



Original Article

Preliminary reliability of the five item physical activity questionnaire

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Abstract. [Purpose] The purpose of this study was to design a physical activity questionnaire reflecting on the basic principles and recommendations of exercise and to examine its reliability. [Subjects and Methods] 342 males and 374 females from the community centers (senior center, residential culture center, sport center, and YWCA center) participated in this study. [Results] The test-retest reliability of the physical activity questionnaire, measured with an interval of three months, being between 0.61 and 0.91 signifies that the questionnaire was useful instrument for assessing physical activity levels. [Conclusion] This study found that the simple physical activity questionnaire containing the frequency, duration, intensity, overall length, and type of activities that the person performed during their leisure time was reliable.

Key words: Measurement, Physical activity, Questionnaire

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INTRODUCTION

Health is considered the most important thing in our lives. There are several ways to keep our health in its best condition. One of them is doing exercise and to burn calories and to stay fit. In an extensive review, regular physical activity increase exercising capacity and overall physical fitness, which results in increased health benefits^{1, 2)}. The increasing use of physical activity for health emphasizes the importance of performing activity regularly. Research on peoples' health and effects of physical activity over the past 50 years has lead to the development of the principle idea for recommending physical activities for people to perform regularly to maintain good health³⁾. The results are used in the forming of physical activity recommendations.

In Korea, there are some guidelines regarding how someone should exercise to improve their health. It is recommended that Korean adults should complete at least 30 minutes of at least moderate activity on three or more days a week⁴⁾. With regards to the recommendations for increased physical activity participation or exercise to receive additional health benefits, one of the issues discussed regarding physical activity participation is assessing patterns and levels of physical activity. Therefore, the measurement of physical activity participation has become an interesting and important topic of study⁵⁻⁸⁾.

There are several assessments for measuring physical activity participation and fitness, ranging from questionnaires to laboratory tests. These measurements can be classified into objective methods and subjective methods. According to researchers⁹⁾, objective physical activity measurements that use direct and indirect calorimetries energy expenditures include measurement of heat production, measurement of oxygen consumption and carbon dioxide production, pedometers, and accelerometers. The subjective methods are questionnaires and activity diaries that have been used to measure physical activity participation. The most widely and easily applicable to large population of South Korea for measuring physical activity participation would be the International Physical Activity Questionnaire (IPAQ), Godin Leisure-Time Exercise Questionnaire, Minnesota Leisure-Time Physical Activity Questionnaire, Modifiable Activity Questionnaire, and 7-day recall.

There are numerous questionnaires that have been proposed in an attempt to measure not only the total energy expenditure

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but also to assess habitual physical activity during leisure time. It is generally considered that they are used in physical activity assessments in epidemiology because they are easily applied to assess large scale populations¹⁰⁻¹². But, these physical activity questionnaires do not satisfy the physical activity recommendations that use frequency, duration, intensity, and type of physical activity.

It is challenging for researchers to measure accurately one's daily physical activity participation because physical activity assessments that have been used in previous studies have both strengths and limitations in the techniques particularly seen in larger epidemiological studies. Furthermore, because much of the literature concerning physical activity questionnaires is based on guidelines for exercise or physical activity⁶⁻⁸), quantification of intensity, frequency, and the duration of physical activity that is performed is needed. In addition, the scarcity of a questionnaire based on the basic principles of intensity, frequency, duration, type, and overall length for physical activity or exercise requires researchers to develop more accurate questionnaire.

Therefore, the purpose of this study was to design a physical activity questionnaire reflecting the basic principle and recommendations of exercise and to estimate its reliability and validity.

SUBJECTS AND METHODS

The assessment of reliability and validity of physical activity index was obtained from four samples, collected at different times and locations. The author used a probability sampling technique to select representative samples. The four samples included South Korean adults aged over 20 who were currently participating in recreational activities provided by the community centers (senior center, residential culture center, sport center, and YWCA center) in Gyeongsan, South Korea. These centers provide recreational activity programs for the residents. Of 800 samples selected by a simple random sampling, a total of 716 were returned. Out of this number, 342 (47.8%) were males while 374 (52.2%) were females. Participants ranged in age from 12 to 95 years ($M=42.4$ for the community sport center, 66.5 for the senior center, 38.8 for the residential culture center, and 44.2 for the YWCA).

The 5-item physical activity questionnaire was developed based on Cho's study¹³) and Baecke, Burema, & Frijters's study¹⁴). From 8 original items, three were discarded from testing based on high semantic similarity. These items consisted of type, frequency, intensity, duration, overall length of physical activity during their leisure time.

