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The Work and Home Activities Questionnaire: Energy Expenditure Estimates and Association With Percent Body Fat

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Abstract

Background—Understanding and increasing physical activity requires assessment of occupational, home, leisure and sedentary activities.

Methods—A physical activity questionnaire was developed using data from a large representative U.S. sample; includes occupational, leisure and home-based domains; and produces estimates of energy expenditure, percent body fat, minutes in various domains, and meeting recommendations. It was tested in 396 persons, mean age 44 years. Estimates were evaluated in relation to percent body fat measured by dual-energy x-ray absorptiometry.

Results—Median energy expenditure was 2,365 kcal (women) and 2,960 kcal (men). Women spent 35.1 minutes/day in moderate household activities, 13.0 minutes in moderate leisure and 4.0 minutes in vigorous activities. Men spent 18.0, 22.5 and 15.6 minutes/day in those activities, respectively. Men and women spent 276.4 and 257.0 minutes/day in sedentary activities. Respondents who met recommendations through vigorous activities had significantly lower percent body fat than those who did not, while meeting recommendations only through moderate activities was not associated with percent body fat. Predicted and observed percent body fat correlated at $r = .73$ and $r = .82$ for men and women respectively, $P < .0001$.

Conclusions—This questionnaire may be useful for understanding health effects of different components of activity, and for interventions to increase activity levels.

Keywords

methods; health; obesity; physical activity questionnaire; energy expenditure

Extensive scientific evidence links lack of physical activity to elevated chronic disease risk. Indeed, the Centers for Disease Control and Prevention (CDC) describes physical inactivity as one of the top three causes of chronic disease,¹ and a goal of Healthy People 2010 is to “improve health, fitness, and quality of life through daily physical activity”². Regular physical activity reduces risk of heart attack, diabetes, hypertension and some cancers. In addition, physical activity maintains physical function in older adults,³ and helps prevent overweight and obesity.⁴ As of 2004, approximately one-third of Americans were overweight and another one-third were obese,⁵ and U.S. adults gain between 0.5 and 2.0 pounds per year.⁶

Despite the demonstrated benefits of physical activity, and the evident need to reduce the population's continuing weight gain, more than half of U.S. adults get insufficient activity to provide health benefits, and one-fourth perform no leisure-time physical activity.⁵ In response, numerous programs to promote increased physical activity are under way, in the U.S. and worldwide.⁵ Such programs require assessment tools, so as to understand where to focus intervention efforts, and to evaluate program effectiveness. Many such tools have been developed.⁷

Many earlier methods of assessing physical activity focused on vigorous activities shown to improve cardio-respiratory fitness. However, more recently it has been recognized that activities of lower intensity may provide health-related benefits.⁸ Even progressing from a sedentary state to a minimal level of physical activity can yield health benefits.⁸ Thus, assessment methods are needed that can capture the range of activities that are encompassed by the term ‘physical activity’, including occupational activities, home and ‘usual-life’ activities such as child care and gardening, and leisure activities ranging from walking to active sports.⁹ Sedentary ‘activities’ like reading are also part of the spectrum, and although their contribution to health may be inverse, measurement of this behavior is needed to evaluate the effects on health or the success of interventions.

If the entire spectrum of activity and inactivity can be assessed, it may be possible to obtain estimates of average daily energy expenditure. The ability to estimate energy expenditure would improve efforts to understand and prevent obesity, could aid in standardization of multinational data, and could aid in improving dietary assessment instruments.

We developed a physical activity questionnaire using a data-based approach, to encompass the entire spectrum of behaviors from sleeping and sedentary activities to vigorous and intense activities found to be important contributors to energy expenditure in national data. The purpose of this analysis was to test the association of estimates from the questionnaire with percent body fat as measured by dual energy x-ray absorptiometry, in men and women; to test which components of reported activity (home-based, moderate leisure, vigorous, etc.) were associated with percent body fat; to test whether meeting national guidelines was associated with lower percent body fat; and to describe the activity patterns as estimated by the questionnaire in a large adult sample.

