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Research

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Physical Activity Assessment in an Italian Adult Population using the International Physical Activity Questionnaire

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ABSTRACT

Introduction: The international physical activity questionnaire (IPAQ) was developed as an instrument for cross-national monitoring of physical activity (PA) and inactivity. The aim of this study was to determine the PA level in a sample of Italian population.
Methods: In total 957 adults (56% women) aged 19-65 years were randomly recruited. PA was assessed using the long form of the IPAQ (IPAQ-L). Lifestyle, body weight and height were obtained by questionnaire.
Results: The total PA was 1610 MET-min/week: subjects were physically more active in the domestic and garden domain, contrary to transportation and leisure domain. Classifying the activities on the basis of the intensity, significant differences between sexes were detected for moderate and vigorous activities; moreover subjects aged 18-30 years had the lowest levels of PA, while subjects aged >50 had the highest levels. The 86% of the examined population spent at least 30 minutes of moderate PA on 5 days of the week, adhering to the international recommendations.
Conclusions: Differences in PA between sexes and among age groups were observed. Strategies for increasing PA should be addressed especially to the young adults.

KEYWORDS: Physical activity assessment; IPAQ; Subjective methods; Community-based research.

ABBREVIATIONS: PA: Physical Activity; IPAQ: International Physical Activity Questionnaire; IPAQ-L: International Physical Activity Questionnaire Long form; BMI: Body Mass Index; EUPASS: EUropean Physical Activity Surveillance System.

INTRODUCTION

Physical activity (PA) has been regarded as one of the most important habitual behaviours, which leads to a healthy life by preventing diseases and increasing health benefits. Regular and adequate levels improve muscular and cardiorespiratory fitness, bone and functional health, reduce the risk of non-communicable diseases and depression and are a key determinant of energy expenditure, thus fundamental to energy balance and weight control.[1-4] For these reasons, in 2010 World Health Organization (WHO) developed the global recommendations on PA for health[1]: people aged >18 years should accumulate at least 150 minutes of moderate intensity aerobic PA throughout the week or do at least 75 minutes of vigorous intensity aerobic PA throughout the week or an equivalent combination of moderate and vigorous intensity activity.

Nevertheless, physical inactivity has been identified as one of the biggest public health problems of the 21st century.[5] As reported by WHO, insufficient PA has been identified as the

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fourth leading risk factor for mortality, as well as the main cause for approximately 21-25% of breast and colon cancers, 27% of diabetes and approximately 30% of ischemic heart disease burden.[6] About 3.2 million people die each year because they are not active enough[7,8] and the levels of physical inactivity increase across the world. In 2012, it was estimated that 31.1% of the adult global population did not meet the physical activity recommendations.[9]

Notwithstanding physical inactivity is considered a global health concern, as no standardized approaches to measurement exist, international comparisons and global surveillance are difficult.[10]

In a recent review of adult physical activity levels across Europe is underlined that because of the large variety in the assessment methods used to assess physical activity, the reported outcome variables and the presented physical activity levels per study, absolute physical activity population levels in European adults are currently unknown.[11]

Several routine instruments are available, all of which having well-known limitations; consequently there is currently no perfect gold-standard criterion.[12] Objective methods, as movement sensors, due to their high costs, are not usually practical in large-scale cohort studies while the self-report questionnaire is the most commonly used instrument.

Several questionnaires are been proposed[13] and among them the international physical activity questionnaire (IPAQ) is widely used. This questionnaire was developed in the late 1990's to obtain internationally comparable data on health related PA[10,14] and several studies have shown its acceptable validity and reliability for population-based studies.[10,15] In particular, the long form of IPAQ (IPAQ-L) measures frequency, duration, and intensity of PA in four domains of life: work, transport, domestic and garden, leisure-time.

To the best of our knowledge, there has been no population-based study in Italy, which examined all four domains of PA. The aim of this study is to determine PA levels in a sample of adult Italian population using the IPAQ-L.

METHODS

Sampling

One-thousand and sixty-two healthy volunteers (482 males and 580 females), aged 18-65 years, were recruited in the North, the Centre and the South of Italy. After being informed about the purpose of the study, they gave their written consent. All the subjects underwent lifestyle questionnaire administration and PA evaluation. From the original sample, after cleaning the data for missing and out-of-range values according to the IPAQ Research Committee,[14] 957 (422 men and 535 women) subjects represent the final sample of the study.

The study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the 'Sapienza' University of Rome Ethics Committee. Written informed consent was obtained from all the subjects.

