Reliability and Validity of Sedentary Behavior Questionnaire in Turkish Population: Evaluation of Psychometric Properties

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Abstract

Background: Inactivity and sedentary lifestyle are a well-known risk factors for health effects. Many questionnaires evaluate physical activity (PA) level; however, the evaluation of sedentary behavior needs more attention. Sedentary behavior questionnaire (SBQ) is a reliable, valid, and easy-to-administer tool. The current study aimed at cross-culturally adapting and assessing the reliability and validity of the Turkish version of SBQ.

Methods: SBQ consists of 9 items related to sedentary lifestyle both on weekdays and weekends. SBQ was administrated to 235 participants with the attrition rate of 24%, followed by a repeated administration after 7 days to assess its reliability. Criterion-related validity was analyzed with the international physical activity questionnaire-short form (IPAQ-SF) within the construct validity of the SBQ. Test-retest reliability was assessed by the intraclass correlation coefficient (ICC), while the Spearman rho was used for criterion-related validity.

Results: The ICC scores for each parameter ranged from 0.388 to 0.771. The obtained results showed moderate to good test-retest reliability. The validity results of SBQ somewhat violated the standards, which are generally accepted. Items of SBQ "watching TV (including videos on VCD/DVD)", "sitting and talking on the phone or being busy on the phone", and "doing paperwork or computer work (office work, e-mails, paying bills, etc.)" correlated significantly with body mass index (BMI) (r = -0.138 to 0.247, P < 0.05).

Conclusions: The SBQ had good reliability and acceptable validity to assess sedentary behaviors in a Turkish population.

Keywords: Body Mass Index, Physical Activity, Surveys and Questionnaires, Sedentary Lifestyle

1. Background

Physical inactivity is a major widespread problem related to public health due to technological advances and industrialization (1). Physical inactivity, or in other words sedentary behavior, is described where energy expenditure is ≤ 1.5 MET (metabolic equivalent), while an individual being awake, sitting, or lying (2). Sedentary lifestyle is accepted as a major risk factor for some chronic diseases, however, participation in a regular physical activity is well known as a key strategy to prevent some chronic convictions such as diabetes (3). It was indicated that the economic burden of physical inactivity is above 1 billion pound in the United Kingdom according to the National Health Service (4). Physical inactivity is responsible for 6% of cardiovascular diseases, 7% of type 2 diabetes mellitus, 10% of breast cancers, and 10% of bowel cancers, which all contribute to 9% of premature deaths (5).

According to the world health organization (WHO), it is estimated that approximately 60% of world population spend their daily hours mostly at work (6). Sitting at work is accepted as being sedentary since energy expenditure is generally < 1.5 MET. It was reported that sitting at working time for 2 hours per day increases the risk of obesity by 5%, while this rate is 7% for diabetes (7, 8). Evidence suggests that regular physical activity (PA), in addition to psychological and cognitive benefits, can increase the survival rate by limiting the development and progression of chronic diseases (9). According to the WHO, PA affects the psychological and physical health of the entire life span (10). Since improving PA level is of great importance to prevent chronic diseases and loss of time and sources, it is indisputable to determine sedentary lifestyle habits and PA level of population.

Assessing the PA level can vary. Basically, objective assessment tools such as accelerometers are used to determine PA level (11), yet they cannot show sedentary lifestyle due to inadequate sensitivity for standing and sitting. A questionnaire-based evaluation of PA is the most common and preferred method to assess PA level (12). In the litera-

ture, above 80 questionnaires were employed to assess PA; nevertheless, the ones that directly assessed the PA level did not give enough information about sedentary behavior (10).

Assessing sedentary behavior is an important factor related to tracking changes in public health interventions. In this manner, sedentary behavior is focused especially on behaviors, commonly associated with sedentarism, such as television watching, leisure time, etc. However, tools assessing sedentary behaviors should focus on television time as well as other habits (13). Sedentary behavior questionnaire (SBQ) is a valid, reliable, and easy-to-use questionnaire that can show a general image of sedentary behavior both on weekdays and weekends; not only including sitting time, but also other habits related to inactivity such as sitting, playing or talking on the phone, which are frequent on such days due to the role of smartphones in humans' lives, were also included in SBQ. To the authors' best knowledge, there was no Turkish questionnaire regarding the sedentary behavior measurement. Thus, the current study aimed at providing the Turkish version of SBQ with acceptable validity and reliability in order to directly assess the sedentary lifestyle habits along with simple administration features.

