The importance of both setting and intensity of physical activity in relation to non-clinical anxiety and depression.

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Abstract

Physical activity is associated with good physical and mental health. Current recommendations suggest that people should achieve 30 minutes of moderate-intensity activity most days of the week to gain health benefits. This activity may be accumulated in leisure time, in active commuting, at work or in the home. Here we look at the cross-sectional relationship between physical activity and mental health as measured by the HADS anxiety and depression scores in a sample of 1,742 participants from a Scottish general population survey. The participants were men and women in three age cohorts aged around 24, 44 and 64 years who, in 1995, were interviewed face to face and also self-completed the HADS depression and anxiety scale. Respondents reported their levels of physical activity at work, in the home and in leisure time; the intensities of activity were also determined. Physical activity was related to depression scores but not to anxiety scores. There was no relationship between work physical activity and depression score. Among women, depression score increased with each additional episode of vigorous home activity. In both sexes, depression score decreased with each additional episode of vigorous leisure activity, but among men the decrease in depression score with moderate leisure activity was reversed if a lot of moderate activity was undertaken. We have found a variable relationship between depression scores and various settings for physical activity. Researchers, policymakers and practitioners who are interested in the relationship between physical activity and mental health should take into account the setting for activity as well as frequency, duration and intensity of activity.

Key words: physical activity, housework, leisure activity, work activity, anxiety, depression.

Introduction

A sedentary lifestyle is now the normal lifestyle for the majority of the populations in developed countries (World Health Organisation 2004). For example, two-thirds of the European population is not doing sufficient activity to meet current recommendations (Kearney et al 1999). The recommendation for how much physical activity is required to achieve benefits has changed over the years. Early guidelines, researched and presented by the American College of Sports Medicine (ACSM), suggested that a minimum of 20 minutes of continuous activity at a level of intensity which could be translated as moderate to vigorous, at least three times each week, was required to enhance cardiorespiratory fitness (Pate et al 1995).

In 1995, in conjunction with the Centres for Disease Control and Prevention (CDC), ACSM augmented the traditional recommendations with guidelines specifically designed to enhance health. These guidelines suggest that "every...adult should accumulate 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week" (Pate et al 1995: 404). These guidelines emphasise the benefits of moderate-intensity physical activity that can be accumulated in relatively short bouts, and are designed to encourage an 'active living' approach to physical activity. Therefore, the recommended 30 minutes of activity per day can be accumulated from activities such as walking, gardening, housework and 'DIY', as long as the intensity corresponds to that of brisk walking (Pate et al 1995). These guidelines for the minimum amount of activity needed for health have been adopted around the world and are the basis of the World Health Organisation strategy for diet and physical activity (World Health Organisation 2004).

The epidemiological evidence regarding the range of medical conditions for which regular physical activity has a preventative effect has increased during the last decade. In the UK, the Chief Medical Officer stated that "... there are few public health initiatives that have a greater potential for improving health and well-being than increasing the activity levels of the population ...' (Department of Health 2004: 20). The evidence showing that physical activity has a preventative effect is more substantial for physical health outcomes than for mental health outcomes (Department of Health 2004, US Department of Health and Human Services 1996). This is largely because there has been more evidence to review in the physical health domain in comparison to the mental health domain, which is a newer topic of investigation. The evidence base on the link between physical activity and mental health is now building and allowed the UK Chief Medical Officer to state that "Physical activity can be considered both for its preventative and therapeutic effects on mental illness and also for its impact on mental health in the general population" (Department of Health 2004: 58).

Two of the most common mental health problems are anxiety and depression. There is a continuum in defining anxiety and depression that ranges from feelings which are short-lived and do not interfere much with our lives, to long-lasting symptoms that suggest a clinical diagnosis of a mental illness. Considering this range of the meaning of anxiety and depression, there are three ways that we might consider how physical activity may have an impact. These are: in the treatment of those with clinically defined depression and anxiety; in the prevention of depression and anxiety; and in the promotion of good mental health in the general population.

