Public Health Nutrition: 15(11), 2054–2059 doi:10.1017/S1368980012003278

Physical activity patterns in the French 18–74-year-old population: French Nutrition and Health Survey (Etude Nationale Nutrition Santé, ENNS) 2006–2007

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Submitted 28 November 2011: Final revision received 17 April 2012: Accepted 1 June 2012: First published online 5 July 2012

Abstract

Objective: To describe detailed physical activity and sedentary behaviour in French adults across physical activity categories.

Design: The French Nutrition and Health Survey (Etude Nationale Nutrition Santé, ENNS), conducted in 2006–2007, was a national cross-sectional survey based on three-stage random sampling. The International Physical Activity Questionnaire (IPAQ) was used to classify participants into three physical activity categories. Time spent in a sitting position and time spent in front of a screen were used as markers of sedentary behaviour.

Setting: France.

Subjects: Adults (*n* 2971) aged 18 to 74 years were included.

Results: Overall, 29·5 % of men and 23·6 % of women were classified into the high-IPAQ category, while 36·1 % of men and 37·5 % of women were in the low-IPAQ category. For each intensity level of physical activity (vigorous intensity, moderate intensity or walking), the number of active days per week decreased from the high- to the low-IPAQ category and daily duration of physical activity was longer in the high-IPAQ category than in the other two categories; 6 % of adults declared neither vigorous nor moderate nor walking activities.

Conclusions: For most adults in the low-IPAQ category, an increasing number of active days per week would be sufficient to attain the moderate-IPAQ category. This should be taken into account in public health initiatives aimed at promoting physical activity.

Keywords
Physical activity
Sedentary behaviour
Adults
France

Physical activity is associated with lower risks of CVD, obesity and diabetes[1–4]. For the past several decades, public health strategies in many countries have been designed to inform and motivate the population to become physically active. Despite the demonstrated effectiveness of such initiatives for promoting physical activity[5], successful measures have not met with widespread use[6] or else have focused only on leisure-time activities, particularly in developed countries[7].

The International Physical Activity Questionnaire (IPAQ) was developed as a surveillance instrument to monitor the physical activity of a given population by considering all aspects of such activity. The short form of the IPAQ does not distinguish between the different domains of physical activity, but evaluates overall physical activity. Moreover, the short IPAQ has been shown to have acceptable test–retest reliability and convergence compared with accelerometers[8].

Since its introduction, surveillance systems have used the short IPAQ in a number of countries[9,10] to classify populations into three physical activity categories: high, moderate and low. The distribution by IPAQ category is considered an estimate of compliance with physical activity recommendations useful for population health surveillance. Identification of differences between IPAQ categories could help to better understand how individuals move from one category to another. Moreover, this would help to define targets for public health measures by identifying persons who need to increase physical activity and those who should reduce their sedentary behaviour.

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In 2006–2007, the French Nutrition and Health Survey (Etude Nationale Nutrition Santé, ENNS) was conducted in order to describe dietary intake, physical activity and nutritional status in a national sample of adults living in France[11]. The objective of the present analysis was to describe detailed physical activity and sedentary behaviour separately, for each gender, according to IPAQ category.

Materials and methods

Participants and sample selection

The national cross-sectional ENNS has been previously described[11]. The survey design consisted of multistage random sampling. Adults aged 18–74 years living in continental France were included during a 1-year period (February 2006–March 2007) to account for seasonal behaviour. The first stage of sampling involved random selection of 190 geographic zones stratified according to degree of urbanization. The second stage involved random selection of households based on randomly generated telephone numbers, including landlines, on free lists or not, and mobile phones. The third stage involved selection of one individual from each household using the date of birth method.

Data collection

Social and demographic characteristics, physical activity and sedentary lifestyle data were collected at home via face-to-face interviews carried out by specifically trained dietitians. The French short form of IPAQ was used. The French version of the questionnaire had already been tested in the Eurobarometer study[10] using translation and back-translation methods. For overall physical activity, the IPAQ collects information on duration (in minutes) and frequency (days) of walking, plus activities of moderate and vigorous intensity. These data are treated as a categorical variable that classifies populations into three physical activity categories: high, moderate and low. The number of days out of the past 7 d during which the participant spent more than 10 min walking or carrying out moderate or vigorous physical activity was recorded, along with the respective duration. Moderate intensity refers to activities requiring a physical effort causing individuals to breathe somewhat more heavily than normal. Vigorous intensity refers to activities that require strong physical effort and much heavier breathing than normal. Independently of time spent seated on weekdays, included in the short form of the IPAQ, leisure time spent in front of a screen (television (TV), computer or video games) during the past 7 d was recorded.