2. Methods

The present methodological study aimed at providing the Turkish version of SBQ with acceptable validity and reliability. For this purpose, office clerks, the administrative and academic staff of Abant Izzet Baysal University, were included in the study after signing the informed consent. Since the study was part of a project to evaluate physical activity and sedentary behavior among office clerks, the sample mostly included both office and university staff. Inclusion criteria were: voluntarily participation, ability to read and write Turkish, working at least 6 months in an office environment, and age above 18 years. Exclusion criteria were: having active infections or chronic diseases such as heart failure, doing regular exercises, using pacemaker, or having mental and/or cognitive disorders. The study protocol was approved by Abant Izzet Baysal University ethics committee for Human Researches in Social Sciences (code: 2015/40).

Demographic questionnaire containing sociodemographic information such as age, gender, height, weight, marital status, working hours, alcohol consumption and smoking habits, and hobbies was administered to the participants along with SBQ and international physical activity questionnaire-short form (IPAQ-SF).

IPAQ-SF was administered to determine the level of physical activity in participants. The questionnaire contains a total of 7 items, which question the type and duration of the physical activity during the last week. For each item, the total score of the questionnaire is calculated by multiplying each activity by how long the individual has done that type of activity. The questionnaire shows the level of activity in terms of MET*minute/week. The 7th question of IPAQ-SF and its total score were used in statistical analysis of the current study since this question investigates the sedentary behavior time. The sitting time of IPAQ was used to support reliability and validity of the study (14). The reliability and validity of the Turkish version of IPAQ was evaluated in 2010 (15).

Sedentary behaviors of the participants were assessed by SBQ. The questionnaire includes items such as watching TV, playing computer or video games, sitting and listening to music on a radio, tapes, or CDs, sitting and talking on the phone, doing paperwork or computer work, sitting and reading a book or magazine, playing a musical instrument, doing artwork or craft, sitting and driving a car or bus or train both on typical weekdays and weekends. The items are answered by selecting 1 of the following options: "none", "15 minutes or less", "30 minutes", "1 hour", "2 hours", "3 hours", "4 hours", "5 hours", "6 hours or more". Total SBQ score can be calculated in a few ways such as calculating total sedentary score, screen time score, and examining specific items. The total score can be measured by summing the scores using a 10-option Likert scale from 0 = none to 9 = 6 hours or more.

Before applying SBQ, the original version was translated into Turkish. The translation protocol previously established by Beaton et al., (16) was used. The first step in adaptation was the forward translation done by 2 bilingual translators who were Turkish native speakers and accordingly, 2 independent versions were provided. One of the translators was aware of the concepts being examined in the questionnaire, while the other was not. The translated versions were discussed in a meeting with 2 translators and the authors. After working on the original questionnaire as well as the first (T1) and the second translated (T2) versions, a primary version was provided (introduced as T-1-2). By working on the T-1-2 version of the questionnaire, while totally blind to the original version, the provided questionnaire was retranslated back into the original language. Then, by authors' consensus a pre-final version was developed. Pilot testing of pre-final version was performed on 30 participants. Each participant completed the questionnaire, then interviewed about what he/she thought and understood about each question as well as the selected response. The meaning of questions and responses were explored. According to the results of the pilot study, a few changes were made in order to integrate cultural adaptation. The first item was changed to "watching television

(including videos on VCD / DVD)" because of dramatical decrease in the use of VCRs today. In the 4th item, "sitting and talking on the phone" was changed to "sitting and talking on the phone or being busy on the phone" due to the widespread use of smartphones today. In the 8th item, "doing artwork or crafts" was changed to "doing handicraft or handiworks", as the changes could improve understanding of the concept. The pre-final questionnaire was applied to evaluate its applicability and understandability on 10 participants. According to the pilot test results, participants declared that the final questionnaire was easy to understand. Thus, the final version of the SBQ was created. For the reliability evaluations, SBQ was re-administered 7 days after the initial application, while IPAQ-SF was administered only once to assess validity.