Physical activity in the treatment of depression and anxiety

There is increasing evidence that exercise can be an effective treatment for clinically defined depression. This evidence comes from meta-analytic review (Lawlor & Hopker 2001) and studies with robust design features (Dunn et al 2005). However, the role of exercise in the treatment of clinically defined anxiety has not attracted the same volume of research and there is insufficient evidence to make conclusions about exercise as a treatment for anxiety disorders (Biddle & Mutrie, in press).

Physical activity in the prevention of depression and anxiety

There are epidemiological data that suggest that physical activity might reduce the risk of depression. In eight prospective studies, in which physical activity was measured at one point of time and participants followed up at a later point in time, there was a consistent pattern of a preventative effect from physical activity (Bernaards et al 2006, Camacho et al 1991, Farmer et al 1988, Mobily et al 1996, Motl et al 2004, Paffenbarger et al 1994, Strawbridge et al 2002, Van Gool et al 2003). A futher three studies have not found this protective effect, but the weight of the evidence is supportive of physical activity having a preventative role in the development of depression (Cooper-Patrick et al 1997, Kritz-Silverstein et al 2001, Weyerer 1992). No prospective studies could be found that show a preventative effect of physical activity on the development of anxiety disorders.

Promoting good mental health in the population

Participation in physical activity and exercise is consistently associated with positive affect and mood (Biddle 2000). It would appear that exercise does 'make you feel good'. Data on non-clinical levels of anxiety and depression tend to show a negative relationship between activity levels and scores on a variety of anxiety and depression scales. For example, in the Scottish Health Survey of 1995 (Dong & Erins 1997) physical activity (assessed by self-report and covering activity at home, at work and sports and exercise) showed a significant negative relationship between levels of physical activity and poor psychological well-being, as measured by the General Health Questionnaire (GHQ) (Goldberg et al 1970). The Copenhagen Heart Health Study showed that with increasing physical activity in leisure time, there was a decrease in stress levels and life dissatisfaction (Schnohr et al 2005). Moderate levels of activity (2-4 hours' walking per week) showed the most pronounced difference in comparison to those who had low levels of activity. Fewer feelings of anxiety and depression would indicate higher levels of psychological well-being and therefore are important to consider in the promotion of good mental health. Such a consideration fits with Seligman's notion of positive psychology in the sense that we need to explore what is associated with helping people feel good as well as establish what makes people feel bad (Seligman et al 2005).

Taken together, these prospective and descriptive data certainly indicate an association at a population level between activity and good mental health. However, there are many questions still to be answered. There is no consensus about why such an association exists: physical activity may relate to mental health because of nuerotransmitters that are released during exercise (such as serotonin) that are related to positive moods, or there may be psychological processes (such as improved self-esteem) that provide a possible explanation. Such possibilities require further experimental studies to add light to the possible explanations. Further prospective population studies and studies that examine the mode, intensity and duration of activity that might confer benefits are also required. Few studies have included measures of physical activity that allow a separate examination of how activity achieved in various settings (such as home or at work) relates to mental health. This is particularly important since the recommendation that health benefits can be achieved by accumulating at least 30 minutes of moderate intensity throughout the day most days of the week is now universally accepted. Such activity might be accumulated

from leisure time, from active commuting, from work activity or from activity done around the home. Recently, some doubt has been cast on the benefit of housework for women in terms of protection from coronary heart disease but no studies could be found that examined such a relationship for mental health (Lawlor et al 2002).

The aim of this paper is to examine the cross-sectional relationship between physical activity and mental health. In particular, we will consider separately moderate and vigorous activity and examine work, home and leisure activity in order to determine whether different intensities or settings for activity have different relationships to self-reported anxiety and depression.

