

Reliability of the telephone-administered International Physical Activity Questionnaire in an Italian pilot sample

ALICE MANNOCCI⁽¹⁾, CLAUDIO BONTEMPI⁽¹⁾, VITTORIA COLAMESTA⁽¹⁾, FILIPPO FERRETTI⁽¹⁾, GUGLIELMO GIRALDI⁽¹⁾, ANNAMARIA LOMBARDI⁽¹⁾, ANGELA MEGGIOLARO⁽¹⁾, ANNA MIANI⁽¹⁾, SILVIA MICCOLI⁽¹⁾, ANNALISA ROSSO⁽¹⁾, ROSELLA SAULLE⁽¹⁾, BRIGID UNIM⁽¹⁾, ANTONIO BOCCIA⁽¹⁾, GIUSEPPE LA TORRE⁽¹⁾

ABSTRACT

BACKGROUND: the International Physical Activity Questionnaire (IPAQ) is an instrument for cross-national monitoring of physical activity and inactivity. The aim of the study was the reliability evaluation of the Italian telephone-administered IPAQ version in Rome.

METHODS: the IPAQ short form (IPAQ-SF), consisting of 7 items, was administered. The responses, used to compute Metabolic Equivalent Task (MET in minutes per week), were processed to analyze the internal consistency. Standardized Cronbach's alpha was used for reliability estimation.

RESULTS: a total of 133 adults (51 males and 82 females) participated in the study, with a mean age of 51 years (SD=19). The mean MET was 4 130, corresponding to good physical activity levels. The standardized Cronbach's alpha on 6 items, concerning time spent on vigorous and moderate activity and walking, was 0.614.

CONCLUSIONS: according to the findings from other countries, the Italian IPAQ-SF has acceptable measurement properties, as good as other established self-reports. The IPAQ-SF has a questionable reliability as previously reported, but the results of the present pilot study are promising and suggest that these instruments can be used to compare population estimates of physical activity.

Key words: Internal consistency; Measurement; Physical activity; Questionnaire; Validity

(1) Hygiene Unit, Department of Public Health and Infectious Diseases, "Sapienza" University of Rome, Rome, Italy

CORRESPONDING AUTHOR: Alice Mannocci, Department of Public Health and Infectious Diseases, "Sapienza" University of Rome, Piazzale Aldo Moro 5, 00185 Rome, Italy. Tel: +39 06 49694306; Fax: +39 06 4454845. e-mail alice.mannocci@uniroma1.it

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INTRODUCTION

Sedentary lifestyles have become a worldwide phenomenon [1] and are associated

with increased obesity, type 2 diabetes [2], and cardiovascular diseases [3]. On the other hand, physical activity (PA) and regular exercise contribute to general health and mental well-

being and are associated with reduced mortality [4-7]. The promotion of active lifestyles is therefore a crucial public health priority.

As the importance of PA has been recognized, reliable and valid measurement tools that can be used internationally to obtain comparable estimates of PA are essential.

The International Physical Activity Questionnaire (IPAQ) was developed by the International Consensus Group in 1997 to establish a standardized and culturally adaptable instrument across various populations in the world [8].

Data collected with IPAQ can be computed by weighting each type of activity by its energy requirements defined in Metabolic Equivalent Task (MET) to yield a score in MET-minutes. One MET is considered a resting metabolic rate obtained during quiet sitting.

METs are multiples of the resting metabolic rate and a MET-minute is computed by multiplying the MET score by the minutes in which an activity is performed [9].

Two IPAQ versions are available: the 7-item short form (IPAQ-SF) is suitable for use in national and regional surveillance systems and the 27-item long version provides more detailed information, often required in research work or for evaluation purposes. The short form is feasible to administer; though, there are no difference regarding the reliability and validity of the short and long IPAQ forms [8, 10]. Both versions can be administered by telephone interview or self-administration. Craig et al. have demonstrated that reliable and valid physical activity data can be collected by the IPAQ instruments in many countries in the world [8].