Lifestyle Questionnaire and Anthropometry

The lifestyle questionnaire was administered to each participant by trained personnel and consisting of a package of questions specifically designed to obtain different information about socio-demographic (marital status, education and occupation) and anthropometric characteristics (height and body weight), smoking habits and alcohol consumption. In order to verify the validity of self-reported body anthropometric data, on a subsample of 300 subjects the fasting weight and height were also measured by a trained observer under standardized conditions.[16] A calibrated computerized digital scale (K-Tron P1-SR; K-Tron SA, Hansler Division, Colombier, Switzerland; capacity 150 kg, graduation 10 g) and a wall- mounted Holtain stadiometer (Holtain Ltd, Crosswell, Crymych, UK), with height being recorded to the nearest 0.1 cm, were used. Both self-reported and objectively-measured weight and height were used to calculate body mass index (BMI, kg/m^2), and consequently the prevalence of obesity and overweight, using the cut-off points proposed for adult population[17]: underweight <18.5 kg/m^2; overweight 25.0-29.9 kg/m^2 and obesity ≥ 30 kg/m^2. The mean difference between self-reported and objectively measured BMI was 0.3 kg/m^2 for men 0.2 kg/m^2 for women and can be considered negligible.

Evaluation of Physical Activity

For estimating the level of PA, the original English version of IPAQ-L was translated into Italian, then back translated into English and the Italian version was administered by trained personnel in a face-to-face interview. The IPAQ-L, designed to assess the levels of habitual PA, consists of 27 questions referred to the previous 7 days covering 4 domains of PA (work-related PA, transport-related PA, domestic and gardening activities, and leisure-time PA). The items in IPAQ are structured to provide separate domain specific scores for walking, moderate-intensity and vigorous-intensity activity within each domain.

The results were presented as the estimation of energy expenditure in metabolic equivalent-minutes per week (MET-minutes/week), made by using the compendium of physical activities,[18-20] which provides a classification of specific activities in MET. One MET represents the resting energy expenditure during quiet sitting and is commonly defined as 3.5 ml O2•kg−1•min−1 or ≈ 250 mL/min of oxygen consumed, which represents the average value for a standard person (70 kg). Obviously the oxygen consumption increases with activity intensity level, therefore the MET value increases with the intensity of PA (e.g. 1 MET=the rate of energy expenditure while at rest [sitting quietly], 2 MET=walking at 3 km/h would require twice the energy that an average person consumes at rest). According to

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IPAQ scoring protocol,[14] MET-minutes/week of specific activity (walking or moderate intensity activity or vigorous intensity activity) is computed by multiplying MET value of particular activity (3.3 for walking, 4.0 for moderate intensity activity, and 8.0 for vigorous intensity activity) with hours spent in that particular activity (e.g., walking MET-minutes/week at work=3.3×walking minutes×walking days at work). Computation of the total scores for the long form requires the summation of the duration (in minutes) and frequency (days) for all the types of activities in all domains. Only the activities lasting at least 10 minutes were taken into account. Domain specific scores or activity specific sub-scores may be calculated. Domain specific scores require the summation of the scores for walking, moderate-intensity and vigorous-intensity activities within the specific domain, whereas activity-specific scores require the summation of the scores for the specific type of activity across domains.[14]

The PA was categorized using the IPAQ scoring protocol. The cut-off levels, reported in Table 1, are based on the current guidelines for PA, which state that every adult should be active on most, preferably all days of the week, at moderate intensity accumulating 30 minutes of PA. In terms of how the IPAQ measures activity, this would be equal to 600 MET-minutes/week, which is the lowest limit for the moderately active category. The cut-off limit for moderately active category also allows a person to be vigorously active for three days per week for 20 minutes. As the IPAQ measures PA across all domains and the guidelines are based mainly on studies assessing leisure time PA, the cut-off for reaching the moderately active category should be viewed as the absolute minimum of PA for some health benefit. The higher category aims to include persons that are doing intentional PA three days per week or more, accumulating 1500 MET-minutes/week or that are accumulating 3000 MET-minutes/week. Subjects in this category are believed to be sufficiently active for health benefits across all domains.