Methods

The sample

The participants were part of the West of Scotland Twenty-07 Study: Health in the Community, which has had appropriate ethical approval (Macintyre et al 1989). This is a longitudinal study on the social patterning of health in three age cohorts, each with approximately 1000 participants aged 15, 35 and 55 when first interviewed in 1987/8. The participants were selected from the population of the Central Clydeside Conurbation using a two-stage stratified, clustered, random sample design, the details of which are described elsewhere (Ecob 1987). The baseline sample has been shown to be comparable with the 1991 census in terms of gender and social class distribution (Der 1998). The data used here are from the third wave of the Twenty-07 Study which was carried out in 1995/6 when the cohorts were aged about 24, 44 and 64 years respectively. This wave of data was chosen for the current analysis since the same physical activity measures were made on all three age cohorts. At the third wave, data were collected on 2,153 participants. This number represents 71% of the original population who were recruited in 1987. We considered that disabled participants were both unlikely to be physically active and very likely to be classified as ill, so we excluded any participants who reported that they were unable to walk a quarter of a mile (400 metres) without great difficulty; this left 1,927 participants. There were further exclusions due to missing data, and the numbers included in each analysis will be given in the results.

Variables

Trained nurse interviewers visited the home of the respondent and carried out extensive face-to-face interviews and took some physical measurements. Age and gender were noted at interview and respondents were asked about many aspects of their lives including: the time spent doing heavy physical work during paid work, housework, household maintenance and gardening; the time spent doing leisure activities such as sports, walking and cycling; whether their activities made them out of breath or sweaty; about their ability to walk a quarter of a mile (400 metres); their smoking status; their employment status; and current job details. The participants also completed a short questionnaire in their own time which included the Hospital Anxiety and Depression Scale (HADS) (Snaith & Zigmond 1994). The HADS scale distinguishes between, and measures the severity of, anxiety and depression. It is self-administered and uses a timeframe of 'over the last few days'. It has been shown to have acceptable reliability and validity (Clark & Fallowfield 1986). For each setting

for activity (i.e. work, home or leisure) we estimated weekly occasions of moderate activity lasting at least 30 minutes and of vigorous activity lasting at least 20 minutes. For all modes, our questions about activity that made the subject out of breath or sweat enabled us to judge whether or not the activity was done at a vigorous level. The measures of physical activity used in the analyses were: weekly occasions of moderate or vigorous activity, at work, in the home, in leisure, or overall. Further details of how we estimated each level of activity in each setting is provided elsewhere (Mutrie & Hannah 2004).

The mental health measures used are depression and anxiety scores calculated from HADS (Snaith & Zigmond 1994). The interpretation of both the anxiety and depression scores is as follows: 0-7 normal, 8-10 mild, 11-14 moderate, 15-21 severe. Since we are interested in non-clinical levels of depression, we used continuous HADS scores in our analyses.

Potential confounding factors were considered to be age (cohort), employment status (housewife, in education, disabled, unemployed, retired, employed or other), head of household social class, and current smoking status. Social class was determined by head of household occupation (OPCS 1980). Standard classifications were then used to categorise respondents into one of six social class categories as follows: I, II, III non-manual, III manual, IV, V.

Statistical methods

All analyses were performed for men and women separately and using SPSS V9.0. These separate analyses were justified because we know that these men and women show different patterns of physical activity (Mutrie & Hannah 2004). General linear modelling (GLM) analyses were used to determine the relationships between physical activity and HADS anxiety or depression scores, adjusting for age cohort, employment status, head of household occupational social class, and current smoking status. In the GLM analyses, the activity variables were entered as continuous covariates and the controlling variables as fixed factors. In order to illustrate the relationship between each of the controlling variables and the HADS scores, we also present the means of the HADS scores for each category of each controlling variable.

HADS depression score has a positively skewed distribution, so the square root transformed score was used as the outcome variable in the analysis. HADS anxiety score was not skewed and did not have to be transformed.

The main analyses involved running bivariate analyses with only the physical activity variable as predictor, and then subsequently adjusting for all the controlling variables at the same time. We report the regression coefficient, its standard error, and significance level for the relationship between each activity variable and the health outcome, before and after full adjustment. We investigated the possibility that some of the relationships found were non-linear and, where a squared term was entered into a model, it was centred around the mean of the original variable in order to reduce collinearity. We also checked for all two-way interactions. Finally, we ran a model which included all the controlling variables and all activity variables as predictors in order to determine whether the effects of one mode or intensity of physical activity were independent of others.

We wanted to illustrate the results by giving an idea of effect size in terms of the change in HADS score for each additional episode of physical activity and did this by calculating the predicted values from the model for a reference group chosen to have modal values. The reference groups chosen were: for men, aged 24, employed, and non-smokers; and for women, employed and in II non-manual social class.

