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Validity and correlates of the International Physical Activity Questionnaire in first-episode psychosis

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Running title

Validity IPAQ in first-episode psychosis

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Abstract

Aim: The International Physical Activity Questionnaire (IPAQ) is a self-report tool commonly used in mental health care settings to assess physical activity. However, its validity has not yet been investigated in first episode-psychosis (FEP). The aim of this study was to examine the concurrent validity of the IPAQ compared with an objective real-life measure, the Sensewear Armband (SWA) in assessing moderate and vigorous physical activity (MVPA) in people with FEP. Secondary aim was to explore whether there are differences in correlates of the IPAQ versus SWA scores.

Methods: Nineteen outpatients with FEP (15 men; 24.4±5.1years) wore a SWA for 5 full consecutive days, subsequently completed the IPAQ, performed a maximal cardiorespiratory fitness test and were assessed with the Positive and Negative Syndrome Scale (PANSS).

Results: There was no significant correlation between time spent in MVPA according to the IPAQ and SWA. In contrast with SWA scores, there were no significant associations between IPAQ scores and cardiorespiratory fitness levels. No correlations with PANSS scores were observed in both measures.

Conclusions: The current results suggest that the IPAQ should be used with caution when assessing levels of MVPA in FEP. More accurate methods of measuring physical activity are needed in this population.

Keywords: physical activity; exercise; fitness; psychosis

INTRODUCTION

Physical activity improves symptomatic, neurocognitive, cardiorespiratory and metabolic outcomes in people with first-episode psychosis (FEP) [1-4]. Current guidelines recommend that patients with psychosis should aim to be physically active for at least 150 minutes per week at a moderate intensity [5]. However, assisting people with FEP to initiate and maintain an active lifestyle remains a key challenge for treatment services [6-8]. There is a paucity of published data on physical activity levels in FEP, with a recent meta-analysis only identifying two previous studies [9]. Valid methods for assessing physical activity levels among young people with psychosis is warranted [10, 11]. Objective methods for measuring physical activity such as accelerometers are considered to offer more precise estimates of physical activity than self-reported levels as they remove many of the issues of recall and response bias [6]. Despite these advantages, objective assessment tools are often costly and time-consuming rendering them difficult to use routinely in mental health care settings (Vancampfort et al., 2015a). In order to be able to define clear treatment goals and to assist patients in adopting and maintaining an active lifestyle, it is also pertinent to determine the context in which physical activity occurs [12] and pedometers or accelerometers do not provide such information (e.g. active transportation, housework, leisure time activity and sports). Questionnaires are a more feasible alternative, are more cost-effective and can provide information about the context in which patients are physically active and in which they are not [13]. The International Physical Activity Questionnaire (IPAQ) [14] is the most widely used self-report tool, and is also commonly used in mental health care settings [15]. The IPAQ was designed to assess levels of habitual physical activity in individuals ranging from young to middle-aged (i.e. 15–69 years old). In addition, there are different forms of the IPAQ based on several variations, which include the length of questionnaire (i.e. short or long form), reference period (i.e. last 7 days or usual week) and mode of administration (i.e. self-report or interviewer-based). It has previously been demonstrated in people with schizophrenia that the IPAQ exhibits measurement properties that are comparable to those reported in the general population and therefore can be considered as an appropriate surveillance tool to assess levels of physical activity in these patients [16, 17].

To the best of our knowledge, although the IPAQ has been used previously to assess physical activity levels in people with FEP [1, 2], validity data pertaining to the use of the IPAQ in young people with FEP is lacking. In order to evaluate its concurrent validity, the IPAQ can be compared with physical activity output from objective measures. Therefore, the aim of this study was to examine the concurrent

validity of time spent in moderate and vigorous physical activity as recorded with the IPAQ, compared with an accelerometer in outpatients with FEP. The secondary aim was to assess whether volume of moderate and vigorous physical activity as assessed with the IPAQ, was differently associated with mental and physical health variables compared with objectively assessed time spent in moderate and vigorous physical activity.

