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Original article

Reliability and validity of the French version of the global physical activity questionnaire

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Abstract

Background: The Global Physical Activity Questionnaire (GPAQ) has been used to measure physical activity (PA) and sedentary time in France, but no study has assessed its psychometric properties. This study aimed to compare the reliability as well as criterion and concurrent validity of the French version of the GPAQ with the French International PA Questionnaire long form (IPAQ-LF) and use of an accelerometer in a general adult population.

Methods: We included 92 participants (students or staff) from the Medicine Campus at the University of Lorraine, Nancy (north-eastern France). The French GPAQ was completed twice, 7 days apart, to study test-retest reliability. The IPAQ-LF was used to assess concurrent validity of the GPAQ, and participants wore an accelerometer (Actigraph GT3X+) for 7 days to study criterion validity. Reliability as well as concurrent and criterion validity of the GPAQ were tested by the intraclass correlation coefficient (ICC), Spearman correlation coefficient for quantitative variables, and Kappa and Phi coefficients for qualitative variables. Both concurrent and criterion validity of GPAQ were assessed by Bland-Altman plots.

Results: The GPAQ showed poor to good reliability (ICC = 0.37–0.94; Kappa = 0.50–0.62) and concurrent validity (Spearman r = 0.41–0.86), but only poor criterion validity (Spearman r = 0.22–0.42). Limits of agreement for the GPAQ and accelerometer were wide, with differences between 286.5 min/day and 601.3 min/day.

Conclusion: The French version of the GPAQ provides limited but acceptable reliability and validity for the measurement of PA and sedentary time. It may be used for assessing PA and sedentary time in a French adult population.

Keywords: Measurement; Physical activity; Psychometric analysis; Questionnaire; Reliability; Self-report; Sitting time; Validity

1. Introduction

Physical activity (PA) surveillance is a public health preoccupation and is considered by the World Health Organisation (WHO) as a protective factor for non-communicable diseases.[1] A high PA level is associated with reduced mortality and the occurrence of diseases or their consequences and improved quality of life.[2,3] Because of its therapeutic role, PA is also used as adjuvant treatment in chronic diseases.[4,5]

In this context, the measurement of PA is essential to assess strategies promoting PA and to survey and compare PA levels between countries. Questionnaires are the most commonly used instrument in epidemiologic studies to assess PA because they are relatively inexpensive and easy to use both for a large population and in a short time. They can be self-administered, completed during an interview or administered by phone. Many different questionnaires have been developed and used to measure PA, so international comparison is difficult, and overall, their development lacked methodological quality.[6]

In the late 1990s, the International Physical Activity Questionnaire (IPAQ) was developed in 2 forms (short form (IPAQ-SF) and long form (IPAQ-LF)) to create national and international comparable and standardized measures of PA. The

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long form of the IPAQ (31 items) was developed to capture information about domains of PA but has been considered too long and too complex to be used in surveillance studies, while the short form (9 items) does not take into account the domains of PA.[7,8] For PA surveillance, the measurement of PA domains is needed to understand the patterns of PA and to develop interventions. Thus, in order to provide an instrument that would address the limits of these questionnaires, the Global Physical Activity Questionnaire (GPAQ) has been developed by the WHO, as part of the WHO STEPwise approach to survey chronic disease risk factors. It is now recommended by the WHO for national surveillance of PA.[1] Since its development, the GPAQ has been translated into and tested in many languages and is used in many countries.[9-16] In France, the GPAQ has been used to describe and analyse PA and sedentary time of the general population.[17] However, it has not been validated in the French language. Evidence for the validity and reliability of the French version of the GPAQ is needed because the results may be affected by the sociocultural specificities of the country.[18]

Rigorous methodology is needed to examine the degree in which an instrument is affected by measurement error (reliability) and measures the construct it intends to measure (validity).[19] Concurrent validity refers to the degree to which the GPAQ measures what it purports to measure, and criterion validity is the degree to which the results of the questionnaire are an adequate reflection of a "gold standard". Because of no satisfying available gold standard measurement for PA behavior, objective measures such as accelerometers and pedometers are commonly used. To appraise the concurrent validity of the GPAQ, a questionnaire measuring the same construct and with similar structure is considered relevant. Even if the IPAQ-LF is more detailed than the GPAQ, it is the most similar in its construct and its structure. For this reason, the IPAQ-LF has been considered relevant to examine the concurrent validity of the GPAQ.