Statistical Analysis

Normality of distributions of variables was tested by Shapiro-Wilk test. Median, 95% confidence interval (CI) for median, and interquartile range (IQR) were calculated for each domain of PA separately, as well as for total PA, for sex and for 4 age groups of participants (18-30 years, 31-40 years, 41-50 years, 50 years and older). The student *t*-test was used to evaluate the differences in physical characteristics between sexes, while differences of PA between age groups and sexes were tested by the non-parametric Kruskal-Wallis test. Differences among prevalence were tested by the chi-square test. Additionally, multiple regression analysis was conducted to identify socio-demographic and anthropometric factors related to PA levels. In the regression model, age, BMI and educational level were used as independent variable, while each of the 4 PA domain scores and total PA score as dependent variable. The level of significance for all analyse was set at $p<0.05$. Statistical analysis was performed by STATISTICA software (release 8; 135 StatSoft Inc, Vigonza PD, Italy).

RESULTS

The sample included a total of 957 (422 men and 535 women) participants, whose physical characteristics are reported the physical characteristics in Table 2.

There were significant differences for all the variables between men and women ($p=0.000$). The mean BMI was 26.0±3.8 kg/m^2 for men (indicating an overweight status) and 24.5±5.3 kg/m^2 for women ($p=0.000$). There were statistically significant differences between sexes ($\chi^2=63.61$, $p=0.001$) in BMI categories: 60.7% of women was normal weight and 55.8% of men was overweight or obese; moreover, the percentage of obese subjects is similar between men and women (14%) (data not shown).

Physical activity category	Cut-off levels
Low	Those individuals who not meet criteria for Categories 2 or 3 are considered to have a 'low' physical activity level.
Moderate	The pattern of activity to be classified as 'moderate' is either of the following criteria: a) 3 or more days of vigorous-intensity activity of at least 20 minutes per day OR b) 5 or more days of moderate-intensity activity and/or walking of at least 30 minutes per day OR c) 5 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum Total physical activity of at least 600 MET-minutes/week.
High	The pattern of activity to be classified as 'high' is either of the following criteria: a) vigorous-intensity activity on at least 3 days achieving a minimum Total physical activity of at least 1500 MET-minutes/week OR b) 7 or more days of any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum Total physical activity of at least 3000 MET-minutes/week.

Table 1: Physical activity categories and cut-off levels based on the IPAQ scoring protocol.

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	Men		Women		*p* value*
N°	42		55		
	Mean	SD	Mean	SD	
Age	38.6	10.9	35.5	11.2	0.000
Weight (kg)	80.6	13.0	65.3	13.9	0.000
Height (cm)	176.0	7.2	163.4	6.5	0.000
BMI (kg/m²)	26.0	3.8	24.5	5.3	0.000

*Statistical analysis: Student *t*-test.

Table 2: Physical characteristics of the sample by gender (mean value and SD).

	Men (%)	Women (%)	χ^2	*p* value*
Marital status			6.97	n.s.
Married/full-time relationship	44.7	44.7		
Separated/divorced	51.9	48.9		
Widowed	3.1	4.4		
Single	0.2	1.9		
Educational level			7.54	0.05
Primary	0.5	1.5		
Secondary	74	66.6		
Tertiary	25.5	31.9		
Working condition			103.27	0.001
Unemployed	11.9	42.0		
Employed	87.4	57.9		
Retired	0.7	0.2		

*Statistical analysis: χ^2 test; n.s.=not significant.

Table 3: Socio-demographic variables of the sample by gender.

In Table 3 are reported socio-demographic variables of the sample by gender. There were not significant differences in marital status, while regarding educational level, about 70% of the sample (74% of men and 66.6% of women) had a secondary education and, on the whole, there were slight differences (χ^2=7,54, p=0,05). The majority of the sample stated to be engaged in some form of work activity; the difference between sexes (χ^2=103.27, p=0,001) depends on the high percentage of housewives in the sample, which are included in the "unemployed" category.

The median (95% CI) of PA, expressed as median of MET-minutes/week, is reported in Table 4 for men and women separately and for the total sample and indicated for the 4 domains separately (work, transport, domestic and garden, and leisure-time) and for the specific activities (walking or 155 moderate intensity activity or vigorous intensity activity).

The median (95% CI) of total PA for the whole sample was 1610 MET-min/week, without significant differences between men and women. Regarding the individual domains of PA, subjects were physically more active in the domestic and garden domain (223 MET-min/week), as opposed to transportation and leisure domain (85 MET-min/week each one). Moreover, there were statistical differences between sexes in the median value of MET-min/week in the work (31 MET-min/week for men and 0 MET-min/week for women, p=0.000), in domestic and garden (69 MET-min/week for men and 617 MET-min/week for women, p=0.000) and in leisure time (198 MET-min/week for men *vs.* 57 MET-min/week for women, p=0.000); no significant differences were observed in the domain of transport. Classifying the activities based on the intensity, significant differences between sexes were detected for moderate (319 MET-min/week for men *vs.* 814 MET-min/week for women, p=0.000) and vigorous activities (103 MET-min/week for men *vs.* 0 MET-min/week for women, p=0.000), while no significant differences were found for walking.