An aspect of the validity is the internal consistency. The Cronbach's Alpha is a measure of internal consistency of a test or scale, and ranges in value from 0 to 1. Internal consistency describes the extent to which all items in a test measure the same concept or construct; hence, it underlines the interrelatedness of the items within the test. Internal consistency should be determined before applying a test for research or examination purposes to ensure validity. George and Mallery [11] provide the following rules of interpretation: " $1 \geq \alpha > 0.9$ =Excellent, $0.9 \geq \alpha > 0.8$ =Good, $0.8 \geq \alpha > 0.7$ =Acceptable, $0.7 \geq \alpha > 0.6$ =Questionable, $0.6 \geq \alpha > 0.5$ =Poor, and $0.5 \geq \alpha$ =Unacceptable".

Mannocci et al. validated the Italian

version of the IPAQ questionnaire in 2010; the Cronbach's alpha obtained was 0.73 for the long version, and 0.60 for the short version [10]. According to George and Mallery [11], this study shows an acceptable and "at the limit of questionable" internal consistency respectively.

The purpose of the present study was to evaluate the internal reliability of the Italian telephone-administered IPAQ-SF version in Rome.

METHODS

Questionnaire

The questionnaire consisted of two parts: the first part comprises the IPAQ questions and the second one encloses socio-demographic variables. It's possible to adopt the long or short form of the IPAQ questionnaire. In this study, the short version was used after Italian translation (Appendix). It encloses 7 items on PA and provides information about time spent on vigorous- and moderate-intensity activity, walking and sedentary activity.

Five items related to demographic data (age, gender, educational level, type of work, marital status) and six items about comprehension of the questionnaire were comprised.

In accordance with the guidelines, IPAQ-SF was designed for adults aged 18-69 years [9].

Ten researchers administered the questionnaire by telephone; the phone calls were realized both in the morning (from 10:00 a.m. to 12:00 a.m.) and in the afternoon (from 4:00 p.m. to 8:00 p.m.) in order to enroll people of different ages, gender and social classes. At the beginning of the call, researchers declared their affiliations, the purpose of the investigation, and then enquired - granting anonymity - if the person would like to take part in the study.

Prior to the investigation, a briefing was realized to standardize the procedure in order to control bias and to illustrate the main methods of conducting an effective interview [9]. Data were collected during July 2012.

The information about PA, in the questionnaire, was expressed in minutes/day and days/week. IPAQ-SF responses were converted to MET minutes per week (MET-min/wk) according to the IPAQ scoring protocol [12]: total minutes over last seven days spent on vigorous activity, moderate-intensity activity, and walking were

multiplied by 8, 4, and 3.3, respectively, to create MET scores for each activity level. MET scores across the three sub-components were summed to indicate overall physical activity, as indicated in the following formulas:

- Walking MET-min/wk = 3.3 x walking min/day x walking days
- Moderate MET-min/wk = 4 x moderate-intensity activity min/day x moderate days
- Vigorous MET-min/wk = 8 x vigorous-intensity activity min/day x vigorous-intensity days
- Total physical activity MET-min/wk = Walking MET-min/wk + Moderate MET-min/wk + Vigorous MET-min/wk

Standardized Cronbach's alpha was used as a measure of internal consistency because the encoding of time variables differed between items (the values of "days/week" variables ranged from 0 to 7, while the values of "minute/day" variables ranged from 0 to 960). In addition, a reliability analysis was performed to verify if any item was not consistent with the rest of the scale and, thus, could be discarded. The item-total correlation and the variability of the alpha among items, adding and eliminating items one at a time, were performed. The standardized Cronbach's alpha was calculated for the first 6 items concerning PA, without the time spent sitting, since the overall MET was calculated only on vigorous activity, moderate-intensity activity and walking.

Descriptive statistics (means and standard deviation [SD]) were calculated for all quantitative variables; percentages and frequencies were generated for qualitative variables.

For data analysis we used the IBM software Statistical Package for Social Sciences (SPSS) version 19.0 for Windows (SPSS Inc. Chicago, Illinois, USA).

RESULTS

One hundred thirty-three IPAQ-SF questionnaires were compiled during the telephone investigation. Respondents were mainly female (N=82; 61.65%) and the mean age of the sample was 50.62 (SD=18.75). Up to 47.37% of the sample (N=63) had a high school level of education and 48.12% (N= 64) was married (Table 1).