Methods

Selection of Activities to Include on the Work and Home Activities Questionnaire

In 1999, Dong et al¹⁰ examined activities represented in the National Human Activity Pattern Survey (NHAPS). Methods used in NHAPS have been described.^{11,12} The NHAPS surveyed 7,515 adults, of whom 55.7% were female. Sample weights were applied to achieve estimates representative of the U.S. population. Individuals were interviewed throughout the year. The survey used a 24-hour activity recall method. All activities, including sedentary activities and sleeping, over a 24-hour period were reported. This methodology is analogous to 24-hour dietary recalls used by national surveys of dietary intake.¹³ Respondents were asked to describe everything they did on the previous day and the time spent doing it, from the time of arising—for example, “8:00–8:20, getting dressed; 8:20–8:30, eating breakfast.” Dong et al coded the 125,533 activity entries into activity categories from the Compendium of Physical Activities and the Compendium Update by Ainsworth et al.^{14,15} Compendium values were used to assign the appropriate metabolic expenditure levels (METs; 1 MET = 1 kcal/kg body weight/hour) for each activity category. They then combined activities based on conceptual similarity and activity level (MET value) into 88 activity categories.

Dong et al created a score representing energy expenditure, for each of the 125,533 activities, by multiplying the MET value for that activity (kcal/kg body weight/hour) times the reported duration of activity (hour). Thus, the score was equivalent to the kcal/kg body weight associated with an individual's specific activity. The energy expenditure scores of all mentions of an activity over all individuals were summed for each activity category. The amount contributed by an activity category to total population energy expenditure thus takes into account its intensity (MET value), and the frequency of its performance by the population, and its average duration. The 88 activity categories were then ranked by their percent contribution to the energy expenditure of the population. This ranking was done both overall and separately by gender and other characteristics.

This procedure used by Dong et al for energy expenditure is parallel to that used by Block and colleagues for foods contributing to nutrient intake in the population.¹⁶ The present authors used the rankings of activities contributing to population energy expenditure to identify the activities that should be included on an energy expenditure questionnaire. After examining the ranked activity lists separately for men and women, activities were included on the Work and Home Activities questionnaire if they were within the top 90% of total energy expenditure in the population. Activities similar conceptually and in MET value were grouped together for use in the questionnaire. For example, one question asks about “Exercise on treadmill, stair climber, exercise bike, rowing machine, other cardio machines.” The result was a list of 26 activity groups and 16 job types for the questionnaire. This approach is similar to methods used previously by the authors for dietary data.^{16,17} MET values for each activity and job type are assigned based on the work of Ainsworth et al.^{14,15} The questionnaire takes approximately 12 to 15 minutes to complete.

Activity Areas Covered by the Questionnaire

The resulting instrument asks about types of jobs performed, and number of days and minutes per day, and asks about 26 activity groups. The domains include activities performed for exercise or fitness, home-based activities, transportation, sedentary activities, and sleep. Moderate non job activities (METs 3 to 6) included leisure activities (fast walking, exercise like weight machines, fishing, golf, sports like softball) and household activities (taking care of children, house cleaning, yard work, home maintenance). Vigorous activities (METs > 6) included running/biking, swimming, gym exercises like treadmill. Sedentary activities were defined as including watching TV/movies, using the internet, sitting, talking, driving/riding in a car/bus. Each question asks about how often the activity was performed in the past year and about duration on those days. In addition, two open-ended questions asked about frequency, duration and intensity of other activities not mentioned: "Any other fitness activity" and "Any other home or leisure activity."

Parameters Estimated

The questionnaire produces estimates of total energy expenditure, in kilocalories (kcal) per day; minutes and MET-minutes of moderate and vigorous activities, overall and by categories of job, leisure and 'household' domains; and estimates of whether the participant meets various physical activity recommendations. In addition, the questionnaire produces an estimate of percent body fat, based on the respondent's age, sex, weight, height, and responses to the physical activity questionnaire.

Minutes in each activity were calculated by multiplying reported frequency by reported duration. Estimates based on minutes were adjusted to compensate for over-reporting of total minutes. MET-minutes in each activity were calculated by multiplying minutes by MET values. Jobs were assigned MET values ranging from 1.5 to 10.5, based on Compendium values.^{14,15} Basal energy expenditure was calculated as a function of age, height and weight based on formulae from the Energy Expenditure chapter of the 2005 Dietary Reference Intakes (DRI).¹⁸ Physical Activity Level (PAL) was calculated as the ratio of energy estimated from the questionnaire to basal energy expenditure. Total energy expenditure was then calculated, separately by gender, using formulae from DRI.