Stratifying the sample by age, all the differences were statistically significant, except for the vigorous activities (Table 5). As a general remark, PA increased with age: subjects aged 18-30 years had the lowest levels of PA (1154 MET-min/week), while subjects aged >50 had the highest levels (3639 MET-min/week). Moreover, the oldest subjects were highly involved in transport (236 MET-min/week) and domestic and garden (1260 MET-min/week) domains, while in leisure-time the most active group was aged 18-30 years (170 MET-min/week).

The multiple regression analysis between BMI (calculated using self-reported weight and height) and socio-demographic characteristics (age and educational level) as independent variables with PA as the dependent variable is reported in Table 6. Total PA, as well as moderate PA, was positively correlated with age (p=0.000) and negatively with educational

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		Men (n=422)	Women (n=535)	Total (n=957)	*p* value†
Work	Median 95% CI IQR*	31 5181-5931 1393	0 2998-3380 137	0 4255-4654 509	0.000
Transport	Median 95% CI IQR*	58 808-925 453	113 624-704 462	85 724-792 456	n.s.
Domestic and garden	Median 95% CI IQR*	69 1694-1940 377	617 2210-2492 2417	223 2091-2288 1234	0.000
Leisure-time	Median 95% CI IQR*	198 1107-1268 728	57 787-887 354	85 970-1061 548	0.000
Walking	Median 95% CI IQR*	283 1871-2141 1110	255 1354-1527 790	269 1638-1792 924	n.s.
Moderate activities	Median 95% CI IQR*	319 2763-3163 1251	814 2725-3073 2314	549 2804-3067 2059	0.000
Vigorous activities	Median 95% CI IQR*	103 3965-4539 1120	0 2110-2379 46	0 3186-3485 411	0.000
Total physical activity	Median 95% CI IQR*	1573 5979-6845 4312	1657 4014-4527 3578	1610 5089-5567 3763	n.s.

*Interquartile range (IQR) in MET-minutes/week calculated according to the IPAQ protocol.
†Statistical analysis: Kruskal-Wallis test; n.s.=not significant.

Table 4: Physical activity expressed in metabolic-equivalent-minutes per week (MET-min/week) by gender (median; 95% CI; IQR*).

		18-30 (n=323)	31-40 (n=267)	41-50 (n=258)	>50 (n=109)	Total (n=957)	*p* value†
Work	Median 95% CI IQR*	0 2676-3124 226	0 4458-5285 408	0 4666-5549 707	0 4781-6250 1175	0 4255-4654 509	0.006
Transport	Median 95% CI IQR*	126 561-655 363	42 636-754 347	63 783-931 462	236 878-1148 767	85 724-792 456	0.001
Domestic and garden	Median 95% CI IQR*	90 1080-1260 449	309 2042-2421 1449	321 2393-2846 1844	1260 2481-3244 2734	223 2091-2288 1234	0.000
Leisure-time	Median 95% CI IQR*	170 1096-1279 656	63 767-910 519	57 903-1075 426	57 843-1102 693	85 970-1061 548	0.001
Walking	Median 95% CI IQR*	269 1249-1458 698	170 1741-2064 929	285 1747-2078 999	679 1506-1968 1443	269 1638-1792 924	0.000
Moderate activities	Median 95% CI IQR*	274 1751-2043 913	617 2907-3427 1787	750 2790-3317 2359	1976 3504-4580 3471	549 2804-3067 2059	0.000
Vigorous activities	Median 95% CI IQR*	0 1846-2155 411	0 3105-3682 457	0 3851-4579 308	0 3534-4619 411	0 3186-3485 411	n.s.
Total physical activity	Median 95% CI IQR*	1154 3174-3705 2074	1636 5169-6128 3674	2113 5393-6413 4559	3639 6036-7890 5596	1610 5089-5567 3763	0.000

*Interquartile range (IQR) in MET-minutes/week calculated according to the IPAQ protocol.
†Statistical analysis: Kruskal-Wallis test; n.s.=not significant.

Table 5: Physical activity expressed in metabolic-equivalent-minutes per week (MET-min/week) by age (median; 95% CI; IQR*).