The comments about the questionnaire

from the 133 respondents were as following: 97% understood the language and 94.7% said that the intent of each question was clear; 9% had doubts about the questionnaire, for example, 7.5% asked about the aim of interview; 3% thought the questionnaire's queries were not specific enough; the questions didn't create discomfort in 94% of the sample and 2.3% suggested to include social and recreational activities in the survey.

Results on walking, moderate, vigorous activity and total MET of the sample are reported in Table 2. The mean of total MET was 4 130.42 per week (SD=5 989.99). According to the definition of MET [9], from 500 to 1 000 MET-minutes per week indicate good health of the sample. Indeed, a possible interpretation of MET values reported in Table 2 can be as follows: on average, the sample walked for an hour every day, also did one hour of moderate physical activity and achieved 20 minutes of vigorous physical activity every day. The average level of total MET=413, therefore, represents a good level of physical activity.

The standardized Cronbach's alpha on first 6 items, concerning PA without time spent sitting, was 0.614 and the reliability analysis is shown in Table 3. In agreement with George and Mallery [11], the resulting value of α doesn't denote a high consistency. In Table 3, the column that contains "Standardized Cronbach's alpha if the item deleted" showed that the all items gave similar contribution to the reliability (range=0.101; min=0.515; max=0.616).

The questions about clarity of the questionnaire showed that the items are comprehensive and the aims are understandable. However, there were suggestions for clarity improvement concerning some activities such as physiotherapy or sexual activity and standing. It is true that in the full version of the IPAQ standing activity is considered and has therefore been deliberately removed in the short version.

DISCUSSION

This study reports the internal reliability of the telephonic format of the IPAQ-SF questionnaire. The IPAQ is one of the most used generic PA questionnaires [13] and was designed to assess PA related to aerobic capacity [14]. It has shown good

TABLE 1

IPAQ SHORT VERSION. STATISTICAL DESCRIPTION OF SOCIO-DEMOGRAPHIC VARIABLES AND PHYSICAL ACTIVITY (ABSOLUTE FREQUENCIES)					
SOCIO-DEMOGRAPHIC VARIABLES			N		
Gender	M		51		
	F		82		
Age (years)	N (mean ± SD)		132 (50.62 ± 18.75)		
Educational level	Primary school		10		
	Secondary school		21		
	High school		63		
	Degree +		38		
Civil status	Unmarried		43		
	Married		64		
	Separated/Divorced		10		
	Widow		14		
QUESTIONNAIRE			MEASURE UNIT	N	MEAN (SD)
PART 1. PHYSICAL ACTIVITY					
1	During the last 7 days, on how many days did you do vigorous physical activities?		Days/week	133	1.15 (1.86)
2	How much time did you usually spend on one of those days doing vigorous physical activities as part of your work?		Minutes/day	133	38.50 (69.89)
3	During the last 7 days, on how many days did you do moderate physical activities?		Days/week	133	3.17 (2.48)
4	How much time did you usually spend on one of those days doing moderate physical activities?		Minutes/day	132	80.98 (121.25)
5	During the last 7 days, on how many days did you walk?		Days/week	133	5.30 (2.12)
6	How much time did you usually spend on one of those days walking?		Minutes/day	133	67.89 (97.24)
PART 2. TIME SPENT SITTING			MEASURE UNIT	N	MEAN (SD)
7	During the last 7 days, how much time did you usually spend sitting on a day?				

test-retest reliability in healthy persons and in different patient populations [15, 16]. According to the findings concerning IPAQ-SF [8], the value of internal consistency in the Italian version was “at limit of acceptability”: 0.614 is a questionable value. Several studies have shown that IPAQ overestimates PA levels [18, 19, 20] and this limitation has been shown to be more problematic for IPAQ-SF; in fact, the IPAQ-SF typically overestimated physical

activity as measured by objective criterion [21]. Participant’s comment showed a good comprehension of the questionnaire, in terms of language understanding and intent of each question. Only 9% had doubts about the questionnaire; these results are quite consistent with the previous study [10].

