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Impact of Sport on the Cardiovascular Diseases Scale Based on Health Belief Model: Questionnaire Psychometric Properties

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Abstract

Background: Inactivity is one of the factors to increase the risk of having cardiovascular diseases.
Objectives: This methodological design study was conducted on the staff of Ilam Medical Science University (Ilam, Iran) in 2016 in order to assess the psychometric properties of the Iranian version of Impact of Sport on the Cardiovascular Diseases Scale based on the Health Belief Model (HBM - ISCS).
Methods: In this study, first, targeted questions were selected based on the scientific literature review (N = 54) and then, the basic version of the questionnaire, including 14 questions in terms of HBM (Health Belief Model) constructs, went on the validation phase using the opinions of experts. At this stage, content and construct validity and reliability were reviewed and approved.
Results: Over all, 433 individuals with a mean age of about 38 years participated in the study. Based on the results, content validity rate (CVR) higher than 0.05 (number of specialists = 20) and content validity index (CVI) higher than the acceptable level of 0.79 were calculated. The primary Exploratory Factor Analysis (in a random spitted sample, N = 187) extracted five factors that jointly accounted for 59.804% of the variance observed. The results of Confirmatory Factor Analysis (in a random spitted sample, N = 246) showed that the questionnaire has desirable construct validity: (X^2 = 146.81, df = 67, P < 0.001, CFI = 0.93, IFI = 0.93, RMSEA = 0.074 and SRMR = 0.067). Similarly, the Cronbach's alpha coefficient was calculated between 0.715 and 0.816, and the Intraclass Correlation Coefficient (ICC) was obtained between 0.455 and 0.623 for the subscales.
Conclusions: The results indicated that HBM - ISCS is a valid and reliable tool for measuring the health beliefs about the impact of sport on CVDs prevention.

Keywords: Questionnaire, Sport, Cardiovascular Disease

1. Background

The development of mechanical life has caused the inactivity in the society such that about 70% of diseases are resulted from inactivity. It is among the ten major causes of death throughout the world and about two million deaths occur for this reason every year; meanwhile, inactivity causes a 2 - 5 folded increase in the risk of cardiovascular diseases (CVDs) and obesity (1, 2). In developing countries, including Iran, the CVD morality rate of 20% - 25% has increased to 35 - 40% as a result of the tendency for urbanization, the decrease in physical activity, weight gain, increase of blood lipids, and other dangerous risk factors (3). The suggested amount of exercising and sports for adults is 30 minutes with average severity during the whole week or at least five days a week; this can reduce the risk of chronic diseases including CVDs (4, 5).

The attitude of individuals toward physical activity influences their performance and participation. Studies have shown that by improving the attitudes and self - efficacy of individuals, their participation rate will increase (6). Despite the fact that exercising is one of the easiest ways to maintain health, and specialists emphasize the increase of physical activity; the lifestyle of inactivity is common almost around the world (7). Accordingly, more than 60% of adults do not have sufficient physical activity to be healthy on the basis of available statistics (8). There is also inactivity among 65% of adults in Iran, which is considered as one of the factors affecting the outbreak of CVDs in this country (2, 4). This can be resulted from the complexities of behavior; due to the fact that any changes in knowledge will not always result in the changes of attitudes, and any changes of attitudes will not result in the changes of behavior because the environment may not allow the person to

show any behavior (9). One of the patterns to review people's attitudes toward different areas affecting any changes in behavior is the health belief model (HBM).

This model was designed exclusively for behaviors related to health. It evaluates the people's attitudes toward the relationship between disease and their health, and suggests a behavior to prevent the disease. The constructs of this model provide special guidance at the micro - level to plan interventions. This model explains the quality of changes in behavior related to the health of people, and helps trainers to review and describe health behaviors of people through understanding their beliefs about health (10).