Data treatment

Calculation of the metabolic equivalent of task (MET), classification by IPAQ category and data processing were strictly as recommended by the IPAQ group[12].

The weekly duration of each level of intensity (walking, moderate or vigorous activity) was calculated by multiplying the number of days and the duration. Relative energy expenditure of each intensity level was taken into account in calculation of MET-min/week by multiplying weekly minutes by a specific MET value (3·3 MET for walking, 4 MET for moderately intense activity and 8 MET for vigorous activity). Participants were then classified into the three IPAQ categories (high, moderate and low). The high-IPAQ category included individuals who performed vigorous activity on ≥3 d and achieved a minimum of 1500 MET-min/week, or any combination of walking and moderate or vigorous activities on at least 7 d, achieving a minimum of 3000 MET-min/week. The moderate-IPAQ category grouped together participants as follows: ≥3 d of vigorous activity of at least 20 min/d, ≥5 d of walking or moderate activities of at least 30 min/d or ≥5 d of any combination of walking, moderate or vigorous activities, and a minimum of 600 MET-min/week. The low-IPAQ category was simply defined as not meeting any of the criteria for either of the previous categories.

To describe sedentary behaviour in the population, the following indicators were used: the percentage of adults who spent ≥3 h in front of a screen daily, the percentage of adults who spent ≥2 h watching TV daily and the percentage of adults who were seated for ≥6 h on weekdays. Medians were retained as cut-offs. In addition to sedentary behaviour, the proportion of adults who practised no vigorous activity, no moderate activity and did no walking, as taken from IPAQ data, was used to describe the absence of physical activity.

Statistical analyses

Analyses were based on weighted data taking into account individual probabilities of inclusion, seasonal period of data collection and calibration on national census data. Analyses were performed using the command for a complex sampling scheme in the STATA® statistical software package version 10 (StataCorp). Gender-stratified analyses were intentionally performed to explore behavioural differences between men and women. Physical activity (day, duration, MET) and sedentary behaviour were also described according to IPAQ categories. Test procedures were adapted to weighted data. Proportions were compared by χ^2 tests and medians of continuous variables by non-parametric equality of median tests.

Results

General characteristics

The participation rate in ENNS was 59·7 % (3115 adult participants/(4483 eligible households +734 households in which the contacted person refused to give information on household eligibility))[11]. Among the 3115 participants included in ENNS, 144 (4·6 %) were excluded

Table 1 Median* number of days, duration and MET of physical activity according to intensity, IPAQ category and gender. French Nutrition and Health Survey (Etude Nationale Nutrition Santé, ENNS), 2006–2007

	Men				Women			
	IPAQ category				IPAQ category			
	High	Moderate	Low	Comparisons†	High	Moderate	Low	Comparisons†
n	309	394	374		436	758	700	
Weighted %	29·5	34·4	36·1		23·6	38·9	37·5	
Vigorous intensity								
Number of active days/week	4	1	1	‡	3	2	1	
Daily duration (h:min)	2:00	1:00	1:15	‡	1:45	1:00	1:00	‡
MET-min/week	3240	960	960	‡	2160	720	480	
Moderate intensity								
Number of active days/week	5	4	2		5	3	2	
Daily duration (h:min)	3:00	1:00	1:30	‡	2:30	1:00	1:00	‡
MET-min/week	2400	900	480		2880	720	480	
Walking								
Number of active days/week	7	6	2	§	6	5	2	
Daily duration (h:min)	1:00	0:45	0:30	‡	1:00	0:45	0:35	‡
MET-min/week	990	693	198	§	990	693	297	
Total MET-min/week	5139	1893	462		4662	1554	462	

MET, metabolic equivalent of task; IPAQ, International Physical Activity Questionnaire.
*Medians for each physical activity intensity level were calculated in adults who practised activities of that intensity ≥1 d/week, while total MET-min/week medians were calculated for the whole population.
†All differences were statistically significant ($P < 0·05$) between high- and moderate-, high- and low-, and moderate- and low-IPAQ categories except for: ‡no statistical difference between moderate- and low-IPAQ categories; §no statistical difference between high- and moderate-IPAQ categories.