The IPAQ resulted in significant overestimation of moderate PA in part because it included walking of any intensity, as has been reported previously [22]. The inclusion of walking

TABLE 2

WALKING, MODERATE, VIGOROUS AND TOTAL MET OF THE SAMPLE		
MET-MINUTES/WEEK	MEAN (\pm SD)	INTERPRETATION OF THE MET AVERAGE
Walking MET	1 388.73 (\pm 2 240.09)	1 hour x day (every day) (MET=1 386)
Moderate MET	1 602.27 (\pm 3 156.11)	1 hour x day (every day) (MET=1 680)
Vigorous MET	1 130.83 (\pm 2 991. 49)	20 minutes x day (every day) (MET=1 120)
Total physical activity MET	4 130.42 (\pm 5 989.99)	Good physical activity

MET: Metabolic Equivalent Task

TABLE 3

ITEM-TOTAL CORRELATION AND VARIABILITY OF STANDARDIZED CRONBACH'S ALPHA, IF ONE ITEM WAS DELETED		
ITEMS PA IN IPAQ-SF*	CORRECTED ITEM-TOTAL CORRELATION	STANDARDIZED CRONBACH'S ALPHA IF ITEM DELETED
1	0.381	0.542
2	0.205	0.553
3	0.339	0.601
4	0.451	0.515
5	0.219	0.616
6	0.361	0.583

*The items from 1 to 6 are reported in Table 1

IPAQ-SF: International Physical Activity Questionnaire-short form; PA: physical activity

in the moderate PA score was based on previous research [8] which demonstrated that additional questions concerning intensity or pace of walking has no significant effect on the relative validity. It is unlikely that the inclusion of walking pace would affect the relative validity, but it would likely have a substantial impact on the absolute validity, or the absolute amount of PA reported. One reason for over reporting PA may be the wish to present oneself in a positive light by giving socially desirable responses [23] and it's an important factor in surveys and affects the validity of self-reports as it results in underreporting of socially undesirable characteristics or over reporting of socially desirable behavior [24]. High repeatability values for total and vigorous PA, and good for moderate and walking PA were found in another study [25]; about the reproducibility of the IPAQ short version, Kurtze et al. reported that the reliability ranged from good for sitting and

vigorous PA, to moderate for walking and fair for moderate activity [26]. A potential limitation for our study was that the results are likely to be affected by selection (especially participation) bias, as the study was voluntary and participants reside in the province of Rome. Regarding the possibility of recall bias and considering that the activities occurred a short time before the interview, the bias was considered absent or negligible in the present study. Another limitation of this study concerns the administration modality that allows the responder to remain anonymous and, therefore, improves the answers quality better than face to face interview, in which the respondent may feel uncomfortable for the presence of the interviewer. On the other hand, there are few opportunities to contact people who are at work or without a fixed phone line. Given the relatively small sample in this study and the absence of some variables (e.g. weight,

height), we suggest that further examination of this issue may be more fruitful. According to Lee et al [21], the IPAQ-SF does not have acceptable consistency but remains feasible to administer

and handy to combine with other questionnaires.

APPENDIX

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

(AUGUST 2002)

SHORT LAST 7 DAYS TELEPHONE FORMAT

Da utilizzare con giovani e adulti di mezza età

(15-69 anni)

Informazioni per il compilatore

L'International Physical Activity Questionnaires (IPAQ) comprende un insieme di quattro questionari. Sono disponibili sia una versione lunga (con 5 settori di attività, richieste in maniera indipendente) che una versione breve (con 4 generici punti). L'obiettivo del questionario è di fornire uno strumento standardizzato che può essere impiegato per ottenere dati comparabili a livello internazionale sull'attività fisica.

Inserimento e codifica dei dati

Per assistere nella gestione dei dati e nella formazione dell'intervistatore, per ogni domanda vengono suggeriti i campi validi uniti alle categorie di risposta. Si raccomanda di registrare la risposta reale fornite da ciascun intervistato. Per esempio, "120 minuti" viene registrata nello spazio di risposta per i minuti. "Due ore" dovrebbe essere registrata come "2" nella colonna ore. Una risposta di "un'ora e mezzo" deve essere registrata come "1" nella colonna ora e "30" nella colonna minuti.