HBM is appropriate to prevent chronic diseases when a researcher wants to train those people who are not ill (11). According to HBM, adopting a health behavior depends on the people themselves to believe in health problems (inactivity), accept its reality, be sensitive about its impact on health, feel threatened, consider the mentioned problem as their serious health problem, and understand its various side effects (CVDs) in different aspects of their health. Then with the guidance of their surrounding environment, they are convinced that preventive activities (such as doing exercise) are much less costly than treatment of the related diseases such as CVDs. As a result, they will promptly take such preventive measures (12). One of the HBM applications is to model behavioral research and tool creation for programs focusing on the specified health problem such as creating a health belief scale for AIDS, creating screening tool for breast cancer, modeling the behavior of physical activity, etc. (10). It is very important that we realize why and how people accept new behaviors, how changes in behavior have happened, and which factors have caused them. According to HBM, people change their behavior when they realize that their illness is serious because, otherwise, they are less likely to turn into healthy behaviors. HBM tries to explain why some people adopt preventive behaviors, however, others do not. Based on this model, the possibility to adopt health behaviors depends on two issues: first, an individual's perception of the level of danger threatens her (the perceived sensitivity and severity), and second, the individual's assessment of health benefits and barriers (the perceived benefits and barriers) (10). Multiple tools using HBM have been designed so far to assess public opinion about diseases among groups with various ages and sex, however, tools to measure health beliefs about the impact of doing sport and exercise on CVDs specifically were not found, while the existing tools for measuring physical activity are not suitable for use in domestic studies due to existing cultural differences.

There are several questionnaires used to measure physical activity in Iran and other countries: Global Physical Activity Questionnaire (GPAQ) (13), European Prospective Investigation into Cancer and Nutrition (EPIC) (14), New Zealand Physical Activity Questionnaire (NZPAQ) (15), Baekce Physical Activity Questionnaire (16), Rapid Assessment of Physical Activity (RAPA) (17), and Azad - Fesharaki's Physical Activity Questionnaire (AFPAQ) (18). All of the above questionnaires measure only the amount of people's physical activity not their health beliefs about physical activity.

Accordingly, the research team of this study designed a tool to measure the beliefs of people about sports and exercises and its relationship with CVDs, and psychometrized it by using the information gathered from the employees of Ilam Medical Sciences University.

2. Methods

This methodological design study was conducted on the staff of Ilam Medical Sciences University (Ilam, Iran) in October 2016 in order to assess the psychometric properties of the Iranian version of Impact of Sport on the Cardiovascular Diseases Scale based on the Health Belief Model (HBM - ISCS).

2.1. Preparing Questions for the Initial Questionnaire

Based on the review of scientific literature and selection of the most influential factors, 54 questions were designed. First, a group of specialists in the fields of health education, physical education, nutrition, and cardiology assessed the questions. At this stage, 25 recurring, vague questions, with the same issues and out of the study scope were excluded, and 29 questions were included in the validation process. In this way, in the event of possible exclusion of some of the questions during the psychometric process or preliminary test study, there was enough number of questions to measure each construct (19). The initial questionnaire included questions based on the themes of sport and HBM constructs.

2.2. Validation

The most important question that should be asked about any measuring method is: "to what extent is the method valid and to what size is its measurement accurate?" The validity means being appropriate, meaningful, and useful referring to specific perceptions, achieved from the test scores (20). Reviewing and reporting the content validity is especially important in terms of applying research tools (21). Thus, when a new tool is designed, it is expected to acquire appropriate information about its validity and reliability by studying the process of designing tools (20).

2.2.1. Content Validity

In order to review a questionnaire's content validity, there are two proved quantitative and qualitative methods (22). In this study, both quantitative and qualitative methods were used to study the content validity. During the evaluation of content validity by experts, the items such as grammar, using appropriate words, putting questions in their suitable place and appropriate scoring were reviewed (22, 23). For studying the content validity of two indexes quantitatively, there are content validity rate (CVR) and content validity index (CVI). CVR shows the necessity of a question's existence, and CVI shows the clarity and relevance of questions with the aim of the research from the perspective of specialists (24).

1. While calculating CVR, the results of experts' opinions were defined after including in the calculation formula of CVR, and compared according to the number of specialists and table of Lawshe (25).

2. The CVI, score more than 0.79 is acceptable, and less than that is considered unacceptable (26).

2.2.2. Face Validity

In order to determine the formal validity, both quantitative and qualitative methods are used. We used the qualitative method to examine the face validity. In this way, a number of participants were interviewed face - to - face, and difficulty level, proportionality rate, and question ambiguities were examined (26). In the present study, an initial questionnaire was provided to 25 employees and specialists in health education, physical education, nutrition and cardiology, and corrective comments were made in the questionnaire.

2.2.3. Construct Validity

Reviewing the construct validity in this study was conducted with Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) using LISREL (ver. 8.8).

In EFA, which was conducted in a random spitted sample (N = 187), the least correlation coefficient of 0.4 was considered (27).