Results

Very few of our participants were actually depressed: only 0.1% (n=2) severely, 1.9% (n=33) moderately, and 7.9% (n=138) mildly; while more were anxious: 3.9% (n=68) severely, 12.8% (n=223) moderately, and 24.4% (n=424) mildly.

Among men and women, weekly occasions of the various modes of activity ranged from 0 to 7 with median 0. Exceptions to this were: among men, the range of moderate leisure activity was 0 to 14 (median 0.5), and of vigorous leisure activity was 0 to 18 (median 0); among women, vigorous home activity ranged from 0 to 4 (median zero), moderate leisure activity from 0 to 14 (median 0.5) and vigorous leisure activity from 0 to 15 (median 0). Table 1 shows the percentage of men and women doing any (moderate or vigorous) activity in each setting. More men than women did any (moderate or vigorous) work or leisure activity. For home activity, however, more women than men did any at a moderate level, but there was no gender difference for vigorous home activity.

HADS depression score results

After excluding those unable to walk or with missing data for any of the variables in the analysis, there were 790 men and 952 women remaining. Table 2 shows the mean of the HADS depression score for each category of each of the controlling factors. Analysis of variance carried out on square-root transformed scores shows that there is variation in depression score by employment status and smoking for both sexes, and by age for men only, and by social class for women only.

We present below the results of the GLM analyses for HADS depression score taking each setting for activity in turn. Table 3 shows the linear relationships between work, home and leisure physical activity and HADS depression before and after adjustment for the controlling factors. Relationships significant at the 5% level are highlighted in bold.

Work activity

There were no significant relationships between work activity and HADS depression score.

Home activity

There was a significant positive relationship between vigorous home activity and HADS depression score in women only (Table 3). The regression coefficient obtained suggests that, for example, in the reference group there was an increase of about 0.4 in depression score for each additional occasion of vigorous home activity.

Leisure activity

There was a relationship between moderate leisure activity and HADS depression score in men only and the relationship was actually quadratic. (Parameters in adjusted model were: for activity, B=-0.071, SE(B)=0.021, p<0.001; for [activity.sup.2], B=0.009, SE(B)=0.004, p=0.011.) The predicted values suggested that depression score decreased with each additional occasion of moderate activity up to five occasions per week but increased if more occasions were undertaken. In the reference group, the decrease in score was 0.25 from one to two occasions and 0.04 from four to five occasions; the increase in score from five to six occasions was 0.01 and from six to seven occasions was 0.05. We were concerned that this quadratic relationship was an artefact caused by a few outliers, so we re-ran the quadratic model, excluding the highest one per cent of moderate leisure activity, and found a similar result.

There was an inverse linear relationship between vigorous leisure activity and depression score for both sexes (Table 3). For men, there was a decrease of about 0.10 per additional occasion in the reference group. For women, the corresponding decrease was 0.15.

Overall activity (work, home and leisure)

Table 3 shows that overall activity has similar relationships with HADS depression score to those found for leisure activity. However, because we have shown above that each mode of activity has a different relationship with depression scores, the interpretation is not clear. For example, for women, the relationships between leisure and home activity and depression scores go in opposite directions, with the overall relationship being weaker than either of these modes. We are only reporting this finding to allow comparison of other studies which have used an aggregated score.

All modes and intensities of activity

When we adjusted the relationships between each mode of activity and HADS depression for every other mode of activity and all the controlling factors, all the relationships found previously were weakened slightly but remained significant (results not shown).

HADS anxiety score results

After excluding those unable to walk for a quarter of a mile or with missing data for any of the variables in the analysis, there were 791 men and 950 women remaining.

Table 4 shows the mean of HADS anxiety score for each category of each of the controlling factors. There is variation by age cohort, by employment status, by social class for women only, and by smoking status (significant for men only).