from the present analysis because of 'I don't know'-type answers along with missing data on physical activity. Social and demographic characteristics were comparable between excluded and included individuals. Apart from the education level, for which the χ^2 P value was 0·06, the other P values ranged from 0·12 to 0·85 for the following variables: occupation, at least one child at home, birthplace, gender, marital status and age. Women represented 50·9% of the weighted population. The weighted mean age was 45 years; the 18–29-, 30–54- and 55–74-year-old age groups represented, respectively, 21·9%, 49·4% and 28·7% of the population.

According to IPAQ definitions, 29·5% (95% CI 25·9, 33·1) of men and 23·6% (95% CI 21·1, 26·6) of women were classified into the high-IPAQ category ($P < 0·01$); 34·4% (95% CI 30·7, 38·1) and 38·9% (95% CI 36·0, 41·8) were in the moderate-IPAQ category ($P = 0·06$); and 36·1% (95% CI 32·2, 39·9) and 37·5% (95% CI 34·7, 40·3) were in the low-IPAQ category ($P = 0·55$). The total MET-min/week median was significantly higher in men (1893 MET-min/week) than in women (1434 MET-min/week, $P < 10^{-3}$).

The proportion of adults who declared neither vigorous nor moderate nor walking activities was similar in men and women (6·1% and 6·2% respectively, $P = 0·92$). Overall, 62·0% of men and 75·3% of women declared no physical activity of vigorous intensity ($P < 10^{-3}$). Moreover, 38·7% of men and 31·2% of women declared no moderate physical activity ($P < 10^{-2}$). Median time spent in front of a screen was higher in men than in women (3 h 4 min *v.* 2 h 51 min respectively, $P < 10^{-3}$). The proportion of men spending ≥3 h/d in front of a screen (58·8%) was higher than that of women (47·8%, $P < 10^{-3}$). The proportion of men spending ≥6 h seated per weekday (52·3%) was not significantly different from that of women (49·6%, $P = 0·24$).

Physical activity by IPAQ category

In both genders and for each physical activity intensity level, the median number of active days per week decreased from the high-IPAQ category to the low category, except for vigorous activities carried out on only one day by men in both the moderate- and low-IPAQ categories (Table 1). The median number of walking days was substantially lower in the low-IPAQ category than in other categories, while there was no difference between moderate- and high-IPAQ categories. In addition, whatever the intensity level, the median daily duration was higher in the high-IPAQ category than in other categories (Table 1), whereas there was no difference between moderate- and low-IPAQ categories.

Considering each IPAQ category, total MET-min/week medians were significantly higher in men than in women only for high- and moderate-IPAQ categories ($P = 0·04$ and $P < 10^{-3}$, respectively; Table 1). For activities of vigorous intensity, specific MET-min/week medians for high- and moderate-IPAQ categories were significantly higher in men than in women ($P < 0·01$ and $P = 0·02$, respectively). For moderate-intensity and walking activities, MET-min/week medians in each IPAQ category did not differ between men and women (Table 1).

Sedentary behaviour and absence of physical activity by IPAQ category

Fig. 1 shows that time spent in front of a TV or computer did not differ according to physical activity category.