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level (p=0.000). PA in work domain was inversely related to educational level and positively to BMI, opposite to leisure-time domain. PA in transport domain was negatively related to BMI and positively to age. Finally, PA in domestic and garden domain was positively related to age and negatively to educational level.

In Table 7 are reported the PA categories of the sample on the basis of the IPAQ scoring protocol. Overall, the 86% of participants reached the levels of at least 30 minutes of moderate PA 5 days a week, which could be considered as the lowest level of PA for achieving health benefits, according to the recommendations.

DISCUSSION

The aim of the study was to evaluate the PA in a sample of adult Italian population, using the IPAQ-L, which can be considered as an acceptable instrument for monitoring population levels of PA among 18-65 years old adults in different settings.[10] Results show that the majority of respondents (86%) reached the levels of at least 30 minutes of moderate PA 5 days a week, which could be considered as the lowest level of PA for achieving health benefits, according to the recommendations. The total PA of the sample is 1610 MET-min/week, without gender differences. This is because women are mainly involved in moderate activities while men do vigorous activities. Additionally, it is important to notice that patterns of PA were also considerably different for men and women. Indeed, men reported more PA at work and leisure-time, while women at domestic and garden. Moreover, there were age differences, with participants aged >51 years having the highest level of PA and youngest participants having the lowest.

Literature studies conducted in Italy and considering all four domains of PA are lacking.[11] Similar studies conducted in other European countries considered the short version of IPAQ, more simple to be administered (7 questions in the short version compared with 27 questions in the long version)[21,22] or other *ad hoc* questionnaires with study-specific items and time references, severely limiting the potential for comparisons across different studies. European Activity Surveillance System (EUPASS) project, designed to contribute to a European health monitoring system, measured PA in 8 European countries, finding a median of 19.6 MET-hour/week (i.e. 1176 MET-min/week) for Italy.[19] Eurobarometer published the survey "Sport and physical activity" finding that in Italy 65% did not do any vigorous PA in the previous seven days and 54% did no moderate PA at all.[23] In the "Multipurpose survey on households: aspects of daily life" conducted by the Italian National Statistics Institute, the proportion of sedentary people in Italy was 41.2% in 2013 (36.2% of men and 45.8% of women).[24] The "Passi study" conducted from 2011 to 2014 reports 31% of sedentary people; this condition increases with age (25.7% of sedentary people aged 18-34 years, 30.8% of 211 sedentary people aged 35-49 years and 35.4% of sedentary people aged 50-69 years) and decreases with higher socio-economic conditions.[25]

Even if IPAQ-L is less pleasant and more confusing in comparison with the short form[10,26,27] and PA estimated using the long version may be higher because the short version systematically underestimates PA level,[22] it has been demonstrated that results obtained by different versions can be compared.[10] Moreover, beyond the identification of the total PA, it is also important to study the contribution of the different domains. In most studies recommended levels of PA have been determined

	Age		Body Mass Index		Educational level	
		p value		*p* value		*p* value
Work	0.06	n.s.	0.07	0.050	-0.14	0.000
Transport	0.16	0.000	-0.07	0.040	0.03	n.s.
Domestic and garden	0.19	0.000	-0.03	n.s.	-0.13	0.000
Leisure-time	0.04	n.s.	-0.07	0.045	0.09	0.009
Walking	0.10	0.005	-0.04	n.s.	-0.06	n.s.
Moderate activities	0.17	0.000	-0.01	n.s.	-0.17	0.000
Vigorous activities	0.06	n.s.	0.06	n.s.	-0.06	n.s.
Total physical activities	0.16	0.000	0.02	n.s.	-0.15	0.000

n.s.=not significant

Table 6: Multiple regression analysis between anthropometric and socio-demographic characteristics (independent variables) and physical activity (dependent variable).

	Men (%)	Women (%)	χ^2	*p* value*
			3.80	n.s.
Insufficiently active	15.6	12.5		
Sufficiently active	30.1	35.3		
Active	54.3	52.2		

*Statistical analysis: $\chi 2$ test; n.s.=not significant

Table 7: Physical activity categories based on the IPAQ score by gender.