Table 5 shows the linear relationship between work, home and leisure physical activity and HADS anxiety before and after adjustment for the controlling factors. There were no significant linear relationships. Furthermore, there were no significant relationships between work activity, home activity or leisure activity and HADS anxiety score. We found a quadratic relationship between moderate overall activity

(work, home and leisure together) and HADS anxiety in men, but this was not significant after full adjustment (results not shown). We also ran analyses adjusting for all settings for activity and all the controlling factors and found no significant relationships.

Discussion

We found that there were low levels of depression in this population with only 10% scoring out of the normal range. Prevalence of anxiety was greater, with just over 40% scoring out of the normal range. In terms of the relationship of physical activity to depression scores, we found different patterns for different settings for activity. As has been found elsewhere (Dunn, Trivedi et al 2001), vigorous leisure activity was negatively related to depression scores for both men and women, while no relationship was evident with work activity. Surprisingly, we found a quadratic relationship between moderate level activity and depression scores for men, and no relation of moderate activity to depression scores for women. Other studies have found that moderate activity is related to psychological well-being for both men and women, but there are no studies that have used HADS data to establish this relationship and many studies do not separate out moderate and vigorous activity. It is interesting that the peak of the quadratic relationship in the male data, that is the point where levels of activity were associated with the lowest scores in depression, was found at five occasions per week, which is in line with the current activity recommendations for health. With a lower and a higher frequency, the benefit was less. Experimental studies show a benefit of moderate activity over vigorous activity in terms of psychological benefit in both men and women (Moses et al 1989), but in such studies the intensity of activity is much more clearly defined than is possible in a self-report survey such as ours and the frequency was not higher than three days per week.

For men, there was no relationship between home activity and depressions scores. In contrast, among women, depression score increased with each additional episode of vigorous home activity. This suggests that not all kinds of physical activity, even when performed at a vigorous level, are associated with mental health benefits. High levels of vigorous housework may be associated with fewer opportunities to get out of the house and therefore may not be activities of choice. Of course such cross-sectional data cannot suggest cause and effect and there may well be other intervening variables that have not been accounted for in our analyses which could explain this relationship. However, doubt has also been cast over whether or not housework, even when it is completed at a vigorous intensity, has an impact on physical health (Lawlor et al 2002). Again, we could find no other study that has mentioned mental health in relation to activity completed as housework.

We found no significant relationships between HADS anxiety scores and any mode of activity. This pattern of findings is similar to another population study where both depression and anxiety (at a clinical level) (Thorsen et al 2005) have been measured. There is certainly more epidemiological evidence concerning inactivity as a risk factor in the development of depression than there is concerning anxiety. There is no clear reason for these patterns of relationships between physical activity and anxiety and depression, but suggested explanations include the diverse nature of anxiety disorders and the difficulty of precise measurement of such disorders (Biddle &

Mutrie, in press). For example, the HADS scale was deliberately constructed to measure anxious thoughts and moods rather than somatic symptoms of anxiety (Snaith & Zigmond 1994). There may be different relationships between physical activity and somatic and cognitive symptoms of anxiety.

Taken together, these findings suggest that not all settings for physical activity relate to mental health benefit and that the relationships may not be the same for men and women. In order to examine the relationship between physical activity and depression and anxiety, researchers must examine not only the frequency, intensity and duration of activity but also the setting in which the activity is performed, because total physical activity scores aggregated from various settings may mask important patterns of association. There is also a need for a gender analysis of these relationships.

Limitations

There are weaknesses in our measurement of physical activity: we have no measure of incidental activity, such as stair climbing in shopping areas or short walks, nor of accumulated activity over the course of one day, but these are difficult to assess in a large survey setting. There is also the problem of attrition in a longitudinal sample such as this that weakens the representative inference to the population in general. Finally, there is the limitation of the cross-sectional nature of these data which precludes any discussion of causality. We acknowledge that poor mental health may preclude vigorous activity. We hope to be able to address this when the next wave of data has been collected on this sample to enable relationships between changing levels of physical activity and anxiety and depression scores to be explored.

Conclusions

We observed here relationships between two measures of mental health and various modes of physical activity and have noted that the relationships were varied. Physical activity was significantly associated with depression scores but not with anxiety scores. While lower depression scores were seen among those undertaking frequent vigorous leisure activity, if the intensity reduced to moderate or if the activity was done through work, or housework, then we observed different relationships. Future studies of the relationship between active living and mental health must take account of how people achieve the recommended levels of daily physical activity as well as duration, intensity and frequency of activity.