CFA was conducted in a random spitted sample (N = 246). To determine the fitness of model, Bentler Index or Normal Fitness Index (NFI), Non - Normal Fitness Index (NNFI), Comparative Fitness Index (CFI), and others were examined; all of these indexes require desirable values greater than 0.9 (28). RMSEA and SRMR were also measured. The values equal to or less than 0.5 show very good fitness and values up to 0.8 are acceptable (29, 30).

The two populations (in EFA and CFA) randomly selected from the main population were homogeneous.

2.2.4. Reliability

In this study, the tool's reliability was estimated through correlation between the questions or comparing the questionnaires, and their internal coordination was defined using the Cronbach's alpha coefficient. Based on the existing references, Cronbach's alpha coefficient of 0.7 or higher is a prescribed standard for a tool. The coefficients less than 0.7 represent the inadequate validity of the tool (31).

In order to test the reliability, there are various methods including face validity, content validity, predictive validity, and construct validity (32). In the present study, the validity of questionnaire (HBM - ISCS) was studied using the methods of content validity, face validity, and construct validity.

2.3. Sample & Sampling

The sample size was calculated to be 180 subjects in order to collect information in this part according to the number of model constructs and recommendation to have a least 30 samples for each construct (33). The sampling was conducted at two stages among the employees of Ilam University of Medical Sciences consisting of 187 people for EFA and 246 people for CFA. To this end, the required number of samples was determined in accordance to the number of employees in each of the eight cities of Ilam Province. The research team traveled to the targeted city and randomly selected some centers covered by the health care network in that city; some subjects were selected randomly from a name list of employees of that center. The sampling was conducted at the workplace of the employees. They were included in the study if they met the inclusion requirements: permanent or short - term employment, lack of chronic diseases, or those diseases resulting in motor limitation, and completion of informed consent form.

Ilam University of Medical Sciences is a state university and subset of the Ministry of Health and Medical Education. In addition to admitting students at different levels of education, this university provides all health care services to the residents of Ilam Province through 10 health care networks and eight hospitals.

2.4. Statistical Analysis

Data analysis was done using SPSS (ver. 16) and descriptive statistics including frequency, mean and standard deviation. Significance level in all measurements was considered $P < 0.05$. SPSS (ver. 16) was used to study EFA and LISREL (ver. 8.8) was employed for CFA.

In the current study, in order to correct the missed data, data were substituted with mean values, and accordingly, the normal distribution of data was reviewed and approved by skewness and kurtosis/std error.

2.5. Ethics

The research team received the necessary ethical authorization from the Research Council and the Medical Ethics Committee of Medical Sciences School of Tarbiat Modares University (Registration Code No. IR.TMU.REC.1394.148) while committed to keep the information of individuals confidential. Written informed consents were obtained from all participants.

The employees received comments before being included in the study during a meeting. They were allowed to communicate their questions and ambiguities with the research team. After receiving answers to the questions of their own, they signed the written consent form and were included in this study.

3. Results

3.1. The Study Sample

A total of 229 subjects out of the 433 employees of Ilam Medical Sciences University participating in the study were men and the majority of them (88.68%) were married. The mean age of the participants was about 38 years, and 386 (89.5%) of them had a university degree. Profiles of the participants are shown in Table 1.

Table 1. Demographic Characteristics of the Respondents (N = 433)

Item	EFA Participants (N = 187)	CFA Participants (N = 246)
Sex		
Male	110 (58.8)	119 (48.4)
Female	77 (41.2)	127 (51.6)
Age (Mean ± SD)	37.79 ± 5.13	37.92 ± 5.59
Marital status		
Single	23 (12.3)	28 (11.4)
Married	164 (87.7)	218 (88.6)
Education		
Non - academic	20 (10.7)	27 (11)
Academic	167 (89.3)	219 (89)
Job category		
Health care	159 (85)	204 (82.9)
Administrative	28 (15)	42 (17.1)

3.2. Content & Face Validity

In the present study, the panel of experts was used in order to calculate CVR and CVI, and eventually, the comments of 20 specialists in the fields of health education, nursing, cardiology, physical education, epidemiology, and nutrition (out of the research team) were used.