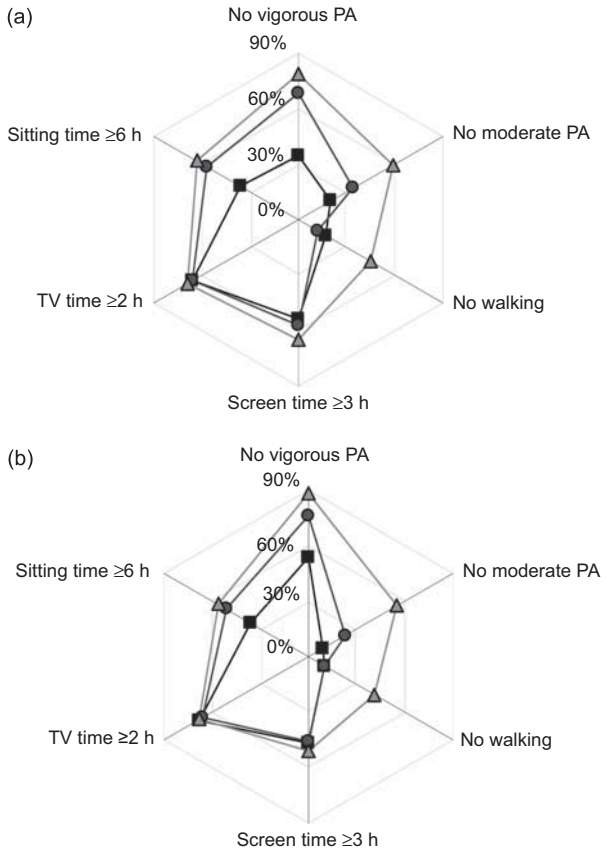

Fig. 1 Adult sedentary behaviour and absence of PA by IPAQ category (—■—, high; —●—, moderate; —▲—, low) and gender: (a) men; (b) women. French Nutrition and Health Survey (Etude Nationale Nutrition Santé, ENNS), 2006–2007 (PA, physical activity; IPAQ, International Physical Activity Questionnaire; TV, television)

For both genders, data points for 'TV time ≥2 h' and 'screen time ≥3 h' were close between IPAQ categories. In contrast, for other indicators, the three IPAQ category curves were distinct. As expected, the percentages of men and women who practised no vigorous activity or no moderate activity were significantly lower in the high-IPAQ category than in the low-IPAQ category, with the moderate-IPAQ category being intermediate between the two others (Fig. 1). In both genders, the proportion of non-walkers was less than 20 % in high- and moderate-IPAQ categories, but exceeded 40 % in the low-IPAQ category (Fig. 1). Percentages of men and women spending ≥6 h seated per weekday were significantly lower ($P < 10^{-3}$) in the high-IPAQ category than in other categories.

In men, medians of daily sitting time were 5 h, 6 h and 6 h 40 min in the high-, moderate- and low-IPAQ categories, respectively. In women, medians were 5 h in the high-IPAQ category and 6 h in both the moderate- and low-IPAQ categories. For both genders, duration of time spent seated was significantly different between the high-IPAQ category and the other categories ($P < 10^{-3}$).

Finally, the high-IPAQ category was characterized by a small number of adults who practised no vigorous physical activity and a small number of adults who remained seated for ≥6 h per weekday. Moreover, the low-IPAQ category was characterized by the highest percentage of adults who practised no moderate physical activity and the highest percentage of adults who did not walk at all.

Discussion

Our results provide a comprehensive description of physical activity and sedentary behaviour in a nationwide adult population. Almost two-thirds of adults were classified into the moderate- and high-IPAQ categories, while 6 % declared neither vigorous nor moderate nor walking activities. IPAQ was used in the Eurobarometer study in 2002[10], where it was shown that France had the highest proportion of sedentary persons and was one of the least physically active European countries. Among French adults aged 15 years and above, the prevalence of 'sufficient total activity' (comparable to the high-IPAQ category) was 29·1 % in men and 19·5 % in women. The prevalence of the low-IPAQ category was higher in Eurobarometer (39·7 % in men, 46·3 % in women) than in our study, whereas the percentage of those remaining seated for ≥6 h per weekday (38·8 % in men, 29·2 % in women) was much lower. Differences in age range might partly explain these discrepancies. Another hypothesis is that, while the Eurobarometer study used telephone interviews, in our study IPAQ was filled in during face-to-face interviews carried out by specifically trained dietitians particularly concerned about response quality and aware of a possible effect of social desirability. Physical activity is known to be overestimated, particularly when IPAQ is self-administered[13] or carried out via telephone interviews[14]. The scrupulous application of data processing rules recommended by the IPAQ group, and the quality of data checked by the dietitians during face-to-face interviews, contributed to minimizing physical activity overestimates in our study. This is corroborated by comparison with the results of two other French studies in which percentages of at least moderate- and high-IPAQ categories were much higher than in our study[15,16]. In the Health 2005 Barometer, the short IPAQ were filled in during telephone interviews[15]; in the National Individual Survey on Food Consumption 2006–2007 (INCA 2), they were filled in during face-to-face interviews at home.