METHODS

Participants and procedure

Over a 9-month period, outpatients of the UPC KU Leuven campus Kortenberg in Belgium, experiencing a FEP [18] were invited to participate. Participants needed to be stable on psychotropic medication for at least 4 weeks. Somatic exclusion criteria included evidence of severe cardiovascular, neuromuscular and endocrine disorders which prevented participants being physically active as per usual. All participants wore an SWA for 5 consecutive days. At the end of day 5, participants completed the International Physical Activity Questionnaire [14]. To maximise adherence to the study protocol, on the third day of monitoring participants received a follow-up telephone call to resolve any issues or concerns about the study. The study procedure was approved by the Scientific and Ethical Committee of the UPC KU Leuven, campus Kortenberg, Belgium and conducted in accordance with the principles of the Declaration of Helsinki. All participants gave informed written consent. There was no compensation for participation in the study.

Objective physical activity assessment: Sensewear Armband (SWA)

The SWA is worn over the right arm triceps muscle and assesses minute to minute movement through multiple sensors, namely a two-axis accelerometer and sensors measuring heat flux, galvanic skin and near body-temperature. Data are combined with gender, age, body weight and height, to estimate active energy expenditure using algorithms developed by the manufacturer (SenseWear Professional software, version 7.0). Data were collected for 5 full days (3 week days and 2 weekend days). Daily average time spent in moderate (MPA) (3-6METs) and vigorous physical activity (VPA) (≥6METs) were calculated from all minutes during waking hours. We only included physical activities performed in bouts of at least 10min. In accordance with a previous validity study in people with chronic schizophrenia [17], we did not assess time spent in light physical activity (<3MET). Although time spent in light physical activity can be considered as a measure-of-proxy for time spent walking, this can be misleading or erroneous, as for example household chores might also be executed at low intensity. In accordance with previous research [19], data were accepted when the average wear time was at least 1368 minutes per day (95% of a 24-hour bout).

Subjective physical activity assessment: International Physical Activity Questionnaire (IPAQ) - short version

A structured format (short version) that requires participants to recall activities for each of the last seven preceding days was used (self-report) [14]. We included the reported time spent in moderate and vigorous physical activity performed in bouts of at least 10min (min/day). The walking item was not included. In this study, the questionnaire was not interviewer-administered.

Cardiorespiratory fitness test

Cardiorespiratory fitness tests were performed according Internationally accepted standards [20] on a cycle ergometer (Siemens-Elema 380B; Ergometrics 800S, Ergometrics, Bitz, Germany) in an air-conditioned laboratory where the room temperature was regulated at 18-22°C. Participants were asked to cycle at a constant rate of 60 revolutions per minute. The initial workload of 20W was increased by 20W every minute. Blood pressure was measured at rest before the test, with the patient sitting on the bicycle, and every 2 minutes during the test. Heart rate and a 12-lead electrocardiogram (Max Personal Exercise Testing®, Marquette, WI, USA) were registered continuously. In- and expired gasses were analysed breath-by-breath by means of the Oxycon Pro (Jaeger, Mijnhardt, The Netherlands). The gas analysers and the flow meter were calibrated before each test according to the manufacturer's instructions. VO_2max values were defined as the 30 seconds average at the highest workload achieved. All participants were asked and encouraged to perform a symptom-limited graded exercise test until exhaustion. In order to define a maximal effect we followed the criteria described by the European Association for Cardiovascular Prevention and Rehabilitation [21]. A maximal effort was assumed if the cardiorespiratory fitness test was terminated by the patient due to exhaustion, dyspnea, pain or tiredness in the legs and if (a) a peak respiratory exchange ratio (RER) ≥1.10 and/or (b) a rating of perceived exertion ≥16 on the Borg Scale [22].

Positive and Negative Syndrome Scale (PANSS)

In this study we used the positive (7 items) and negative (7 items) subscales of the PANSS [23]. Each item is scored on a Likert type severity scale ranging from 1 (absent) to 7 (extreme). The subscale scores range from 7 to 49.

Anthropometric measurements

Body weight was measured in light clothing to the nearest 0.1kg using a SECA beam balance scale, and height to the nearest 0.1cm using a wall-mounted stadiometer. Waist circumference (WC) was measured to nearest 1cm at the level of the umbilicus and at the end of expiration with the participant upright and his/her hands by the side.