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in relation to leisure-time PA, while other domains (work, transport, domestic and garden) were not equally considered.[21] Most self-reports are unreliable especially for housework and occupational activity; this may be particularly problematic especially in low- and middle-income countries, where transport, occupational, and housework activities often are mixed with daily life.[28]

Total PA scores alone do not give us a complete understanding of the PA pattern. For example, health studies determining the level of PA only in the domain of leisure, while ignoring the domain of work, could possibly lead to flawed conclusions. This is supported by the studies that found a correlation between PA at work to specific aspects of health. For example, Norfolk prospective population study showed a significantly decreased risk of death and cardiovascular diseases in persons who were physically active at work[29] and other studies showed an inverse correlation between work-related PA and cardiovascular mortality.[30,31] Studies that determine only total PA and do not examine PA throughout domains neglect the fact that PA in the domain of leisure and in the domain of work has a different influence on certain aspects of health. Gutierrez-Fisac and coworkers[32] found that PA at work was not related to obesity while Fung et al[33] found that there was a relation between PA in leisure time and obesity. Furthermore, in another study[34] it was demonstrated that an increased PA at work was not related to the improvement in physical fitness because it does not have adequate intensity and duration to affect positive changes. On the otherhand, other studies[35] showed a positive correlation between PA in leisure time and physical fitness.

The multiple regression analysis showed that anthropometric and socio-demographic characteristics were significantly related to PA in different domains. As expected, there was an inverse association between educational level and PA in work domain and positive association in leisure-time domain. People with lower educational level often perform more physically demanding work and probably do not have enough time for leisure-time PA. On the contrary, people having higher educational level have jobs that are more sedentary and have a tendency to be more physically active in leisure time due to greater knowledge about PA health benefits. A positive relationship between educational level and leisure-time PA has been demonstrated by other literature studies.[36,37]

Moreover, BMI was positively related to PA in work domain and negatively in both transport and leisure-time domain even if the multiple regression did not show significant relations between BMI and total PA, as well as with both moderate and vigorous activities. These results differed from other literature studies in which a high PA level especially at work and during leisure time strongly correlate with lower BMI.[38] The use of self-reported height and weight to calculate BMI did not influence the results. It has been demonstrated that weight is often under-reported (especially by women) and height is generally overestimated, especially by men and older subjects,[39] and consequently the prevalence of overweight tends to be lower when self-reported values are used. In our study, the self-reported anthropometric data cannot lead to erroneous estimates of underweight and/or overweight. Indeed, the mean difference between self-reported and objectively measured BMI can be considered negligible.

The main strengths of the study were the size of the sample and the use of the recommended IPAQ-L. IPAQ-L enabled us to assess PA levels in different domains in order to encourage people to be more active not only in their leisure time, but also while performing every-day activities, introduce 'get-moving' strategies at work, during transportation and at home to improve their health. Nevertheless, subjective methods of measuring PA are useful with large populations as they are inexpensive and easy to apply but have their limitations such as reliability and validity problems associated with the recall of activity.[28,40] Moreover, the use of self-reported data with the potential for information bias in relation to PA[41] could have led to overestimate the time spent in high intensity activity and underestimate the time spent in sedentary activities, probably because subjects tend to respond in a socially desirable way,[42,43] even if it has been demonstrated that data are reproducible and can provide reliable estimates of a range of PA domains.[27] Whilst subjective methods remain the most feasible and affordable instruments for global surveillance, there is a need for standardization of PA measurements, which would allow the comparison between different studies from different countries. The results of a recent systematic review highlight the need for harmonisation and standardisation of the measurement methods and data processing used to assess physical activity in Europe, and the added value of a cross-European surveillance system including state-of-the-art physical activity measurements.[11] Indeed, monitoring population levels of physical (in) activity provides the opportunity to track changes over time, identify and target populations with low physical activity levels, and evaluate public health policies and strategies. Internationally comparable data are especially interesting, since they allow cross-country comparisons and benchmarking.

In conclusion, taking together these findings indicate that 86% of the sample has a sufficient level of PA, with differences between sexes and among age groups. These results can provide useful baseline data in Italian population, but additional studies could be conducted to ascertain population trends over years in order to promote PA and improve public health by using a broad approach which considers the different segments of population.

AUTHORS CONTRIBUTION

The authors of the manuscripts have made the following contributions in carrying out the field work and writing of the research paper for publication: AP conceptualized, designed and supervised the study; FI conducted bibliographic research and critically reviewing the paper; DC, LB contributed to the study protocol, conducted the research and contributed to the data analysis; MZ, AT, CF contributed to the collected the data; AP,

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FI, DC, LB, MZ, AT, CF drafted the paper and all authors listed reviewed the manuscript and contributed to subsequent drafts. All authors read and approved the final manuscript.

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CONFLICTS OF INTERESTS

The authors declare that they have no conflicts of interest.

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