The questionnaire also scores respondents on whether they meet physical activity recommendations, based on several different definitions. One score is referred to as the "CDC-ACSM" score, based on recommendations put forward by the Centers for Disease Control and Prevention and the American College of Sports Medicine^{2,8}: "Engage in moderate physical activity for at least 30 minutes on at least five days a week, or engage in vigorous physical activity for 20 minutes on at least three days per week." To evaluate the impact of different types of activities, several definitions of this score were created: to include all moderate and vigorous activities including household activities; nonhousehold leisure activities; only moderate activities; only vigorous activities. Only activities that were reported as being performed for at least 30 minutes at a time could contribute to the score for days of moderate activity. The frequency of such days was summed over all activities. Thus, to meet the recommendation the participant had to have sessions in a particular activity lasting at least 30 minutes of moderate or 20 minutes of vigorous activity, and to have such

sessions for the appropriate number of days. Scores were also developed to represent meeting the physical activity recommendations of the 2005 Dietary Guidelines, “Engage in approximately 60 minutes of moderate- to vigorous-intensity activity on most days of the week.”¹⁹ This score was calculated by summing the number of days in which an individual moderate or vigorous activity was engaged in for at least 60 minutes. “Most days” was defined for the analysis as five or more days.

Sample in Which the Questionnaire Was Tested

In 2005 we recruited adults for a randomized controlled trial of the effect of vitamins C and E on C-reactive protein. The data reported here refer only to the baseline data from that study. The methods have been described in detail elsewhere.²⁰ Briefly, 396 participants were recruited from the San Francisco Bay area. Exclusion criteria included active or passive smoking, consumption of more than two alcoholic drinks per day, pregnancy or breastfeeding, disease conditions (cancer, stroke, diabetes, HIV), and use of certain prescription medications. The study design was approved by the institutional review boards of the University of California at Berkeley and Children's Hospital & Research Center of Oakland, CA. Signed informed consent was obtained from all participants.

Anthropometric measurements were obtained by trained nurses and technicians. Body weight (Health-O-Meter digital electronic) was measured without shoes, jackets, or heavy sweaters. Height was measured without shoes, using a wall mounted stadiometer (Perspective Enterprise). Height and weight measurements were repeated until two measurements in succession were within 0.5 cm and 0.3 kg respectively. Body fat was assessed by a whole body scan, at baseline, using dual energy x-ray absorptiometry (DXA) (Hologic, Delphi A, Model QDR 4500A; Software version 11.2). Scans were analyzed according to manufacturer's specifications using the whole body fan beam analysis mode.

The physical activity questionnaire was mailed to participants to complete at home, and was brought to the first clinic visit. (Electronic online and offline versions of the questionnaire exist at www.nutritionquest.com, but they were not used in this study.) If the questionnaire had not been completed at home, participants were given time during the clinic visit to complete it. The questionnaire was examined for missing data by study personnel, and missing questions were completed by interview.

Statistical Methods

To maximize the generalizability of the results to ‘real-world’ situations, no outliers were removed, and heights and weights used in calculations are those reported on the questionnaire, not those measured in the clinic. Baseline differences between men and women were assessed using 2-sided nonparametric Wilcoxon scores. Associations of predicted percent body fat and MET-minutes in various types of activities with percent body fat as estimated by DXA were examined using nonparametric Spearman partial correlation coefficient, adjusted for age and minutes spent in moderate/vigorous jobs.

Equations for the prediction of percent body fat were developed in a test dataset consisting of the first 200 participants. Prediction equations were then tested in the remainder of the dataset. Correlations between predicted and observed percent body fat were similar in both

subsets and therefore results are presented for the combined dataset. Completed questionnaires were analyzed using programs developed by NutritionQuest, formerly known as Block Dietary Data Systems (Berkeley, CA).

Results

Mean age was 44 years (range 18 to 65), and 65% of the participants were female (Table 1). Whites comprised 71.7% of the sample, and almost 70% had a college degree or higher. Men and women did not differ significantly in race or education, but women were significantly older and had higher BMI. Clinic-measured BMI correlated at $r = .96$ with BMI calculated from questionnaire responses (data not shown.)

Few members of the sample had jobs involving moderate or vigorous activity, with a median of zero and mean of 30 minutes per day in job-related moderate or vigorous activity (Table 2). Total non job moderate and vigorous activities represented a median of 76.15 and 73.05 minutes per day by men and women respectively. However, of those minutes only a median of 22.5 and 13.0 minutes per day were spent in moderate leisure (ie, nonhousehold) activities by men and women; and only 15.6 and 4.0 minutes/day were spent in vigorous leisure activities by men and women respectively. In contrast, 276.4 and 257.0 minutes per day were spent in sedentary activities by men and women respectively.