The first question was to discover the different types of physical activities that the adults were participating in during their leisure time. An expert panel in the field of sports & leisure and recreation was invited to classify the activities into five different types of physical activities. The categorizations of physical activities were aerobic exercise & sports (walking, biking, jogging, swimming, aerobics, basketball, softball, soccer, golf, table tennis, badminton, football, etc), flexibility exercises (stretching, yoga, Pilates, calisthenics, etc), muscular exercises (weight training, free weight training), arts & cultural activities (reading, writing, playing cards, dance & music, painting, etc), and sedentary activities (spectator sports, movies, television, etc). All responses to the types of physical activity were coded on five-point scales (5 = performing all types of cardiovascular exercise, resistance exercise & flexibility exercise; 4 = performing two types of physical activity among cardiovascular exercise, resistance exercise & flexibility exercise; 3 = performing one type of physical activity among them; 2 = performing arts & crafts; 1 = sedentary activity).

The second question was "during a week, how often do you participate in the activity in your free time?" The frequency of physical activity was categorized as "almost every day", "4-5 days/week", "3 days/week", "1-2 days/week", and "sometimes".

The third question was "how intensely do you participate in the activity?" The intensity of leisure participation was categorized as "very hard", "hard", "moderate", "light", and "very light".

The fourth question was "how long do you do the activity in your free time?" The duration of physical activity participation was categorized as "less than 30 minutes", "30-60 minutes", "60-90 minutes", "90-120 minutes", and "more than 150 minutes".

The fifth question was "how monthly have you been performing the activity?" The overall length of activity participation was less than 1 month, 2 months, 3 months, 4 months, and more than 5 months.

Physical activity questionnaire is based on respondents' answers to the questions related to the type of physical activity, frequency, intensity, duration, and overall length of their participation in the physical activity. For each item, a 5-point Likert-type response format was used with values ranging from 1 to 5.

To determine the physical activity level, it requires several steps. Firstly, it is necessary to obtain a score from adding their responses on the different types of physical activities, frequency, intensity, duration, and overall length of physical activity. Secondly, this was calculated by multiplying sum scores to the scaled score for the type of physical activity that the person performed. The maximum and minimum scores were "100" and "4, respectively. Thirdly, the author divided the physical activity index into five categories; "very high level", "high level", "acceptable level", "low active level", and "inactive level". The specific cut-offs used for classification of physical activity index were "very high level (>96)", "high level (95-64)", "acceptable (63-36)", "low level (35-16)", and "inactive level (15-4)". Higher scores indicated higher activity levels during their leisure time.

After obtaining an ethical clearance by the authentic ethical committee of Daegu University, copies of the survey question-

Table 1. Samples' locations and alpha reliabilities

Sample	Location	Alpha	Mean
Community sample	Public sport center	0.63	2.93
Residential culture sample	Culture center	0.61	2.68
YWCA sample	Town community center	0.78	3.70
Senior sample	Senior center	0.62	3.14

Table 2. Stability coefficients for the habitual physical activity questionnaire

Sample	Location	Alpha	Time lag
Community sample (N=95)	Public sport center	0.66	3 months
Residential culture sample (158)	Culture center	0.61	2 months
Senior center sample (N=129)	Town community center	0.91	1 month

naires were distributed to each of the 200 participants in community centers from the four different centers in Gyeongsan, South Korea. The written consent forms and questionnaires were distributed to participants by the researcher. The participants were informed that participation in the study was voluntary and they were free to withdraw from the study at any time. Respondents completed the questionnaire in a variety of settings such as part of a group-administered questionnaire or individually in a class room setting. At retesting, 334 respondents were unavailable owing to a change in shift pattern or the completion of activity classes in the survey period, the second questionnaire was administered to 382 respondents.

Data for frequency, intensity, exercise time, overall length and types of exercise and physical activity during leisure time were collected. Principal components analysis with varimax was used to find meaningful dimension of the five item physical activity questionnaire. Product-moment correlation coefficients was calculated in order to study the test-retest reliability.

RESULTS

Table 1 shows each of the samples, their locations, and alpha reliabilities of the physical activity questionnaire. The internal consistency in the five items consisting of the habitual physical activity index was tested using Cronbach's alpha reliability. In all samples, the five items showed acceptable internal consistency, describing comparability across samples of varying ages. The alpha's ranged from 0.61 to 0.78. Table 1 showed the reliability coefficients obtained from each sample.

Longitudinal data was collected in three samples and the habitual physical activity index demonstrated stability over time. As shown in Table 2, the time lag between testing sessions ranged from 1 month to 2 months. The test-retest reliability ranged from 0.61 to 0.91.