Statistical analyses

Data were assessed for normality using the Shapiro-Wilk test and except for vigorous physical activity assessments found to be normally distributed. Descriptive statistics are reported as mean and standard deviation (SD), and for uniformity reasons also for vigorous physical activity assessments. Associations between the levels of moderate physical activity using the IPAQ and the SWA were assessed using Pearson's correlation coefficients and for vigorous physical activity using Spearman Rho correlation coefficients (as not normally distributed). We also explored associations of IPAQ and SWA scores with demographical and clinical variables using respectively Pearson's correlation coefficients and Spearman Rho correlation coefficients. The significance level was set at 0.05. Statistical analysis was carried out using IBM SPSS statistics software (version 22.0).

RESULTS

Participants

Twenty-four consecutive patients were invited to participate. One patient was excluded due to a locomotor co-morbidity preventing safe participation and one declined (i.e. not interested). Three patients responded on the questionnaire that they were not able to recall their physical activity levels of the past 7 days (which is a valid option in the IPAQ) and were therefore excluded. Nineteen outpatients with FEP completed the study. There were 15 men and 4 women. Four outpatients (21%) smoked (14±5 cigarettes per day). The mean time spent in moderate physical activity was 214.7±156.6 min/day using the IPAQ and 158.7±81.7min/day when assessed with the SWA. The mean time spent in vigorous physical activity was 6.3±12.6 min/day using the IPAQ and 4.1±5.7 min/day as assessed with the SWA. Seventeen patients were on antipsychotic monotherapy: aripiprazole (n=5), amisulpride (n=3), ziprasidone (n=3), quetiapine (n=3), paliparidone (n=2). There were two patients who were antipsychotic-naïve, of which one was also psychotropic medication-naive. Six patients took antidepressants (duloxetine (n=2), mirtazapine (n=2), escitalopram (n=2)) and 2 were on lithium carbonate. All participants wore the SWA for at least 1368 minutes per day (95% of a 24-hour bout) and could be included in the analysis. Mean and SD for other demographical and clinical variables are presented in Table 1.

Associations with and comparisons between the IPAQ and SWA assessments

The correlation between mean time (min/day) spent in moderate physical activity recorded with the SWA and the IPAQ was 0.29 (P=0.23) while the correlation spent in vigorous physical activity assessed with the SWA and the IPAQ was -0.11 (P=0.66). Compared with the SWA data for physical activity accumulated in bouts of at least 10min, the IPAQ was found to overestimate moderate and vigorous physical activity by 35% and 54% respectively.

Associations of the IPAQ and SWA scores with demographical and clinical variables

As can be seen in Table 1, there were no significant correlations for IPAQ and SWA scores with age, body mass index, waist and PANSS scores. In contrast, better cardiorespiratory fitness levels were associated with higher physical activity levels as assessed with SWA. No associations were found between cardiorespiratory fitness levels and IPAQ scores.

[Insert Table 1 about here]

DISCUSSION

General findings

To the best of the authors' knowledge, this is the first study to examine the concurrent validity of the IPAQ in people with FEP. In sum, we found no significant correlations between time spent in moderate and vigorous physical activity as assessed with the IPAQ and the SWA. Moreover, 3 participants (13.6%) were unable to recall how much physical activity they had engaged in over the previous week and were excluded from the analysis. Thus, our preliminary data suggests that the IPAQ is not a suitable method for monitoring moderate to vigorous physical activity among people with FEP in clinical practice.

There is an imperative to actively include the monitoring of physical activity in the management of FEP. However, based on our data the suitability and accuracy of the IPAQ is questionable for this purpose. As the original objective of the IPAQ was to provide a self-report measure of physical activity that was suitable for assessing general population levels of physical activity across multiple countries [14], the assessment of physical activity levels in clinical settings was not an explicit original goal. In the current study, outpatients with FEP overestimated their physical activity levels by between 35% to 50%, which is however in line with previous research in young men from the general population with poor physical fitness[24]. A potential reason for this overestimation might be that people with FEP have difficulty with accurately recalling their physical activity levels. Cognitive deficits have been noted among people in the at risk mental state [25, 26] and those experiencing FEP [27] and sedentary behavior and low physical activity have been associated with worse cognition among those with established schizophrenia [28]. Second, people with FEP are significantly less physically active and have a lower cardiorespiratory fitness versus matched controls [29, 30] and may have difficulties in accurately recalling the intensity of various physical activities and therefore may perceive light intensity physical activities (≤3MET) already as moderate. The IPAQ defines moderate intensity physical activity broadly as an activity causing somewhat harder breathing [14]. In physically inactive and unfit patients, light intensity physical activity might cause people to start already breathing somewhat harder. Third, people with FEP may already have elevated levels of cardio-metabolic abnormalities[31-33], which is associated with cognitive impairments[34] and which can make recall less accurate and therefore influence perceived exertion in actual physical activities.