TEMPO TRASCORSO IN ATTIVITÀ INTENSE

Leggere: Ora, pensi a tutte le attività fisiche intense (lavoro, casa, tempo libero) che ha fatto negli ultimi 7 giorni, che le hanno

richiesto *un certo sforzo fisico*. Le attività fisiche *intense* sono quelle che l'hanno fatta respirare in maniera più impegnativa rispetto al normale e possono includere il sollevamento di carichi pesanti, scavare, fare aerobica, o andare veloce in bicicletta. Pensi soltanto a queste attività che deve aver svolto per almeno 10 minuti di seguito.

1. Durante gli **ultimi 7 giorni**, quanti giorni ha fatto **attività fisica intensa**?
 _____ Giorni a settimana [inserire valore tra: 0-7]
 < > Non so/Non sono sicuro [8]
 < > Rifiuta la risposta [9]

[Chiarimento dell'intervistatore: Pensi solamente all'attività fisica che ha fatto per almeno 10 minuti di seguito.]

[Note intervistatore: Se la risposta è zero, rifiuta la risposta o non sa, passare alla Domanda 3]

2. In uno di questi giorni in cui fa attività fisica intensa, per quanto tempo la pratica?
 _ _ Ore al giorno
 [ore, inserire valore tra:0-16]
 _ _ _ Minuti al giorno [minuti,
 inserire valore tra: 0-960]
 < > Non so/Non sono sicuro [998]
 < > Rifiuta la risposta [999]

[Chiarimento dell'intervistatore: Pensi solamente all'attività fisica che ha fatto per almeno 10 minuti di seguito]

[Proposito dell'intervistatore: si sta cercando il tempo medio per uno di questi giorni in cui si fa attività fisica intensa. Se il rispondente non può rispondere perché il tempo trascorso varia notevolmente di giorno in giorno, chiedere: "Quanto tempo in totale spende **negli ultimi 7 giorni** facendo intensa attività fisica?". Dopo di che si fa una media su 7 giorni. Si inserirà nel campo "Ore" il numero medio di ore e gli eventuali minuti.

TEMPO TRASCORSO IN ATTIVITÀ MODERATE

Leggere: Adesso pensi ad attività che richiedono uno *sforzo fisico moderato* che ha svolto negli ultimi 7 giorni (*sia a lavoro,*

che a casa, nel tempo libero). Le attività fisiche moderate sono quelle che l'hanno fatta respirare un po' più frequentemente del normale e possono includere il trasporto di pesi leggeri, ciclismo ad andatura regolare, partita a tennis in doppio. Non si deve considerare il semplice passeggiare. Ancora, pensi soltanto alle attività che ha fatto per almeno 10 minuti di seguito.

3. Durante gli ultimi 7 giorni, quanti giorni ha fatto attività fisica moderata?
 _____ Giorni a settimana
 [MDAY; Intervallo 0-7, 8,9]
 < > Non so/Non sono sicuro [8]
 < > Rifiuta la risposta [9]

[Chiarimento dell'intervistatore: Pensi solamente all'attività fisica che ha fatto per almeno 10 minuti di seguito.]

[Note intervistatore: Se la risposta è zero, rifiuta la risposta o non sa, passare alla Domanda 5]

4. In uno di questi giorni in cui fa attività fisica moderata, per quanto tempo la pratica?
 — — Ore al giorno
 [ore, inserire
 valore tra: 0-16]
 — — — Minuti al giorno [minuti,
 inserire valore tra: 0-960]
 < > Non so/Non sono sicuro [998]
 < > Rifiuta la risposta [999]

[Chiarimento dell'intervistatore: Pensi solamente all'attività fisica che ha fatto per almeno 10 minuti di seguito.]

[Proposito dell'intervistatore: si sta cercando il tempo medio per uno di questi giorni in cui si fa attività fisica moderata. Se il rispondente non può rispondere perché il tempo trascorso varia notevolmente di giorno in giorno, chiedere: Quanto tempo in totale spende **negli ultimi 7 giorni** facendo attività fisica moderata?". Dopo di che si fa una media su 7 giorni. Si inserirà nel campo "Ore" il numero medio di ore e gli eventuali minuti.

TEMPO TRASCORSO CAMMINANDO

Leggere: Adesso pensi al tempo che ha trascorso **camminando** negli ultimi 7 giorni.