Median energy expenditure for the entire sample was 9.9 mJ/day (2,365 kcal) among women and 12.4 mJ/day (2,960 kcal) among men (Table 2). Estimated expenditures ranged from a median of 7.4 mJ/day (1,765 kcal) for sedentary females to 14.6 mJ/day (3,483 kcal) for very active males (Table 2).

When all activities are included, 60% of men and 64.9% of women were estimated to meet the CDC-ACSM recommendations (Table 2). However, when the four household items are excluded and only leisure activities are considered, only 29.3% of women and 45.9% of men met the CDC-ACSM recommendations. Only 20.7% of men and 10.0% of women met the 2005 Dietary Guidelines recommendation of 60 minutes on most days.

The association between meeting or not meeting the CDC-ACSM guideline definitions and percent body fat as measured by DXA was significant in both men and women when all moderate and vigorous activities are included (Table 3). Men who met that definition had 20.0% body fat, compared with 23.3% body fat in those who did not ($P = .001$). Women who met the guideline had 33.9% body fat, compared with 36.3% in those who did not ($P = .006$). However, for both men and women, meeting guideline recommendations only through moderate activities was not associated with a significant difference in percent body fat ($P = .38$ to 0.92). Associations with body fat were limited to those performing vigorous activities. The number of days on which vigorous activities were performed for at least 20 minutes correlated significantly ($P = .0003$) with percent body fat in both men and women, although the correlation was weaker in women.

The predicted body fat estimated by the program correlated highly with observed body fat, Spearman $r = .73$ and 0.82 for men and women respectively ($P < .0001$) (Table 3). The

distribution of predicted body fat corresponded well to the distribution of actual body fat as estimated by DXA (figure 1).

Discussion

These analyses have shown that the questionnaire produces estimates of physical activity that correspond significantly with percent body fat as estimated by DXA, and produces estimates of energy expenditure that are consistent with energy expenditure estimates from other studies. Median energy expenditure was 9.9 mJ/day (2,365 kcal) among women and 12.4 mJ/day (2,960 kcal) among men. While energy expenditure varies depending on the sex, age and activity level of participants, some comparison values may be found among investigations that estimated total daily energy expenditure using doubly labeled water. Among women, expenditures of 2357, 1928 and 2256 kcal/day were found by Mehabir et al,²¹ Whitehead et al²² and Seale et al²³ respectively. Among men, expenditures of 3172, 2793 and 2970 kcal/day were found by Conway et al,²⁴ Goren et al among young men,²⁵ and Seale et al among older men.²³ These values correspond reasonably well with our mean values of 2428 and 2960 for women and men. While it is likely that estimates based on questionnaire responses involve error, these data suggest that the questionnaire produces energy expenditure estimates that may be useful in some circumstances

Percent body fat as estimated by the questionnaire correlates highly with percent body fat estimated by DXA, and the estimated distribution closely matches the actual distribution of percent body fat. These estimates may be useful in some circumstances.

The questionnaire estimated that men and women spent approximately 4.6 and 4.3 hours/day in sedentary activities. For comparison, the NHAPS study, using an activity diary in a nationally representative sample, found that 2.8 hours/day were spent “Watching TV/ movies” and 1.4 hours/day were spent on “Activities performed while sitting quietly,”¹⁰ or a sum of 4.2 hours/day, which corresponds well with our estimates.

The proportion meeting recommended activity levels in this study depended on the nature of the calculation. When all activities are considered (including household activities such as taking care of children, cleaning house, home maintenance), as many as 60% of male and 65% of female respondents appear to spend at least 30 minutes on at least five days a week. However, when only non-household leisure activities are included, only 45.9% of men and 29.3% of women meet such a guideline. The latter estimate may be more realistic; while the Compendium assigns MET values >3 to the household activities mentioned, it is likely that much of the time attributed to these activities does not reach an aerobically effective intensity level (William L. Haskell, personal communication, 2008).

Meeting or failing to meet certain guideline definitions was significantly associated with percent body fat as estimated by DXA. However, it is notable that guideline definitions that include moderate *household* activities such as child care and home maintenance, at least as estimated in this study, were not associated with differences in percent body fat. While such activities contribute to energy expenditure, achieving the minimum recommended amounts through these activities does not appear to be sufficient for weight maintenance or reduction.