For the content validity of the physical activity questionnaire, it takes several specific procedures. First, an item pool was generated. Second, the questionnaire was constructed and then evaluated by the author. Third, the questionnaire was sent to a panel of recognized experts in the fields of recreation, physical education, and medical services. The selected experts were asked to evaluate and comment on the initial questionnaire with regard to: the clarity and readability of the questions; the wording of the questions; the appropriateness and representativeness of the items included within each question; and finally, the overall applicability of the survey instrument. Finally, comments were noted and appropriate revisions were made.

Principal component analysis which was performed showed that the five items of the habitual physical activity questionnaire was load on a single factor. Table 3 contains the factor-loading matrix of the five items. It is indicative of physical activity during leisure time. It appeared that item 1 concerning types of physical activity participation during leisure time, item 2 concerning frequency of physical activity participation during leisure time, item 3 concerning the self-perception intensity of physical activity participation during leisure time, item 4 concerning time of physical activity participation during leisure time, and item 5 concerning the total duration of physical activity during leisure time. This factor can be interpreted as a habitual physical activity during leisure time. The physical activity scale factor accounted for 55.8% of the item variance.

DISCUSSION

The results of this study suggest that the physical activity questionnaire shows acceptable internal consistency. Despite the questionnaire's simplicity and brevity, this new one is characterized by acceptable internal consistency that illustrates stability over time and across five different samples. The test-retest reliability of the physical activity questionnaire, measured with an interval of three months, being between 0.61 and 0.91 signifies that the questionnaires were useful in analyzing and interpreting the data gathered for this study.

This study also found that by means of principal-components analysis, the five items of the habitual physical activity

Table 3. Factor loading matrix of the items about physical activity questionnaire

Item	Factor	Question	Response format
1. Types	0.967	What type of physical activity are you doing?	5 = performing all types of CE, RE, FE 4 = performing two types of physical activity among CE, RE, FE 3 = performing one type of physical activity among them 2 = performing arts & crafts 1 = sedentary activity
2. Frequency	0.810	During a week, how often do you participate in the activity in your free time?	5="almost every day" 4= "4-5 days/week" 3= "3 days/week" 2="1-2 days/week" 1= "sometimes"
3. Intensity	0.704	How intensely do you participate in the activity?"	5="very hard" 4="hard" 3="moderate" 2= "light" 1= "very light"
4. Duration	0.617	How long do you do the activity in your free time?"	5="more than 150 minutes" 4="90-120 minutes" 3="60-90 minutes" 2="30-60 minutes" 1="less than 30 minutes"
5. Total length	0.586	How monthly have you been performing the activity?"	5= more than 5 months 4=5-6 months 3=3-4 months 2=1-2 months 1= less than 1 month

CE: cardiovascular exercise, RE: resistance exercise, FE: flexibility exercise

questionnaire were loaded on a single factor. It contained the types of physical activities, frequency, intensity, duration, and overall length of physical activity that each person performed during their leisure time.

Since the terms of physical activity, exercise, and sports were published in South Korea, several instruments were available to measure physical activity including direct observation, indirect calorimetry, movement sensors, and self-report questionnaire¹⁵). All of these methods have limitations^{6, 13, 16}). In spite of the common problems in physical activity questionnaires such as limited reliability and validity, a number of modifications to the questionnaire have been developed to assess the physical activity levels in large samples. Because the results of assessing physical activity are used in health preventive and the forming of physical activity recommendations, measuring physical activity is considered to be important in epidemiological studies¹⁰). In a review of methods for physical activity assessment in research, researchers¹⁷) suggested that physical activity questionnaires should include questions about frequency, duration, intensity, and types of physical activity. In addition, current exercise or physical activity recommendations request for an appropriate balance of aerobic and resistance activity¹⁸). However, none of physical activity questionnaire used meets the recent physical activity recommendations.

The finding from this study was that this questionnaire focused on recommendations for physical activity participation based on the frequency, duration, intensity, overall length, and type of activities the person performs, thus this questionnaire provides more accurate data about a person's physical activity pattern. This questionnaire was easy to implement and provided measurement accuracy and the shot form of the questionnaire reduced financial burden on respondents'. In summary, it was concluded that in this simple physical activity questionnaire containing five items was appropriate number for this particular study. These specifically were the frequency, duration, intensity, overall length, and type of activities that the person performed during their leisure time. The indices of physical activity from these items were reliable.

A key limitation of this study was related to the concurrent validity, the author in this study did not perform a common analysis to correlate self-reported physical activity data with data from an objective measurement device such as accelerometer. Therefore, in any future studies it is recommend they validate the use of physical activity index by comparing the questionnaires to both indirect and direct measures of the physical activity.

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