Overall, our data suggest that IPAQ has questionable validity and should be used with caution when assessing moderate to vigorous intensity physical activity in clinical settings, among outpatients with FEP.

Limitations and future research

While research into physical activity measurement is associated with broad methodological limitations [35], the current data should be interpreted in light of some specific limitations. Firstly, while the IPAQ assesses physical activity within a 7-day framework, the Sensewear was only worn in 5 of these 7 days. Second, we did not perform an a-priori power calculation and the current data are based on a small sample of mainly male outpatients with FEP. This limits the generalizability of the current findings. Nevertheless, our results suggest that more work is needed to address the identified problems of the IPAQ when used in outpatients with FEP. There is a need for a clinical physical activity instrument that validly captures physical activity in this population. Therefore, one of the most important challenges in physical activity research in people with FEP is to develop a low cost, easy to use, reliable and valid physical activity questionnaire that captures structural moderate and vigorous physical activity. Such a reliable and valid questionnaire is necessary for standardization across studies and clinical practices and would permit meaningful comparisons of values, for example between disease stages. Another option is to assess the feasibility and validity of the experience sampling method which represents a valuable way of assessing physical activity in real world settings and across time. The experience sampling method requires participants to complete self-assessment questions when prompted by an electronic device (e.g. a mobile phone) at different times of the day, in real world settings. This methodology is flourishing in research examining mental illness [36]. Because nowadays most people with psychosis carry a mobile phone most of the time and the vast majority is in favor of using mobile phones to enhance contact with services and support self-management[37], they have the potential to enhance recall of physical activity by frequent prompting and limiting the time lag between the behavior and data collection. This may reduce information bias and increase compliance. Finally, further research is required to explore whether compared with other questionnaires and objective assessment tools the IPAQ is sensitive to monitor intervention-related changes in physical activity.

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TABLE 1. Pearson's and Spearman Rho correlation coefficients° of demographical and clinical variables in people with first-episode psychosis (n=19)

Variables	**Mean±SD**	**r with IPAQ moderate**	**P IPAQ moderate**	**r with SWA moderate**	**P SWA moderate**	**r with IPAQ vigorous**	**P IPAQ vigorous**	**r with SWA vigorous**	**P SWA vigorous**
Age (years)	24.4±5.1	-0.04	0.88	-0.07	0.78	0.14	0.56	0.02	0.93
Body mass index	24.8±3.8	0.05	0.84	-0.34	0.15	0.16	0.50	-0.33	0.17
Waist (cm)	84.4±10.6	-0.10	0.78	-0.17	0.47	-0.12	0.63	-0.08	0.73
VO2 max (ml/min/kg)	30.3±7.4	0.27	0.25	0.68	0.001*	-0.22	0.36	0.49	0.032*
PANSS positive score	7.9±1.1	-0.008	0.97	0.02	0.94	-0.31	0.20	-0.07	0.79
PANSS negative score	9.6±3.1	0.06	0.80	-0.05	0.84	0.11	0.66	-0.04	0.86
Antipsychotic dose (mg/d)	273.1±120.6	0.11	0.66	0.31	0.22	-0.23	0.37	0.07	0.78

*Significance is set at P<0.05. °Pearson's correlation coefficients are calculated for the moderate physical activity levels, Spearman Rho correlation coefficients for the vigorous physical activity levels. IPAQ= International Physical Activity Questionnaire; SWA: Body Sensewear armband, VO2 max= maximum oxygen uptake.