JBACHS
Journal of Basic and Clinical Health Sciences

J Basic Clin Health Sci 2024; 8: 119-128
https://doi.org/10.30621/jbachs.1300396
RESEARCH ARTICLE

THE PSYCHOMETRIC PROPERTIES OF THE HEALTH BELIEF MODEL SCALE FOR EXERCISE IN THE TURKISH POPULATION

Melissa KÖPRÜLÜOĞLU [1], Elvan FELEKOĞLU [1], İlknur NAZ [1]

[1] Izmir Katip Celebi University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation. Izmir, Turkey

ORCID: M.K. 0000-0002-3607-4680; E.F. 0000-0001-6633-1572; İ.N. 0000-0003-1160-6561.

Corresponding author: Melissa Köprülüoğlu, **E-mail:** kopruluoglumelissa@gmail.com

Received: 22.05.2023; **Accepted:** 30.11.2023; **Available Online Date:** 31.01.2024

Cite this article as: Köprülüoğlu M, Felekoğlu E, Naz İ. The Psychometric Properties of the Health Belief Model Scale for Exercise in the Turkish Population. J Basic Clin Health Sci 2024; 8: 119-128.

ABSTRACT

Purpose: Personal health and exercise belief is an essential component of creating physical activity and exercise programs. The Health Belief Model Scale for Exercise (HBSE) is an instrument that evaluates this component. Our study aims to translate the HBSE into Turkish and to investigate its psychometric properties in the adult population.

Materials and Methods: After the translation process, we included 180 participants (median age: 28 years, female/male: 115/65) in our study. Explanatory factor analysis was performed. Internal consistency was measured by Cronbach alpha and test-retest reliability was assessed using the intra-class correlation coefficient (ICC). Convergent, divergent, and known-groups validity (gender, educational level, marital status, and regular exercise habit) were used for construct validity.

Results: Factor analysis indicated six factors (factor-loadings=0.664 to 0.900). Cronbach α coefficients ranged from 0.706 to 0.842 and ICC ranged from 0.710 to 0.956. It was seen that the HBSE subscores with the scales that were used for convergent validity had a moderate-strong correlation (Rho=0.614 to 0.752 and <0.001). Age and BMI were not related to the HBSE scores ($p>0.05$). The HBSE total scores were higher in females and persons with regular exercise habits ($p<0.05$).

Conclusion: The results highlighted that the Turkish version of the HBSE is a reliable and valid instrument to assess exercise belief.

Keywords: Health belief model, physical activity, exercise, psychometrics.

INTRODUCTION

The knowledge gained over the years has proven the harmful effects of a sedentary lifestyle on health. Regular physical activity (PA) and exercise have been shown to reduce the development and progression of chronic diseases and disabilities, and decrease the risk of premature death, enhance life expectancy and produce many other health-related benefits (1–3). Therefore, promoting PA participation is among the fundamental necessities for improving health (2).

To develop an intervention for improving PA, descriptive information about the determinants of this behavior is needed. It is known that there are several factors about PA, and the internal and external processes associated with these factors contribute to the development of this behavior. Physical activity determinants are categorized into two main headings to explain these processes: a) individual properties such as self-efficacy, motivational status, history of PA and exercise habits, and other healthy lifestyle behavior, etc., and b) environmental properties

including sociocultural status, time, financial situation, access, etc (4).

There are behavioral change models developed to improve health behaviors including PA. These models play a key role in explaining, developing, and encouraging healthy behavior. The Health Belief Model (HBM) is one of the most common models used to identify the processes of health behaviors and health belief variables, maintain these habits, and provide a basis for health research about behavior change (5). There are six components associated with the exercise behavior change process in the current version of the model such as perceived benefits, perceived barriers, perceived severity, perceived susceptibility, cues to action, and self-efficacy (6). Based on these findings, it can be said that HBM is an important predictor and an effective model of exercise behavior (7).

The known contributions of HBM to improve PA and exercise behavior have brought along the necessity for some tools to evaluate this process. Consequently, several scales have been developed based on this model. One of them is the Health Belief Model Scale for Exercise (HBSE) which was developed by Wu et al. (2020), and evaluates exercise habits based on health beliefs. When examining Turkish scales related to exercise beliefs, it is observed that both the developed and translated scales are limited (9,10) Therefore, the study aims to perform a Turkish translation of HBSE and assess whether it is a valid and reliable tool for examining the HBSE in adults.

