



RESEARCH ARTICLE

Evaluating the responsiveness of Hindi version of the International physical activity questionnaire-long form in healthy adults

Sukhada S. Prabhu*, and Anuprita M. Thakur

Abstract

International physical activity questionnaire-long form (IPAQ-LF) is a widely used tool for subjective assessment of physical activity. It has been translated, cross-culturally adapted into the Hindi language and tested for its reliability and validity. However, the Hindi version of this questionnaire is not evaluated for its responsiveness. The current study aims to evaluate the responsiveness of the Hindi version of the IPAQ-LF in healthy adults. The responsiveness was assessed in 60 healthy adults by administering a 6-week pedometer-based program and behavioral modification. Responsiveness statistics suggested that the Hindi version of IPAQ-LF was responsive to change based on internal responsiveness statistics. The values calculated for effect size I, effect size II (SRM) and effect size III were 0.223, 0.618, and 0.631, respectively, suggesting small to moderate effect size. Also, the MCID calculated in the current study for healthy individuals was 1425.06 MET-min/week. The study demonstrates that the Hindi version of IPAQ-LF is a responsive tool for assessing physical activity levels for Hindi-speaking population.

Keywords: Hindi, International physical activity questionnaire, Responsiveness, Physical activity, Psychometric.

Introduction

The recent review of the literature reveals that low level of mortality is directly associated with regular physical activity in adults and the elderly population.

A sedentary lifestyle and lack of physical activity can be considered to be accountable for 6 to 10% of the major non-communicable diseases and various lifestyle-related chronic diseases like diabetes, hypertension and cardiovascular diseases (Haskell WL *et al.*, 2007). Physical activity (PA) is defined as any activity involving bodily movement that produces energy expenditure greater than at rest (Lee IM *et al.*, 2012). The activities ranging from incidental daily

activities to structured exercise programs can be explained by this term (Caspersen CJ.,1985, and WHO 1985). At present, there are numerous objective and subjective methods available in the literature described for measuring physical activity levels. The self-reported subjective methods of physical activity assessment like physical activity diaries/logs, questionnaires; rely more on the information provided by an individual whereas the objective methods which include wearable monitors like accelerometers, pedometers, indirect calorimetry, heart rate monitoring and motion sensors, utilize the technology to measure and record the physical activity in real-time. However, the subjective methods are the most broadly adopted monitoring tools for physical activity assessment as they are cost-effective, quick, easy to administer, and generally accepted (Troost SG., 2014, and Dishman RK., 2001). Many self-reported physical activity questionnaires are available; though the International physical activity questionnaire (IPAQ) still remains an excellent and widely used questionnaire of choice. The IPAQ was formulated by an international consensus group in 1998 for the evaluation of physical activity levels in young to middle-aged adults ranging from 15 to 69 years of age. (Kim Y 2013; Hagstromer M 2006; Craig CL *et al.* 2003) It is a self-administered questionnaire that has acceptable validity and reliability when evaluating the levels and patterns of physical activity in healthy adults. There are two forms of

School of Physiotherapy, D.Y. Patil University, Mumbai, Maharashtra, India

***Corresponding Author:** Sukhada S. Prabhu, School of Physiotherapy, D.Y. Patil University, Mumbai, Maharashtra, India, E-Mail: sukhada.prabhu@dypatil.edu

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IPAQ – long form (LF) and short form with a reference period of either “the last seven days” or “the usual week” (Kim Y 2013; Hagstromer M 2006).

Cross-cultural adaptation means adapting the original questionnaire to the new settings so that the questionnaire is comprehensible and relevant to the current settings. (Craig CL *et al.* 2003) As the people of the world do not share a common language, culture, and lifestyle; it is beneficial and economical to adopt a particular questionnaire rather than developing a new one. The IPAQ-LF has been translated and cross-culturally adapted to the Hindi language using guidelines prescribed by the IPAQ core group and the World Health Organization (WHO). Also, the psychometric or clinometric properties evaluation of the questionnaire which includes testing the adapted questionnaire for its reliability and validity was already done. (Guyatt GH, 1993). Considering that the psychometric properties of responsiveness of the original questionnaire may or may not be retained in this adapted version, the Hindi version of IPAQ-LF was subjected for evaluation of this psychometric property, i.e., responsiveness.

Responsiveness is one of the major aspects of psychometric analysis. It has been defined as the ability of a questionnaire to detect clinically important changes over time, even if these changes are small. (Guyatt GH *et al.*, 1989). It is important for an assessment tool to detect change over time, as failure to do so can lead to type II errors. The most classical approach to measure responsiveness is to study the true improvement that occurred to the intervention in patients and then to calculate its effect size. (Guyatt GH *et al.*, 1993) Thus, the internal responsiveness statistics is computed using the t-test statistics to test the hypothesis that there is no change in the average response of the measure over the two-time points, or more formally $H_0 = 0$ (Husted *et al.* 2000).