Descriptive analysis was used to measure mean and standard deviation (SD) of the demographic variables. The Kolmogorov-Smirnov and the Shapiro-Wilk tests were used to evaluate the distribution of data. Internal consistency (IC) was assessed by Cronbach's alpha coefficient among items. The test-retest reliability of each item was assessed with intraclass correlation coefficient (ICC). The Pearson correlation analysis was used to evaluate correlation between the total scores of SBQ and IPAQ-SF in order to investigate the validity of SBQ. The P < 0.05 was considered as the level of significance. Correlation coefficient power was categorized as poor (P < 0.40), fair to good (P = 0.40 - 0.75), and excellent (P > 0.75) [17]. A correlation coefficient of 0 indicates no reliability, whereas a value of 1 indicates excellent reliability. The correlation coefficient was used for the criteria of poor (r < 0 - 0.20), fair (r = 0.21 - 0.40), moderate (r = 0.41 - 0.60), good (r = 0.61 - 0.80), and excellent (r > 0.81 to 1) [18]. The data were analyzed with SPSS version 20.0 (IBM Corporation, New York, USA).

3. Results

A total of 315 office clerks were called for participation in the study, of which 80 individuals refused to participate in the study, 23 stated that they are very busy, 38 said that they did not have enough time, and the rest of them did not answer. Thus, the study was started with a total of 235 participants (135 females and 100 males). Demographic characteristics of participants are shown in Table 1.

Table 2 shows ICC values of SBQ parameters during weekdays and weekends. On weekdays and weekends, all parameters showed a correlation value from moderate to excellent (weekdays: 0.40 - 0.72, weekends: 0.38 - 0.77). IC of the SBQ on weekdays ranged from 0.408 (playing a musical instrument) to 0.705 (doing handicraft or handiworks). The IC of the weekends ranged from 0.388 (doing hand-

icraft or handiworks) to 0.771 (sitting reading a book or magazine) (Table 2).

The test-retest correlations for the weekdays ranged from 0.477 in the 7th item (playing a musical instrument), to 0.719 in the 6th item (doing handicraft or handiworks). The test-retest correlations for the weekends ranged from 0.579 in the 5th item (doing paperwork or computer work including office work, e-mails, paying bills, etc.) to 0.764 in the 6th item (sitting reading a book or magazine) (Table 2).

Results of criterion validity analysis showed that the 7th item of IPAQ-SF "during the last 7 days, how much time did you usually spend sitting on weekdays?" and IPAQ-SF total score were used to analyze the criterion validity. The question No. 7 of IPAQ-SF significantly correlated with the 4th (sitting and talking on the phone or being busy on the phone) and the 5th (doing paperwork or computer work including office work, e-mails, paying bills etc.) items of SBQ on weekdays (r = 0.237, P = 0.001; r = 0.279, P < 0.001). During the weekend, the 4th and 9th (sitting and driving in a car, bus, or train) items of SBQ correlated significantly with the 7th question of IPAQ-SF (r = 0.174, P = 0.018; r = -0.168, P = 0.022); while in the IPAQ-SF total score, the 7th item of SBQ (playing a musical instrument) correlated significantly with IPAQ-SF total score both on weekdays and weekends (r = 0.144, P = 0.045; r = 0.175, P = 0.014, respectively). The 9th item of SBQ (sitting and driving in a car, bus, or train) significantly correlated with the IPAQ-SF total score during the weekend (r = 0.163, P = 0.022). The results of criterion validity analysis are shown in Table 3.

Results of the study indicated a significant correlation between the following items of SBQ and body mass index (BMI): "watching TV (including videos on VCD/DVD)" (r = 0.247, P < 0.001), "sitting and talking on the phone or being busy on the phone" (r = -0.130, P = 0.047) and "doing paperwork or computer work (office work, e-mails, paying bills, etc.)" (r = -0.138, P = 0.034).

4. Discussion

The current study showed that the Turkish version of SBQ is a reliable tool to assess sedentary lifestyle among the studied population. Although the results of the study showed that validity of SBQ somewhat violated the standards, it was generally accepted. However, in the original version of SBQ, there was no significant correlation among the results of criterion validity analysis in males, while there was a significant correlation between TV time, office work, playing a musical instrument, weekend scores of SBQ, and overweight in female subjects [13]. Poor convergent validity was also found in another SBQ study [19].