MATERIALS AND METHOD

Permission and Ethics

Before starting our study, permission was obtained from the author who developed the scale to translate it into Turkish and investigate its psychometric properties. The ethical approval of the study was obtained from XXX University Ethical Committee (Approval Number: 145) and conducted in accordance with the provisions of the Helsinki Declaration. An informed consent form was obtained from all participants. The methodological quality was examined using the COSMIN criteria (11).

Participants

This study was conducted as a cross-sectional design and was carried out between January and April 2021. Participants were reached through snowball sampling by Google Forms (https://docs.google.com/forms/d/1emb7q5fa8ViVMs50LPGjWc63UulOdY_YVXilDQifpbE/edit?usp=forms_home&ths=true). The inclusion criteria for participants were (1) being aged 18-65 years, (2) being a native Turkish speaker, and (3) completing all surveys. Individuals with physical disabilities or reported diagnosed psychological or cognitive problems were excluded from the study.

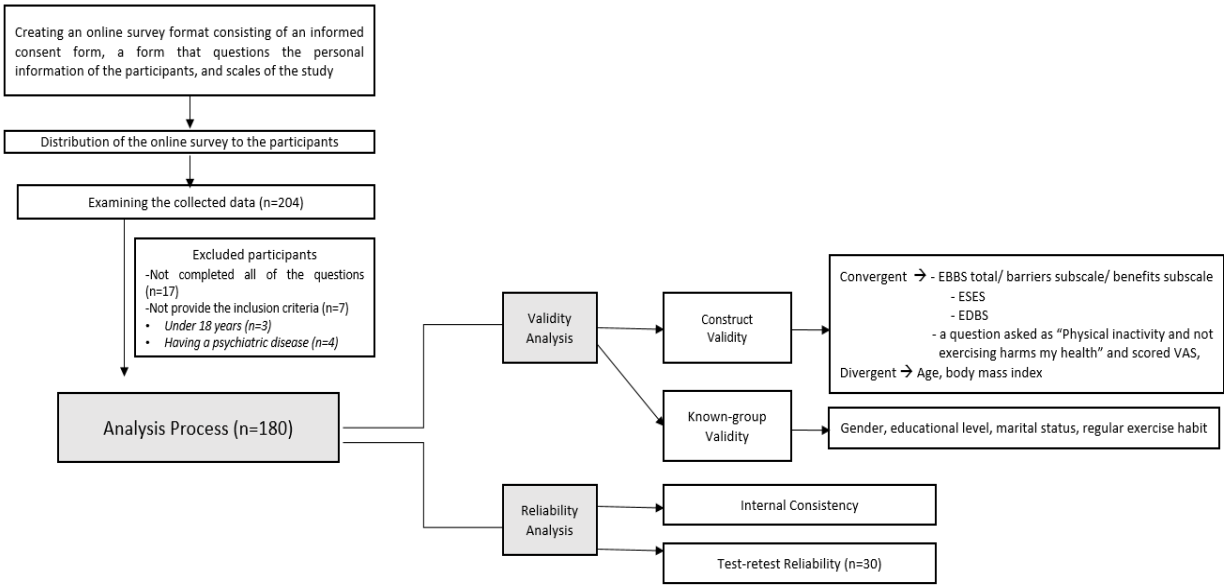

Figure 1. Flowchart of the study

Study Procedure

The study consisted of two stages. First, the HBSE was translated from English into Turkish. Then, the psychometric properties of the Turkish version of the HBSE were examined. The flowchart of the study design is shown in Figure 1.