The present study thus aimed to evaluate the responsiveness of the Hindi version of the IPAQ-LF in healthy adults.

Methodology

The study was approved by the Institutional Ethics Committee for Biomedical and Health Research (IEC Ref No. DYP/IECBH/2020/53). The sample size was estimated to 60 (at 95% of confidence interval). Out of the 60 participants, 41.66% were males and 58.33% were females within the age group of 20 to 69 years. There characteristics of the study population are portrayed in Table 1.

The participants were selected randomly based on the chit method in which each participant was randomly assigned to a tailor-made program. Participants who were able to move independently, willing to participate in the study and were well versed in the Hindi language were included in the study, whereas individuals with severe chronic diseases likely to hinder physical activities,

individuals diagnosed with psychiatry or cognitive diseases, individuals undergone recent surgery were excluded from the study. The informed consent was taken from included participants for study participation and confidentiality of the data was ensured.

The Hindi version of IPAQ-LF was administered to the participant in order to obtain baseline values of total PA.

Pedometer-based Program

An individualized tailor-made pedometer-based program was given to individuals for 6 weeks. A target achievable goal was given based on the average number of steps walked per week. For instance, if the participant walked 6000 steps/weekly, he was given an attainable goal of 6500 to 7000 steps/weekly for the following week. To achieve this, a participant was subjected to a new target every following week. This was continued for six weeks. The duration of 6 weeks for intervention was used in the current study as the duration of a minimum 4 to 6 weeks is recommended to exhibit some change in physical activity. Physical activity promotion counseling was done by the researcher through face-to-face communication and via a telephonic conversation on day 1 followed by every week. In the counseling, the individuals were made aware of the importance of being physically active. They were explained about the risks of physical inactivity or a sedentary lifestyle. Participants were instructed to improve the time spent in pre-existing moderate or vigorous physical activity in minimum intervals of 5 to 10 minutes per week and to reduce the time spent in sitting on weekends or weekdays. They were motivated to make some extra efforts to improve the weekly time spent in gymnasiums, on exercising, doing yoga, walking, jogging, dancing and playing sports or simply increasing the daily step count.

Lifestyle Modifications

Like replacing elevators or escalators with staircases, using active modes of transportation, walking up to the minimum required distance to buy vegetables or groceries, engaging in any regular PA of choice (brisk walking, jogging, running, playing sports, perusing hobby) were explained to all the participants. A certain number of participants who were housemakers and not going to gymnasiums etc

Table 1: Characteristics of study population for responsiveness

Characteristics	Mean \pm SD ^a
Age	38.42 \pm 14.21 years
Height	156.97 \pm 8.38 cms
Weight	65.54 \pm 10.79 kgs
BMI	25.79 \pm 4.32 kg/m ²
Baseline total PA values (Pre)	5309.5 \pm 4302.8 MET-mins/week
Post Intervention total PA values	6269.1 \pm 4544.5 MET-mins/week

Notes: ^aSD= Standard Deviation

were advised to enhance time spent in moderate physical activities like cleaning, mopping and sweeping indoors as well as outdoors, cooking for family, taking care of laundry, etc. They were also advised to pursue their hobby in their day-to-day life which would keep them active and to avoid afternoon nap. The work-from-home participants were instructed to take about five to ten rounds covering the entire house every two hours and certain chair exercises were incorporated for them. They were instructed to walk or spot march while attending any phone calls with their clients. The Hindi version of IPAQ-LF was administered again after 6 weeks for post-intervention values.

Results

The data obtained was analyzed for responsiveness using paired T-test and effect size. All the statistical analysis was performed by using IBM SPSS version 23 software (IBM Corp., Armonk, NY, USA).

Responsiveness

Paired t-test

The paired t-test statistic was used to analyze the baseline and post-intervention data originating from a one-group repeated measures design. (Liang MH *et al.*, 1985; Deyo RA., 1991)

The t value obtained in this study was 4.788 which concluded that a statistically significant change in the measure has occurred over time. Also, a value of t greater than 1.96 indicates that the data provide evidence to reject the null hypothesis and accept the alternate hypothesis that there is a change in average pre and post-responses measured over two-time frames. On this basis, the questionnaire is considered to be responsive (Deyo RA., 1991) (Table 2).

Effect size I

Cohen was the first to propose effect size statistics (Cohen J. 1977). This effect size provides direct information on the magnitude of change in the measure, expressed in terms of some measure of variation. It is represented by:

$$ESI = \frac{Dx}{SD(X)}$$

This effect size is calculated as the difference between the mean baseline scores and follow-up scores on the measure (Dx), divided by the standard deviation of baseline scores (Beaton DE., 1997; Fitzpatrick R *et al.*, 1993). A value of 0.20 or less represents a change of approximately one-fifth of the baseline standard deviation and is considered small. A value of 0.50 reflects a change of at least one-half the baseline standard deviation and is considered moderate, whereas a value of 0.80 or greater represents a change of at least four-fifths of the baseline standard deviation and is viewed as large (Husted *et al.* 2000). Thus, a measure with high level

Table 2: Responsiveness statistics for the Hindi version of IPAQ-LF.