During the investigation of the validity rate based on Lawshe table and according to the number of specialists, the quorum of CVR was 0.42 for the questions of the questionnaires. To increase the work precision, the CVR quorum was determined 0.5, and at the end, seven questions were excluded because their CVR was less than 0.5. During the study of CVI, it was found that 8 out of the 29 questions in total had CVI less than 0.79. In order to increase the accuracy of tools, the questions that score less than 0.79 even in one of the criteria of CVI (simplicity, relevance and clarity) were excluded. Accordingly, 15 out of the 29 questions were excluded in total (Table 3).

3.3. Exploratory Factor Analysis (EFA)

Prior to evaluating the results of exploratory factor analysis (EFA), the Kaiser - Meyer - Olkin and Barlett's tests were used. The value of KMO measurement was 0.656 (Chi - square = 449.786, $P < 0.0001$), indicating that the sample size was adequate. Principal components analysis was carried out for all 14 items by using a Varimax rotation.

All the items were loaded under their respective theoretical constructs, and the factors were labeled as follows: Factor 1: 'Susceptibility', Factor 2: 'Severity', Factors 3: 'Benefits', Factor 4: 'Barrier', and Factors 5: 'Self - efficacy'.

Table 2 presents a summary of the 14 items, factors and factor loadings. The primary analysis extracted five factors that jointly accounted for 59.804% of the variance observed.

3.4. Confirmatory Factor Analysis (CFA)

At the stage of construct validity with respect to the determination of the primary structure of the questionnaire, CFA was conducted (Figure 1). The results of the factor analysis in Table 4 show that the resulted patterns of the necessary fitness and tools have desirable construct validity.

3.5. Reliability

Cronbach's alpha coefficients of 0.715 to 0.816 (Table 2) and the Intra class Correlation Coefficients (ICC) of 0.455 to 0.623 were calculated for the subscales. This indicates the desirable reliability and internal correlation of the instrument (Table 3).

Table 2. Factor Loading for HBM - ISCS Obtained from the Exploratory Factor Analysis

Q		Factors				
		Perceived Susceptibility	Perceived Severity	Perceived Benefits	Perceived Barriers	Self Efficacy
1	To prevent cardiovascular diseases, I should exercise.	0.870	- 0.015	0.033	- 0.113	0.101
2	Overweight increases the risk of cardiovascular diseases.	0.736	0.202	0.274	- 0.020	0.116
3	If I was diagnosed with cardiovascular disease, I would be hospitalized.	- 0.139	0.671	0.140	0.005	0.168
4	If I was diagnosed with cardiovascular disease, I could not do my daily tasks.	0.267	0.600	- 0.019	0.089	0.011
5	Having cardiovascular diseases can reduce my longevity.	0.087	0.673	0.016	- 0.216	0.044
6	I use preventive methods for cardiovascular diseases in order to prevent early death.	0.107	- 0.009	0.889	- 0.081	.010
7	I can easily prevent cardiovascular diseases by respecting the prevention principles of cardiovascular diseases.	0.118	0.115	0.811	- 0.100	0.136
8	Since daily exercise is time-consuming, I do not have a chance to do it.	- 0.105	- 0.219	- 0.071	0.679	0.133
9	It is difficult for me to access gyms.	0.058	0.085	- 0.040	0.825	0.013
10	I think I do not have the necessary skills and knowledge to do exercise.	- 0.087	- 0.006	- 0.089	0.628	- 0.170
11	I can prevent cardiovascular diseases by doing regular exercises.	0.212	0.134	0.337	- 0.251	0.597
12	I can keep my weight in the normal range.	0.063	0.206	- 0.057	- 0.049	0.734
13	I can follow the regular exercise program.	- 0.009	0.190	0.079	0.112	0.684
14	I am sure I can prevent cardiovascular diseases.	0.092	- 0.258	0.044	- 0.009	0.686

4. Discussion

Physical activity improves many chronic and non - contagious diseases including cancers, CVDs, diabetes, etc. (34, 35). Different tools have been designed and used to measure the amount of physical activity and exercise in the world; for instance, International Physical Activity Questionnaire (IPAQ) measures the moderate and severe physical activity of people during the past seven days (28, 36-39). This questionnaire just measures the amount and duration of physical activity, and has nothing to do with the cultural issues as well as the opinions of people regarding an especial physical activity or exercise. While to ensure the success of the health interventions, understanding the ideas and opinions of people is very important.