Consideri quello per andare a casa o a lavoro, camminare per spostarsi da un posto ad un altro e qualsiasi passeggiata che ha fatto esclusivamente per tempo libero, sport, esercizio fisico, o per piacere.

5. Durante gli ultimi 7 giorni, per quanti giorni ha camminato per almeno 10 minuti di seguito?
 _____ Giorni a settimana
 [WDAY; Intervallo 0-7, 8,9]
 < > Non so/Non sono sicuro [8]
 < > Rifiuta la risposta [9]

[Chiarimento dell'intervistatore: Pensi solamente al cammino che ha fatto per almeno 10 minuti di seguito.]

[Note intervistatore: Se la risposta è zero, rifiuta la risposta o non sa, passare alla Domanda 7]

6. Per quanto tempo cammina in uno di questi giorni?
 — — Ore al giorno
 [ore, inserire valore tra:
 0-16]
 — — — Minuti al giorno
 [MDMIN; Intervallo: 0-960,
 998, 999]
 < > Non so/Non sono sicuro [998]
 < > Rifiuta la risposta [999]

[Proposito dell'intervistatore: si sta cercando il tempo medio per uno di questi giorni in cui si cammina. Se il rispondente non può rispondere perché il tempo trascorso varia notevolmente di giorno in giorno, chiedere: Quanto tempo in totale spende negli **ultimi 7** camminando?". Dopo di che si fa una media su 7 giorni. Si inserirà nel campo "Ore" il numero medio di ore e gli eventuali minuti.

TEMPO TRASCORSO SEDUTO

Leggere: Adesso pensi al tempo che ha trascorso stando seduto negli ultimi 7 giorni. Consideri il tempo trascorso a lavoro, a casa, mentre faceva un corso e durante il tempo libero. Può considerare il tempo in cui è stato seduto ad una scrivania, ha fatto visita ad amici, ha dedicato alla lettura o è stato seduto o sdraiato a guardare la televisione.

7. Questa settimana quanto tempo ha trascorso **seduto** al giorno?
- — Ore per giorno della settimana [ore, inserire valore tra: 0-16]
- — — Minuti per giorno della settimana [SDMIN; Range: 0-960, 998, 999]
- < > Non so/Non sono sicuro [998]
- < > Rifiuta la risposta [999]

[Chiarimento dell'intervistatore: Includa il tempo che ha trascorso sdraiato (da sveglia), nonché da seduto]

[Proposito dell'intervistatore: si sta cercando il tempo che si trascorre in media seduti. Se il rispondente non può rispondere perché il tempo trascorso varia notevolmente di giorno in giorno, chiedere: Quanto tempo in totale ha trascorso *stando seduto* Mercoledì scorso?"

- — Ore alla settimana [ore settimana, inserire valore tra: 0-112]
- — — Minuti alla settimana [minuti settimana, inserire valore tra: 0-6720]
- < > Non so/Non sono sicuro [9998]
- < > Rifiuta la risposta [9999]

DOMANDE SOCIO-DEMOGRAFICHE

Età:

Sesso:

- < > M
- < > F

Stato civile

- < > celibe/nubile
- < > sposato/convivente
- < > separato/divorziato
- < > vedova/o

Comune dove vive¹

.....

Provincia

Cap.....

Attività professionale:

.....

Livello educativo:

- < > elementare
- < > media inferiore
- < > media superiore
- < > laurea più

A questo punto il questionario è terminato. Le domande che seguono ci serviranno a verificare se il questionario è comprensibile

- a. Hai compreso tutte le parole?
.....
.....
- b. Era chiaro l'intento delle singole domande?
.....
.....
- c. Hai delle chiarimenti da chiedere sul questionario?
.....
.....

- d. Come potrebbe essere più chiara la formulazione delle domande?
.....
.....
- e. Ci sono delle domande che ti hanno creato disagio?
.....
.....
- f. Ci sono della attività che abbiamo dimenticato?
.....
.....

Qui termina il questionario, si ringrazia per la collaborazione.

¹Non si chiede la città di residenza poiché potrebbe non coincidere con quella in cui vive.

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