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TABLE 1: Percentage of subjects by gender doing any moderate or vigorous activity at work, home, or leisure, showing p value for Chi-squared test

		Percentage of subjects doing any:					
		Work activity		Home activity		Leisure activity	
		%	n	%	n	%	n
Moderate	Men	13.2	104	39.5	312	63.9	505
	Women	7.6	72	48.5	462	57.5	547
	p	p<0.001		p<0.001		p=0.007	
Vigorous	Men	13.2	104	13.3	105	48.2	381
	Women	4.8	46	14.4	137	39.2	373
	p	p<0.001		p=0.550		p<0.001	

TABLE 2: Mean and standard deviation of HADS depression score for each category of the controlling factors. The p value obtained from one-way analysis of variance, using square root transformed HADS depression score, is also shown for each variable

	Men			Women		
	mean	(s.d.)	n	mean	(s.d.)	n
Overall	3.40	(2.69)	790	3.61	(2.82)	952
Age cohort	p<0.001			p=0.459		
youngest	2.77	(2.31)	271	3.44	(2.67)	320
middle	3.84	(2.85)	285	3.78	(2.98)	350
oldest	3.59	(2.78)	234	3.60	(2.79)	282
Employment status	p<0.001			p<0.001		
female housewife				4.40	(3.16)	137
other	3.50	(3.39)	6	4.60	(4.12)	10
in education	1.71	(1.65)	17	3.79	(2.68)	19
disabled	5.14	(3.26)	35	7.10	(4.63)	10
unemployed	4.04	(3.05)	69	4.83	(2.57)	23
retired	3.39	(2.68)	98	3.53	(2.76)	177
employed	3.26	(2.57)	565	3.32	(2.62)	576
HOH Social Class (a)	p=0.584			p<0.001		

I	3.14	(2.79)	78	3.15	(2.40)	88
II	3.39	(2.68)	213	3.24	(2.84)	259
IIIN	3.48	(2.76)	114	3.52	(2.57)	202
IIIM	3.44	(2.63)	264	3.78	(2.77)	259
IV	3.47	(2.92)	95	4.23	(3.05)	103
V	3.12	(2.03)	26	4.80	(3.74)	41
Current smoker	p<0.001			p=0.047		
no	3.12	(2.53)	506	3.49	(2.80)	635
yes	3.89	(2.90)	284	3.87	(2.84)	317

(a) p value is for linear trend

TABLE 3: Results of linear GLM analyses with HADS depression score (square root transformed) as outcome variable

		Moderate activity		
		B	SE (B)	p
Men	Work	-0.033	0.020	0.104
	Work (adj. (a))	-0.023	0.021	0.272
	Home	-0.036	0.029	0.897
	Home (adj. (a))	-0.032	0.027	0.240
	Leisure	-0.023	0.013	0.071
	Leisure (adj. (a))	-0.028	0.012	0.023
	Overall	-0.023	0.010	0.023
	Overall (adj. (a))	-0.027	0.010	0.007
Women	Work	-0.034	0.026	0.199
	Work (adj. (a))	-0.012	0.026	0.658
	Home	0.011	0.021	0.610
	Home (adj.(a))	-0.005	0.021	0.803
	Leisure	-0.017	0.013	0.186
	Leisure (adj. (a))	-0.014	0.013	0.281
	Overall	-0.013	0.010	0.193
	Overall (adj. (a))	-0.012	0.010	0.257

		Vigorous activity		
B	SE (B)	p		
Men	Work	0.004	0.018	0.818
	Work (adj. (a))	0.018	0.018	0.331
	Home	0.019	0.047	0.688
	Home (adj. (a))	0.004	0.047	0.925
	Leisure	-0.058	0.012	0.000
	Leisure (adj. (a))	-0.036	0.013	0.005
	Overall	-0.034	0.009	0.000
	Overall (adj. (a))	-0.016	0.010	0.105
Women	Work	0.030	0.030	0.326
	Work (adj. (a))	0.048	0.030	0.112
	Home	0.118	0.051	0.021
	Home (adj.(a))	0.114	0.050	0.024
	Leisure	-0.059	0.015	0.000
	Leisure (adj. (a))	-0.048	0.016	0.002
	Overall	-0.029	0.013	0.024
	Overall (adj. (a))	-0.016	0.013	0.218