	Paired t-test	4.788
Internal Responsiveness	Effect size I	0.223 (small effect size)
	Effect size II	0.618 (moderate effect size)
	Effect size III	0.631 (moderate effect size)

of variability at baseline in relation to mean change score will have small effect size. (Husted *et al.* 2000). In the current study a value of ESI obtained was 0.223, representing a small change, justifying that the tool is responsive enough to detect change over time, even if this change is small (Table 2).

Effect size II: Standardized response mean (SRM)

The standardized response mean (SRM) is referred to as a responsiveness-treatment coefficient (RT) or an efficiency index (Norman GR., 1997). It is a ratio of observed change and the standard deviation reflecting the variability of the change scores. Values of 0.20, 0.50, and 0.80 or greater have been proposed to represent small, moderate and large responsiveness, respectively (Liang MH., 1985; Deyo RA., 1991). The SRM value computed in the present study was 0.618 demonstrating a moderate effect size. This justifies that there was a moderate level of variability in change scores in relation to mean change. This suggests that the tool is responsive to detect moderate change over time.

Effect size III

It is defined as the ratio of minimal clinically important change (MCID) and mean squared error (MSEx) (Guyatt G, Walter S & Norman G., 1987). MCID reflects the magnitude of change in measure whereas, MSEx is the standard deviation of the individual change score. MCID was estimated by the average change score among those participants rating some improvement in total physical activity levels minus the average change score among those patients rating no change in physical activity (Stucki G 1995). MCID calculated in the current study for healthy individuals was 1425.06 MET-mins/week. This suggests that for a healthy individual to show an improvement in physical activity assessment done using the Hindi version of IPAQ-LF, a difference of 1425.06 MET-mins/week should be observed from the baseline score to the final score. Considering this calculated MCID value, a moderate effect size of 0.631 was obtained for the present study.

Thus, the overall responsiveness statistics for the present study demonstrate that the Hindi version of IPAQ-LF has shown moderate responsiveness.

Discussion

To our knowledge, this is the first study to evaluate the responsiveness of the Hindi version of IPAQ-LF. The methods used to evaluate the internal responsiveness (by paired t-test and effect size statistics) were recommended by Husted *et*

al. and have been extensively used in various studies. (Choi EP., 2015 ; Hon J *et al.*, 2010; Tveita E.K., 2008) Effect size is a quantitative measure of the magnitude of the experimental effect; the larger the effect size the stronger the relation between two variables (Husted *et al.*, 2000). The effect size can be calculated by using the baseline standard deviation, by using the pooled standard deviation or by SRM analysis. SRM is an appropriate index to assess responsiveness as it is used to gauge the responsiveness of scales to clinical change and it also reflects variability in the change of interest (A.K. Yoosefinejad., 2019). In the analysis of the present study, it was observed that the Hindi version of IPAQ-LF had a moderate effect size as these values were in the moderate range for score change, suggesting a moderate degree of responsiveness for the Hindi version of IPAQ-LF. The statistics of the current study indicate that the Hindi version of IPAQ-LF has moderate power to detect the changes that occurred after six weeks of intervention in the group of healthy adults.

Also, the benchmark values of effect size statistics used for investigating ESI, ESII and ESIII suggested the moderate responsiveness of this Hindi version of IPAQ-LF (Liang MH., 1990; Garratt AM., 1994). The paired t-test used, showed a statistically significant difference of observed change in measure. This clearly suggested the acceptance of the alternate hypothesis that there was a change in the average response on the measure over two time points, thus advocating the questionnaire to be responsive.

The present study results do not go in accordance with a study conducted by Smith *et al.*, which examined the responsiveness of IPAQ-SF in patients with osteoarthritis and found poor responsiveness with ES of -0.14 and SRM of -0.21 (R.D. Smith *et al.*, 2020). The poor responsiveness in a study conducted by Smith *et al.* can be attributed to the lesser number of subdomains in IPAQ-SF as compared to IPAQ-LF. In addition to effect size statistics, MCID was also estimated to be 1425.06 MET-mins/week for the total physical activity scores assessed by Hindi IPAQ-LF on apparently healthy individuals. The difference between pre-and post-treatment values for healthy individuals should be higher than this MCID value to show true changes in the individual's status to call them as improved in PA levels (A.K. Yoosefinejad., 2019).

In conclusion, the Hindi version of IPAQ-LF demonstrated an acceptable responsiveness for assessing physical activity levels for Hindi-speaking population. This adapted questionnaire can be used to assess physical activity in healthy individuals as a prognostic or diagnostic tool. However, more studies are warranted in the future to assess its responsiveness compared to a gold-standard criterion measure and in various conditions.

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