The proportion of a population who meet physical activity recommendations is critically dependent on how the question is asked. The Behavioral Risk Factor Surveillance System (BRFSS) in 2000 presented respondents with a list of 56 moderate and vigorous activities, almost all of which were leisure activities; only 2 were outdoor ‘household’ activities like gardening, and there were no indoor moderate activities like sweeping at all. That BRFSS survey estimated that 26.2% of Americans met the recommended levels. In the next year, 2001, BRFSS did not show respondents a list of activities at all, but the few examples mentioned in the prompt included vacuuming. (Neither survey mentioned child care.) In that BRFSS, 45.2% were categorized as meeting the recommended levels. Using the same question, in 2007 49.5% met the recommended levels nationwide. These figures also vary substantially by gender, age and education. For example, 64.2% of Californians 18 to 24 met the guidelines in the 2007 BRFSS, while only 43.5% of persons over 65 did so. Thus, our estimates are somewhat consistent with estimates from BRFSS assessments using a similar methodology, although they probably represent overestimates in comparison with estimates from accelerometer data.²⁶

Strengths of this analysis include its relatively large sample size, and its inclusion of both genders, a wide age range and considerable racial diversity. In addition, the development of the questionnaire is unique in that it is “data-based,” the activities having been chosen for inclusion based on the large national NHAPS dataset. Another strength of the analysis is the fact that the results presented here include all participants, so as to provide a realistic appraisal of real-world applications of the survey. On the other hand, the fact that 70% of the sample were college graduates or more highly educated limits its generalizability. Finally, a strength of the questionnaire is the fact that it not only provides estimates of physical activity, but also of daily energy expenditure and percent body fat.

Important limitations of this study are the fact that it is based on self-report, and is cross-sectional in nature. The ability of subjects to report their activities over the prior year is undoubtedly imperfect. However, it should be noted that questionnaire is not a direct recall (“I ran 50 times last year”) but a reporting of a pattern of behavior (“I usually run about once a week”). In addition, because the data are cross-sectional, we do not know how long participants have been active at their reported levels, nor whether the presence of overweight and obesity has led them to be recently active at their current levels. For example, an overweight person might have started exercising only in the past several months in an attempt to lose weight, but could report on the questionnaire that he currently exercises daily. Thus, any association of activity level with percent body fat is composed of inverse associations of percent body fat with long-term lifetime activity and contrary, positive associations of percent body fat with recent activity stimulated by the participant's recognition of his/her over-weight. In addition, in this analysis we have no data on their dietary intake, which could contribute to percent body fat despite physical activity level. Finally, we are unable to present validation data representing ‘true’ usual activity level or energy expenditure. However, we believe that the associations shown with percent body fat represent some criterion validity.

Conclusions

In summary, the Work and Home Activities questionnaire is a self-administered questionnaire which provides estimates of time and activity level in a range of domains covering the spectrum of physical activity and inactivity; estimates of total daily energy expenditure; estimates of percent body fat; and estimates of whether participants meet current activity recommendations. These estimates correlate significantly with percent body fat as estimated by DXA. In addition, energy expenditure estimates appear to be reasonable and are consistent with the values found in the DRI analysis. This questionnaire may be useful for research to understand the role of different components of activity, and for interventions to increase activity levels. In addition, it may be useful in conjunction with dietary research, as an aid in improving dietary intake estimates.

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Figure 1.

Observed and predicted body fat. Vertical axis, percent body fat. Within each gender, 2 plots are shown—percent body fat as measured by DXA and percent body fat as predicted by the questionnaire. The boxes indicate 25th, 50th, and 75th percentile, and the tails on the boxes represent minimum and maximum.

Table 1

Characteristics of the Sample

	All	Males	Females	<i>P</i>
N	396	137	259	
Age (mean, SD)	44.0 (15.1)	41.4 (14.5)	45.4 (15.2)	.02
Race (n, %)				.23
White	284 (71.7)	93 (67.9)	191 (73.8)	
African American	38 (9.6)	15 (11.0)	23 (8.9)	
Other	74 (18.7)	29 (21.2)	45 (17.4)	
Education (n, %)				.96
Less than college graduate	119 (30.1)	45 (32.9)	74 (28.7)	
College graduate	138 (34.9)	41 (29.9)	97 (37.6)	
Postgraduate degree	138 (34.9)	51 (37.2)	87 (33.7)	
BMI (kg/m ² ; mean, SD)	26.6 (5.5)	25.1 (3.7)	27.4 (6.1)	.003
BMI categories (n, %) ^a				<.0001
<18	5 (1.3)	1 (0.7)	4 (1.5)	
18–24.9	168 (42.4)	73 (53.3)	95 (36.7)	
25–29.9	138 (34.9)	51 (37.2)	87 (33.6)	
30–34.9	58 (14.7)	11 (8.0)	47 (18.2)	
35	27 (6.8)	1 (0.7)	26 (10.0)	

^a BMI based on clinic measurements rather than self-report.