(a) adjusted for all controlling factors

TABLE 4: Mean and standard deviation of HADS anxiety score for each category of the controlling factors. The p value from one way analysis
of variance is also shown for each variable

		Men			Women	
	mean	(s.d.)	n	mean	(s.d.)	n
Overall	6.50	(3.64)	791	7.53	(3.74)	950
Age cohort	p=0.012			p=0.008		
youngest	6.67	(3.59)	273	7.77	(3.63)	319
middle	6.81	(3.80)	286	7.78	(3.91)	350
oldest	5.91	(3.41)	232	6.95	(3.60)	281
Employment status	p<0.001			p<0.001		
female housewife				7.57	(4.06)	138
other	6.67	(3.93)	6	8.90	(4.38)	10
in education	5.18	(2.98)	17	8.32	(4.75)	19
disabled	8.37	(4.29)	35	12.40	(4.43)	10
unemployed	7.41	(3.76)	70	8.86	(4.49)	22
retired	5.70	(3.52)	97	6.84	(3.58)	176
employed	6.44	(3.56)	566	7.55	(3.55)	575
HOH Social Class (a)	p=0.827			p=0.002		
I	6.53	(3.62)	78	7.26	(3.30)	88
II	6.26	(3.87)	213	6.86	(3.40)	257
IIIN	7.01	(3.43)	114	7.72	(3.60)	202
IIIM	6.50	(3.66)	265	7.85	(3.87)	261
IV	6.29	(3.41)	95	8.08	(4.05)	102
V	6.77	(3.20)	26	8.00	(5.13)	40
Current smoker	p=0.002			p=0.087		
no	6.20	(3.57)	507	7.38	(3.69)	632
yes	703	(3.69)	284	7.82	(3.84)	318

(a) p value is for linear trend

TABLE 5: Results of linear GLM analyses with HADS anxiety score as outcome variable

		Moderate activity		
		B	SE (B)	p
Men	Work	-0.133	0.094	0.157
	Work (adj. (a))	-0.134	0.097	0.170
	Home	0.046	0.127	0.719
	Home (adj. (a))	0.011	0.128	0.934

	Leisure	-0.062	0.059	0.289
	Leisure (adj. (a))	-0.035	0.059	0.552
	Overall	-0.065	0.046	0.162
	Overall (adj. (a))	-0.050	0.046	0.279
Women	Work	-0.005	0.127	0.971
	Work (adj. (a))	0.006	0.128	0.963
	Home	0.025	0.102	0.805
	Home (adj. (a))	0.001	0.104	0.995
	Leisure	-0.085	0.063	0.181
	Leisure (adj. (a))	-0.022	0.064	0.735
Overall		-0.048	0.050	0.342
	Overall (adj. (a))	-0.012	0.050	0.809

		Vigorous activity		
		B	SE (B)	p
Men	Work	0.018	0.082	0.821
	Work (adj. (a))	0.030	0.087	0.730
	Home	0.221	0.221	0.317
	Home (adj. (a))	0.213	0.221	0.336
	Leisure	-0.046	0.056	0.406
	Leisure (adj. (a))	-0.054	0.060	0.370
	Overall	-0.014	0.044	0.740
	Overall (adj. (a))	-0.014	0.047	0.760
Women	Work	0.121	0.147	0.411
	Work (adj. (a))	0.104	0.146	0.479
	Home	0.411	0.249	0.099
	Home (adj. (a))	0.376	0.246	0.126
	Leisure	-0.040	0.074	0.593
	Leisure (adj. (a))	-0.052	0.078	0.505
	Overall	0.019	0.062	0.754
	Overall (adj. (a))	0.010	0.064	0.874

(a) adjusted for all controlling factors