As you know, one of the factors influencing the adoption of health behavior by individuals is their beliefs about that issue. There are different tools to measure the health beliefs of individuals with regard to the diseases; each can be used in appropriate time and place, however, to the best of our knowledge, there are no tools to measure the health beliefs of individuals about the impact of sport and exercise on diseases, especially CVDs. Therefore, the present study was conducted with the aim of designing and psychometrizing tools to measure the beliefs of employees of medical sciences universities about the relationship between sports, exercises, and CVDs.

The validity and reliability of the instruments designed in this study were confirmed. We tried to examine the questions with a simple language using HBM. The approach of these tools is to examine the health beliefs of employees about the impact of exercise on CVDs. The researchers are allowed to acquire more accurate information about the beliefs influencing health behaviors of individuals and understand why they do not have any physical activity or exercise in order to avoid suffering from the related diseases (e.g. CVDs). “Does he/she consider the likelihood of having a CVDs insignificant?”, “Does he/she consider it a minor disease?”, “What are the barriers to exercise from the individual’s point of view?”, “Does one know the benefits of exercising in the prevention of CVDs?” and ultimately, “How much does a person see himself/herself fit enough to exercise with the aim of preventing CVDs?”.

Table 3. The Results of Instrument Validity, Internal Consistency and Stability

Items	CVR	CVI	Cronbach' Alpha	ICC	Mean ± SD	Range	Impact Score	Item - scale Correlation
Susceptibility			0.725	0.568	8.00 ± 1.66	2 - 10		
Q1	0.75	0.89			4.02 ± 0.96	1 - 5	2.28	0.740
Q2	0.62	0.84			3.98 ± 0.99	1 - 5	2.34	0.740
Severity			0.715	0.455	10.64 ± 1.87	3 - 15		
Q3	0.75	1			3.32 ± 0.93	1 - 5	3.87	0.709
Q4	1	1			3.53 ± 0.92	1 - 5	3.28	0.678
Q5	1	0.98			3.79 ± 0.88	1 - 5	3.36	0.869
Benefits of Exercise			0.768	0.623	7.70 ± 1.61	2 - 10		
Q6	0.62	0.87			3.89 ± 0.95	1 - 5	2.73	0.787
Q7	0.62	0.89			3.81 ± 0.87	1 - 5	3.36	0.898
Barriers of Exercise			0.727	0.470	9.10 ± 2.53	3 - 15		
Q8	1	0.98			3.12 ± 1.17	1 - 5	1.7	0.621
Q9	0.87	0.95			2.83 ± 1.14	1 - 5	4.05	0.683
Q10	0.87	0.91			3.13 ± 1.15	1 - 5	3.87	0.734
Self - efficacy			0.816	0.526	13.10 ± 2.91	4 - 20		
Q11	0.75	0.98			3.26 ± 1.14	1 - 5	2.73	0.569
Q12	0.87	1			3.31 ± 1.03	1 - 5	2.73	0.768
Q13	1	0.89			3.13 ± 1.05	1 - 5	1.65	0.575
Q14	0.87	0.95			3.39 ± 0.92	1 - 5	2.59	0.708
HBM - ISCS			0.746		48.55 ± 5.41	14 - 70		

Table 4. Confirmatory Factor Analysis for the Five - factor Model

Model	X^2/df	P	NNFI	RMSEA	CFI	SRMR	GFI	Hoelter (CN)
	2.19	0.001	0.91	0.074	0.93	0.067	0.91	145.83

The reliability of the study tool (HBM - ISCS) was between 0.715 and 0.816, whereas the coefficient of reliability of IPAQ reported by Au (13) was about 60% and that of AFPAQ (18) was about 70%. Meanwhile, HBM - ISCS could show the variance value of 59.804%, which was higher than the variance of AFPAQ (18), which was 45%. In the study by Ono (40), the coefficient of ICC was reported between 0.78 and 0.87, which was higher than the results of HBM - ISCS in the present study. This could be due to sample size in the study of Ono and also the sickness of the sample.

Another advantage of this instrument is that it is a short one so its completion is fast and it is more likely that the respondents would be willing to cooperate with the investigators in filling it out. In addition, the specificity of this tool results in monitoring the health beliefs of employees, who are at risk of CVDs due to sedentary lifestyle, more accurately.

In addition to what is mentioned above, the present research is among those few studies in which the health beliefs' impact on prevention of CVDs among employees has been studied, and this can be highlighted as the strength of this study.

4.1. Limitations

In contrast to the many advantages and strengths of this tool, we can refer to its disadvantages such as the self - reporting method. Similarly, this tool was tested among the employees of medical sciences universities in Ilam Province who have probably more knowledge than other groups of employees about CVDs; therefore, it is better to conduct the same study on other groups of employees working at different medical sciences university.