This study aimed to assess the test-retest reliability as well as criterion and concurrent validity of the French version of the GPAQ by comparison with the IPAQ-LF and use of an accelerometer in a general adult population in France.

2. Methods

2.1. Patients and study design

A convenient sample was recruited from January 20, 2015 to April 20, 2015, from the Medicine Campus, University of Lorraine, Nancy (north-eastern France), by posting an advertisement on campus and by e-mailing students and staff. Participants had to be ≥18 years old, working or studying at the Medicine Campus, able to read and understand French, and willing to participate in the study. The study protocol was approved by the Legal representative of the French data protection authority (Commission Nationale Informatique et Libertés) of the University of Lorraine, France. All participants were asked to read and sign a consent form. A ratio of 5 subjects per item was used to determine the number of participants to include.[20] Because the GPAQ contained 16 items, a minimum number of 80 participants was required.

Each subject was invited to participate in a face-to-face interview on Day 0 (D0) and receive all explanations about the study and its purpose from an interviewer. After giving consent, participants answered sociodemographic and anthropometric questions, then completed the GPAQ and IPAQ-LF. Then, the interviewer gave the participant an accelerometer and explained its use. Participants were asked to wear the accelerometer for 7 consecutive days. Eight days after the first interview (D8), participants returned the accelerometer and completed the GPAQ and IPAQ-LF a second time. They were also asked if they had changed their activity during the week of the study as compared to a typical week.

2.2. Instruments

We used the French translation of the GPAQ (Version 2.0)[21] to gather information on the time spent in moderate and vigorous PA and in sedentary behavior. At the WHO level, the GPAQ has been translated in French by a professional translator, and back-translated by 2 independent technical experts. The versions were then compared, and where discrepancies existed, these were discussed and a consensus was found. The GPAQ contains 16 items designed to assess the frequency and duration of PA in 3 domains: during work, transportation, and leisure time as well as time spent sitting during a typical week. It distinguishes PA duration by min/day and min/week for each PA domain, which allows for calculating the energy expenditure scored in metabolic equivalent tasks (METs). One MET corresponds to resting energy expenditure. According to duration and energy expenditure, PA level was classified as low, moderate, and high.

The French IPAQ-LF was used to test the concurrent validity of the GPAQ. It contains 27 items designed to assess the frequency and duration of PA in 4 domains: during work, transportation, household activities, and leisure time, then time spent sitting.[22] The IPAQ-LF scores PA in terms of energy expenditure (MET), intensity (low, moderate, high, and sedentary), and duration (min/day, min/week).

The ActiGraph accelerometer, model GT3X+ (ActiGraph, Pensacola, FL, USA), was used as the criterion measure. The device is worn at the waist and measures and records the changes in acceleration and deceleration movements in 3 axes (anteroposterior, superio-inferior, and medial side). Data for measuring acceleration and deceleration are stored in non-volatile flash memory and can be read by using ActiLife software. Accelerometer data were scored using ActiLife 6 Data Analysis Software (ActiGraph) to assess time spent at various PA intensity levels (moderate and vigorous in min/day). Freedson's Adult VM3 (2011) cut-off points were used to determine several PA levels: light, 0–2690 counts per minute (CPM); moderate, 2691–6166 CPM; vigorous, 6167–9642 CPM; and very vigorous, 9643–∞ CPM. Minutes spent at each intensity level were averaged across valid days. Non-wear periods were identified as 60 consecutive minutes with no movement data o (0 counts).[23] All calculations were based on 60 s epochs; an epoch is a user-defined time-sampling interval used to filter the acceleration signal. In this study, we used 7-days PA questionnaires, so only

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