has become more sedentary. Individual participation in leisure time physical activity can vary considerably during adulthood and participation may depend on a person's social circumstances.

smoking 20 plus cigarettes a day had a reduced likelihood of exercise (odds ratio 0.24, 95% confidence interval 0.17 to 0.34) relative to non-smokers, and for men it was 0.27 (0.2 to 0.37).

DISCUSSION

Principal findings and comparison with other studies

We found considerable year to year variation in participation within participants. This shows the value of longitudinal data in being able to detect the impact of changes in social and economic circumstances. While there are sizeable groups of consistently active and inactive people (table 1), for most leisure time exercise "comes and goes" year to year, life stage to life stage.

This finding is supported by longitudinal studies from the UK and other countries that have also found substantial year on year variations in activity, albeit with various measures of activity. In Canada analysis of the national population health survey showed that over two year periods, from 1994/95 to 1998/99, the incidence rate for inactive adults aged 20 and over beginning moderate leisure activity was 24 cases per 100 person years but that the rate of previously active adults becoming sedentary was 32 cases per 100 person years.²² In the Dutch GLOBE study, 28% of previously active adults, aged under 45 in 1991, had reduced their activity rate at follow up in 1997 and 20% of those aged over 45.²³ Among adults in the UK 1958 birth cohort study, interviewed at age 33 and 42, only about 15% were classified as leisure time inactive at both time points.¹⁵ The most directly comparable measure from our study, reporting non-weekly exercise at any wave, gave a figure of about 20% (table 1).

As income is arguably likely to be associated with residential environmental quality and access to exercise facilities, the lack of a significant independent association between income and exercise in this study was a surprising finding and contradicts work from elsewhere. Cross sectional evidence from Australia, for example, showed that some types of physical activity are associated with area level socioeconomic status.³¹ Analysis of the health survey for England found a negative association with regular participation in all physical

What this study adds

This longitudinal study, accounting for changes in people's circumstances over time, shows that for most people participation in leisure time exercise "comes and goes" rather than being something they always or never do. Having children is a barrier to exercise participation, but the effects differ for men and women. The effects start a little later in the child's life, but last longer for women than for men. Working long hours is associated with not participating in leisure time exercise but there is no independent association between income and leisure time exercise.

activities for men living in the lowest income households, after controlling for household social class, region and age.⁴ More specifically, rates of participation in sports and exercise and walking among the whole population declined at lower levels of household income.⁴ Perhaps the wider range of covariates controlled for, and higher quality income information in this study account for the contrast between our finding and that in other studies.

Social class gradients in exercise and walking have also been identified elsewhere, with those in highest classes usually more likely to engage in these activities.⁴ However, when assessing all physical activity (including that derived from employment), differences in participation rates tend to disappear.³² We also found a particular impact of education level and type on women's participation and again, this echoes other longitudinal studies.^{22 23}

Although other studies have also found an association between working long hours and less leisure time physical activity, especially for men, patterns have been inconsistent.^{21 33 34} An increased likelihood of exercise shortly after retirement has been shown among UK civil servants.²¹ Time use surveys find that, for both men and women, working longer hours limits the amount of time they are able to allocate to leisure.^{19 20}

Sex differences seen in this study on the impact of having children are notable. We speculate that post-natal advice explains why women exercise more in the first year of their child's life, but once the child is over 1 year old, the demands of motherhood may constrain leisure time exercise right up until her youngest child is in their late teens. Perhaps a reduction in the need for "hands on" childcare labour as the child ages explains why only young children have an impact on men's exercise participation. The impact on adult exercise participation of having children has been studied less often elsewhere.¹⁴ However, one cross sectional North American study found that women aged 20 to 65 whose children were aged 5 or under were less likely to exercise than those without young children.³⁵ Time use surveys have found that for men and, particularly, women having children limits the time adults have for leisure each day.^{19 20}

Together, the results for income, working hours, job type, and having children suggest that time, rather than money, is a key determinant of leisure time exercise.

Strengths and weaknesses of the study

Longitudinal studies of physical activity are comparatively rare. Using the BHPS allowed us to account for changes in people's social circumstances when assessing associations with regular exercise. The range of information provided by the BHPS allowed us to control for covariates not always included in other studies, income in particular.¹⁴ However, like the other covariates in the study, income was based on self report and so misclassification remains a possibility.

However, our measure of leisure time exercise was limited compared with the detailed questions on physical activity found in population health surveys.^{4 5} While, another major UK study (the Whitehall study) also used a single question to assess participation in leisure time physical activity and found more precise indicators of fitness to be associated with the self reported measure,⁷ the possibility of misclassification in our study remains. Our measure focused solely on the frequency of exercise. It measured neither the duration nor intensity and only included leisure time activities. Those classified as non-weekly exercisers could have been physically active in other aspects of their lives. Direct comparisons with other estimates of exercise rates are difficult because of differences in measures used and populations included in the samples. In England in 2003, 31% of the population reported undertaking sports and exercise on four or more days per

month, while for walking it was 23% although this figure only includes those walking at above average speed.⁴

CONCLUSION

Participation in regular leisure time exercise varies over the life course, both at a scale measurable in years and at a scale measured in life stage (for example, having children or becoming retired). Several of the factors associated with reduced likelihood of exercise seem to be about time. Income was not independently associated with weekly exercise, perhaps suggesting that material resources are less important than opportunity for exercise. There are perhaps two key messages for policy from this paper. Firstly, most people's exercise behaviour varies over time and health promotion campaigns should be sensitive to the influences of changing social and economic circumstances. Secondly, opportunity for exercise needs to be built into our hectic, everyday lives. If we do not have time for leisure time exercise, and the demands of our jobs and children cannot be easily curtailed, exercise as part of travel and work must be emphasised. The accurate measurement of physical activity, whether in leisure time, or as part of daily working life, is notoriously difficult.¹⁷ The inclusion of more comprehensive measures in longitudinal studies would improve understanding of this important behaviour.

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