Since this study was conducted on Ilam University of Medical Sciences employees, therefore, the generalization of its results to other employees is difficult. Hence, it is suggested that the tools used in this study be tested in other

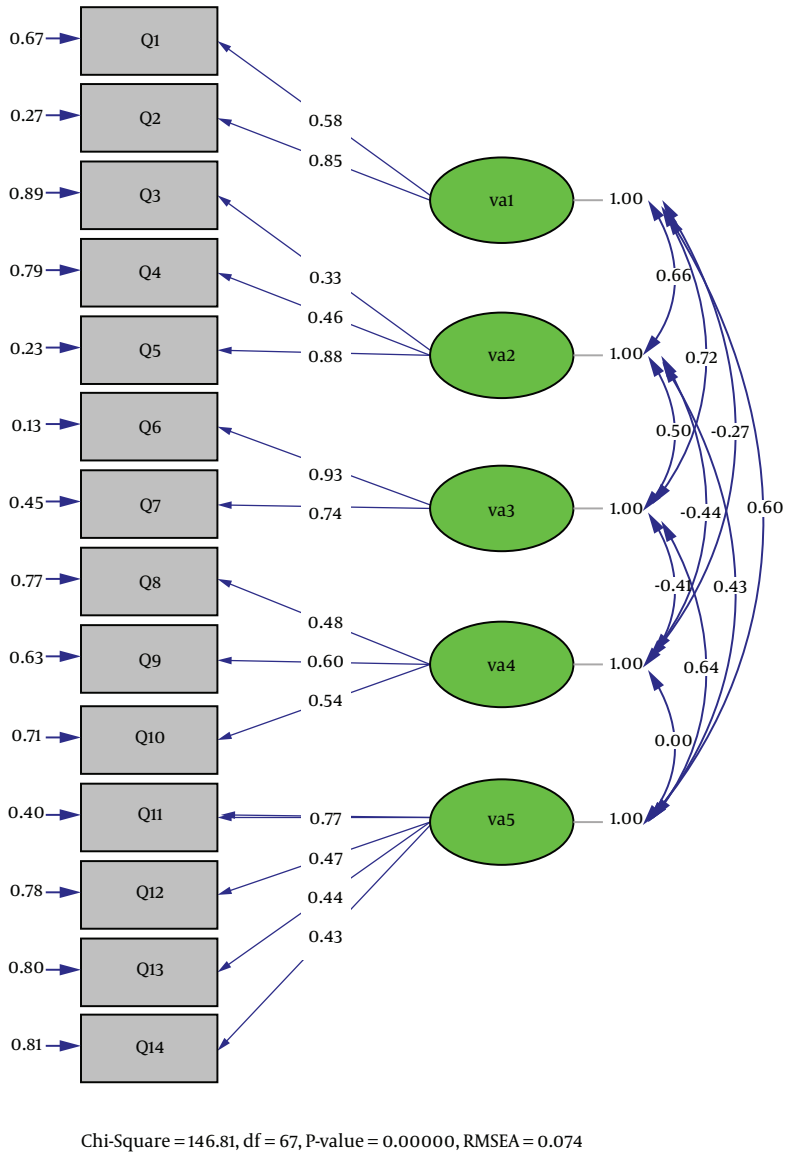

Figure 1. Factor Loading for the HBM - ISCS

populations.

4.2. Conclusions

The results indicated that HBM-ISCS is a valid and reliable instrument for measuring the health beliefs of participants about the impact of Physical activity and exercise on CVDs prevention.

Footnotes

Authors' Contribution: Reza Jorvand was the main researcher, who designed the study, collected the data, and wrote the first draft. Fazlollah Ghofranipour as the study supervisor, critically reviewed the manuscript, responded to the reviewer's comments and provided the final draft. Mahmoud Tavousi contributed to the statistics and was the study consultant. All authors read and approved the final manuscript.

Conflict of Interests: The authors declare that they have no competing interests.

Ethical Approval: The research team received the necessary ethical authorization from the Research Council and the Medical Ethics Committee of Medical Sciences School of Tarbiat Modares University (Registration Code No. IR.TMU.REC.1394.148) while committed to keep the information of individuals confidential.

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Informed Consent: Written informed consents were obtained from all participants.

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