Table 2

Minutes in Activities, Energy Expenditure by Activity Category, and Proportion Meeting Various Guideline Definitions

	Males	Females
Minutes/day [median/mean (SD)]		
Moderate or vigorous activities		
Job	0 / 30.0 (95.2)	0 / 29.0 (89.4)
All nonjob mod and vig	75.9 / 89.7 (71.0)	72.2 / 84.8 (62.6)
Moderate—household	18.0 / 35.2 (48.9)	35.1 / 50.0 (53.1)
Moderate—leisure	22.5 / 29.0 (30.7)	13.0 / 20.4 (21.1)
Vigorous—leisure	15.6 / 25.5 (31.2)	4.0 / 14.4 (23.9)
Sedentary activities		
All sedentary	276.4 / 290.5 (168.9)	257.0 / 289.3 (151.3)
Excluding driving/riding	226.8 / 241.2 (144.3)	205.8 / 236.5 (134.4)
Energy expenditure (kcal) [median/mean (SD)]		
All subjects	2974 / 2960 (541)	2365 / 2428 (459)
By activity category [†]		
Sedentary	2375 / 2308 (263)	1765 / 1815 (218)
Low active	2500 / 2572 (384)	2057 / 2012 (286)
Active	2881 / 2814 (346)	2263 / 2284 (311)
Very active	3483 / 3470 (369)	2762 / 2776 (395)
Meeting guidelines [‡] (n,%)		
CDC-ACSM (all activities)	81 (60.0)	168 (64.9)
CDC-ACSM (leisure only)	62 (45.9)	76 (29.3)
Guide 2005 (all)	46 (34.1)	81 (31.3)
Guide 2005 (leisure mod/vig)	28 (20.7)	26 (10.0)
Guide 2005 (vigorous)	16 (11.9)	14 (5.4)

[†] Derived using formulae based on estimates of the ratio of total energy expenditure to basal energy expenditure, from DRI.¹⁸

[‡] CDC-ACSM: moderate activities for at least 30 minutes on at least 5 days, or vigorous activities for at least 20 minutes on at least 3 days. Guide 2005: 2005 Dietary Guidelines: 60 minutes of moderate or vigorous activities on most (defined as 5) days.

Table 3

Association of % Body Fat With Meeting Physical Activity Recommendations, and Correlation of Observed and Predicted % Body Fat

	Males		Females	
	Adjusted mean, DXA%fat, In met / not met [*]	<i>P</i> [*]	Adjusted mean, DXA%fat, In met / not met [*]	<i>P</i> [*]
CDC-ACSM [†]				
All moderate and vigorous	20.0 / 23.3	0.001	33.9 / 36.3	0.006
All moderate	20.9 / 21.2	0.76	34.4 / 34.7	0.73
Moderate household	20.7 / 21.1	0.74	34.9 / 34.4	0.50
Moderate leisure	20.9 / 21.1	0.92	33.6 / 34.7	0.38
Vigorous	19.5 / 22.5	0.002	32.8 / 35.3	0.004
Guide 2005 [‡]				
All	19.8 / 21.7	0.059	35.0 / 34.4	0.47
Leisure	18.5 / 21.7	0.005	33.0 / 34.7	0.19
Vigorous	18.0 / 21.5	0.02	33.7 / 34.6	0.62

	Correlation ^{**}	<i>P</i>	Correlation ^{**}	<i>P</i>
Days vigorous 20 minutes	−0.35	<0.0001	−0.17	0.0003
Estimated percent body fat	0.73	<0.0001	0.82	<0.0001

^{*} Difference in adjusted mean %body fat between those meeting and not meeting the guideline, from multiple regression analysis adjusting for age and minutes of occupational moderate or vigorous activity; and significance of the adjusted difference.

^{**} Spearman correlation with observed % body fat measured by DXA, and significance, adjusted for age and minutes of occupational moderate or vigorous activity.

[†] CDC-ACSM: moderate activities for at least 30 minutes on at least 5 days, or vigorous activities for at least 20 minutes on at least 3 days. Guide 2005: 2005 Dietary Guidelines: 60 minutes of moderate or vigorous activities on most (defined as 5) days.