Healy et al., [20] reported that measurements used to assess validity cannot be accepted as a gold standard

Table 1. Demographic Characteristics of Participants (N = 235)

Variables	Mean ± SD	Minimum	Maximum
Age, y	35.40 ± 7.96	19	57
Height, cm	167.33 ± 7.95	148	192
Weight, kg	67.81 ± 14.37	42	117
BMI, kg/m^2	24.07 ± 3.94	16.8	39.5
Office working experience, y	10.01 ± 7.99	0.5	32

Table 2. Reliability and Validity of the Sedentary Behavior Questionnaire (SBQ)[a]

SBQ Item	ICC (95% CI)		The Spearman rho (95% CI)	
	Weekdays	Weekends	Weekdays	Weekends
1- Watching TV (including videos on VCD/DVD)	0.617 (0.531 - 0.690)	0.663 (0.585 - 0.729)	0.622 (0.537 - 0.694)	0.692 (0.619 - 0.753)
2- Playing computer or videogames	0.705 (0.634 - 0.764)	0.717 (0.648 - 0.774)	0.702 (0.631 - 0.761)	0.705 (0.635 - 0.764)
3- Sitting listening to music on the radio, tapes, or CDs	0.520 (0.420 - 0.608)	0.639 (0.557 - 0.709)	0.655 (0.576 - 0.622)	0.728 (0.662 - 0.783)
4- Sitting and talking on the phone or being busy on the phone	0.579 (0.488 - 0.658)	0.607 (0.519 - 0.682)	0.566 (0.473 - 0.647)	0.622 (0.537 - 0.694)
5- Doing paperwork or computer work	0.609 (0.521 - 0.683)	0.529 (0.431 - 0.615)	0.620 (0.535 - 0.692)	0.579 (0.488 - 0.658)
6- Sitting reading a book or magazine	0.683 (0.609 - 0.746)	0.771 (0.714 - 0.818)	0.706 (0.636 - 0.764)	0.764 (0.705 - 0.812)
7- Playing a musical instrument	0.408 (0.296 - 0.509)	0.388 (0.274 - 0.492)	0.477 (0.372 - 0.570)	0.608 (0.521 - 0.682)
8- Doing handicraft or handiworks	0.729 (0.663 - 0.784)	0.617 (0.531 - 0.690)	0.719 (0.651 - 0.775)	0.716 (0.648 - 0.773)
9- Sitting and driving in a car, bus, or train.	0.585 (0.494 - 0.663)	0.722 (0.654 - 0.778)	0.585 (0.495 - 0.663)	0.748 (0.686 - 0.799)

Abbreviations: 95% CI, 95% Confidence Interval; ICC, Intraclass Correlation Coefficient.
[a] The Spearman rho correlation values are shown without minus sign in order to enhance readability

Table 3. Criterion Validity Results between International Physical Activity Questionnaire-short form (IPAQ-SF) the 7th Question and Sedentary Behavior Questionnaire (SBQ)

SBQ	IPAQ-SF the 7th Question		IPAQ-SF Total	
	r (P value)	r (P value)	r (P value)	r (P value)
	Weekdays	Weekends	Weekdays	Weekends
1- Watching TV (including videos on VCD/DVD)	0.107 (0.147)	-0.028 (0.699)	-0.026 (0.715)	-0.083 (0.246)
2- Playing computer or videogames	0.019 (0.797)	0.012 (0.876)	0.019 (0.796)	0.106 (0.141)
3- Sitting listening to music on the radio, tapes, or CDs	0.067 (0.364)	0.031 (0.678)	0.087 (0.228)	0.003 (0.965)
4- Sitting and talking on the phone or being busy on the phone	0.237 (0.001)	0.174 (0.018)	-0.020 (0.784)	0.012 (0.869)
5- Doing paperwork or computer work	0.279 (0.001)	0.013 (0.864)	-0.083 (0.251)	0.082 (0.255)
6- Sitting reading a book or magazine	0.070 (0.346)	-0.022 (0.764)	0.029 (0.692)	0.047 (0.518)
7- Playing a musical instrument	0.085 (0.250)	0.069 (0.351)	0.144 (0.045)	0.175 (0.014)
8- Doing handicraft or handiworks	0.047 (0.522)	0.078 (0.288)	0.026 (0.718)	0.042 (0.556)
9- Sitting and driving in a car, bus, or train.	0.038 (0.610)	-0.168 (0.022)	< 0.001 (0.993)	0.163 (0.022)

due to errors and biases. Fowles et al., ([21]) reported that accelerometers cannot distinguish standing and sitting; hence, sedentary behavior is overestimated. In contrast, questionnaires assessing the physical activity are quite useful due to their cost-efficacy and ease of use; nonetheless, physical activity levels measured by the questionnaire are generally overreported ([1]). Poor validity results of different studies might be explained by such reports. According to the current study results, the Turkish version of SBQ has ICCs (ranged from 0.40 to 0.72); hence, the re-