Moreover, the short IPAQ version provides information only on total physical activity, without distinguishing between leisure-time, occupational, commuting or home-related physical activity. Nevertheless, most public health recommendations emphasize the importance of physical activity which accumulates due to various types of activity[17]. In fact, studies have supported the benefits of both leisure-time and non leisure-time physical activities in terms of all-cause mortality[18].

At the time the ENNS was being prepared, the IPAQ had already been used in numerous countries[19–24] and its reliability and convergence had been shown in publications from various countries based on differing modes of administration[8,14,25,26]. Although the French version of the short IPAQ was not actually validated, this questionnaire was used in several surveys carried out in France[10,15,16]. Moreover, the IPAQ, which consisted of only seven questions, was one of the shortest physical activity questionnaires available at that time. For all of these reasons, it was considered the instrument of choice for ENNS.

Recruitment biases may have had reverse effects on physical activity measurement in our study. Although seasonal effect was important on an individual level, the weighting process used at the time of data collection enabled estimating the average physical activity level for the year. Low-income individuals and males were less often included in ENNS than might be expected from census data[11]; but these biases were compensated for by weighting statistics. In addition, gender differences that had been previously observed in Eurobarometer[10] were also found in our study. Vigorously intensive activities represented an important part of male physical activity, while women declared mainly moderately intense physical activity. Men were thus more often classified as physically active than women, but they also spent more time in front of a screen than the latter. In the light of recent findings which identified TV viewing time[27–29] and time spent seated[30,31] as risk factors for cardiometabolic disease and all-cause and CVD mortality independently of physical activity, prevention strategies should, in addition to promoting exercise, focus on reducing sedentary behaviour. Due to the absence of validated references regarding the health outcome of sedentary behaviour time to our knowledge, we used medians as cut-offs, although the interpretation of our results is therefore limited.

Differences between low- and moderate-IPAQ categories mainly involved the number of active days, while daily durations were comparable. For most adults in the low-IPAQ category, increasing the number of active days per week would be sufficient to attain the moderate-IPAQ category. This should be taken into account in public health programmes meant to promote physical activity. For individuals who declare neither vigorous nor moderate nor walking activities, it is important to stress that physical activity should be incorporated into lifestyle, taking place not only during leisure time but also during occupational and domestic work and while commuting. Since the moderate-IPAQ category has often been considered the absolute minimum necessary for health benefits[32], attaining a high-IPAQ category should be the next goal, as suggested by Sjostrom *et al.*[10]. However, the gap between moderate- and high-IPAQ categories is much greater than that between moderate and low categories. Although definitions of categories can partly explain this effect, it was not systematic when considering the different parameters separately. Our results showed that the gap in daily duration of physical activity was greater between moderate- and high-IPAQ categories than between moderate- and low-IPAQ categories whatever the level of intensity or gender. But this was not the case for the number of walking days for men, for example. On the other hand, more than 50 % of women in a high-IPAQ category performed no vigorous activity. Women more often than men attained a high-IPAQ category while engaging in only moderate activities or walking. This observation reinforces previous findings showing differences between women and men concerning physical activity and sedentary behaviour patterns[33].

Low-IPAQ individuals, in particular those practising neither vigorous nor moderate nor walking activities, should be encouraged to routinely climb stairs, walk or use a bicycle, for example. Physical activity must be integrated into the daily routine via recreational, commuting and occupational activities. As suggested by King and Sallis[6], the current challenge for physical activity programmes is to 'create more activity-friendly environments to improve population-wide physical activity'. Use of such new instruments as the European ALPHA questionnaire[34] and geographic information systems should help to clarify the way in which an individual views his/her surroundings, so as to eventually encourage a higher level of physical activity.

Acknowledgements

ENNS was funded by the French Institute for Health Surveillance (INVS). There are no conflicts of interest to declare. B.S. contributed to the management of data collection, performed the statistical analysis, interpreted the results and wrote the manuscript. M.V., E.S., A.M. and V.D. contributed to the management of data collection, statistical analysis and revised the manuscript. S.H. designed the study, contributed to the interpretation of results and revised the manuscript. K.C. designed the study, managed data acquisition, contributed to the statistical analysis, interpretation of results and revised the manuscript. All authors read and approved the final version of the manuscript. The authors wish to express their thanks to the dietitians and physicians who participated in survey data collection.

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