sults had good reliability within the acceptable range compared with those of other studies ([5]). In the original version, ICC ranged from 0.64 to 0.90 on weekdays and 0.51 to 0.93 on weekends. In a Spanish SBQ adaptation study, ICC ranged from 0.07 to 0.96. The main factors attributing to the variances among reported ICCs were the sample characteristics and cultural differences between the studies. The original version was administered to adults with overweight, the Spanish adaptation was performed on patients with fibromyalgia, while the current study included only healthy adults. Authors stated that low test-retest reliability of the items "playing a musical instrument" or "listening to music" might have restricted the range ([19]). Compatible with this problem, the lowest ICC value belonged to "playing a musical instrument". In addition, behaviors on a regular basis or prolonged time had stronger reliability coefficients compared with the behaviors not done on a regular basis ([20]). Recall effect was debated upon this outcome and was accepted as the main effect ([19]).

Raask et al., ([12]) used IPAQ-SF due to its repeatability and compatibility with accelerometer regarding moderate to vigorous activities. Thus, IPAQ-SF was used since Rosenberg et al. ([13]), the developers of SBQ, and Raask et al. ([12]), used IPAQ and IPAQ-SF for the same purpose. Thus, IPAQ-SF was employed in the current study. According to the criterion-related validity of the current study results, there was a poor correlation between IPAQ-SF and the Turkish version of SBQ. Rosenberg et al., ([13]) found significant correlations between IPAQ sitting time and the items of SBQ (TV, listening to music, office work, driving in a car) both on weekdays and weekends, while the current study found poor but significant correlations between "sitting and talking on the phone or being busy on the phone" item and those of SBQ in both periods. There was a significant correlation between "doing paperwork or computer work (office work, e-mails, paying bills, etc.)" on weekdays and IPAQ sitting time item due to the current study sample size mostly including office clerks. There are a few reasons to explain the differences associated with poor or insignificant results. The lack of an accelerometer or a questionnaire specific to sedentary behavior might be the factor affecting these results. Also, recall effect might influence the lower correlation results.

Concurrent validity analysis with BMI was measured in the original work. In the original version of the questionnaire, BMI was significantly correlated with TV time ([13]). In the current study, "watching TV (including videos on VCD/DVD)", "sitting and talking on the phone or being busy on the phone" and "doing paperwork or computer work (office work, e-mails, paying bills, etc.)" items correlated significantly with BMI (data not shown). These might be the expected results since watching TV is a widespread

habit, especially on weekdays. In addition, the current study sample size mostly comprised of office clerks, which their jobs frequently attributed to "doing paperwork or computer work". On the other hand, the mean BMI of the current study participants (24.07 kg/m^2) was lower than that of the original version (32.4 kg/m^2), indicating that SBQ can be used safely in adults with overweight and obesity. This can explain the difference regarding the superior reliability coefficient (r = 0.44 vs. r = 0.247) between the outcomes of the original version and those of the Turkish version of the questionnaire.

Measures of sedentary time, analyzed with an accelerometer and accepted as the gold standard to measure physical activity level, had low to moderate intercorrelations. Authors also believed that the SBQ might over- or underestimate sedentary time compared with the values taken by the accelerometer ([22], [23]). Nevertheless, SBQ can show a general image of sedentary behavior in different populations based on its different advantages such as eas-of-use and cost-effectiveness. It is an important factor when considered in low-income countries.

4.1. Limitations

The main limitation of the current study was the lack of an accelerometer or other devices to objectively measure physical activity. It would be more accurate to detect physical activity, in addition, compare self-reported and objectively measured physical activity as a secondary outcome of the study. In addition, conducting the work in a single center might be the factor, which decreased the generalizability of the results. The authors recommend further studies using accelerometer and/or specific tools in order to investigate sedentary behavior with higher validity.

4.2. Conclusion

Self-reported physical activity questionnaires allow one to measure his/her physical activity or inactivity. Easy-to-apply and cost-effective questionnaires can be used in low-income countries. The Turkish version of SBQ is a reliable tool to directly investigate physical inactivity. SBQ can be easily applied to people where their educational status is low; since it is simple and easy to understand.

Footnotes

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