Translation of the Scale: The translation process of the scale was conducted in accordance with the guidelines and showed all of the process in Figure 2 (12). We established a committee of four specialists, consisting of two physiotherapists with PhD degrees and master's degrees, a software engineer, and a physician with English as her first language who is fluent in both Turkish and English. First, the scale was translated from English to Turkish by two Turkish speakers who were also proficient in English. From these translations, a single form was created that reached a consensus for Turkish. The Turkish form was then translated back into English by two translators, one of whom had no background in medicine. The expert committee then assembled, compared, and debated the vocabulary used in the translation with reference to its compatibility with both languages and the target group. All versions of the scale were then compared for validity. There were no items added or removed. Only the 7th item was revised for better understanding and the "for me" part was added to the item "I have not found proper exercise". After the translation process, a pilot study was carried out to assess the items' clarity and contribute to a better comprehension of the questions. Participants' feedbacks were also gathered about the understandability of items. In this context, we included 10 participants to develop the last version of the scale and we did not use the results of the pilot study for the main analysis. Eventually, the final form was constituted.

Psychometric Properties: The participants completed a questionnaire about the sociodemographic characteristics, physical properties, and regular physical activity. They were asked a question described as follows “How often do you perform exercises lasting at least 20 min that make you sweat more or breathe more quickly than normal?”. The participants who responded to the question as “a few times a week” or “every day” were considered as having an exercise habit (13). For validity analysis, different scales were used for each subscale, as no other Turkish scales measured the parameters of HBSE. The participants filled out the

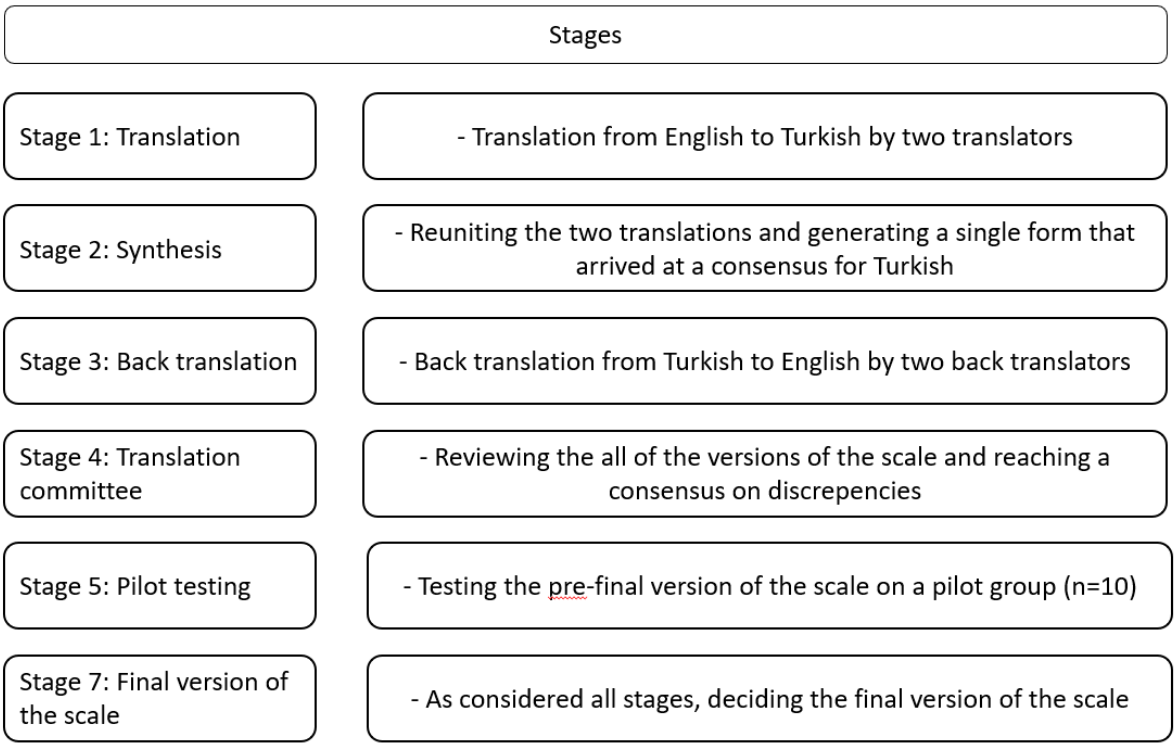

Figure 2. Translation process of the scale

following scales: the benefits subscale of the Exercise Benefits/Barriers Scale(EBBS) for perceived benefits of HBSE, the barriers subscale of EBBS for perceived objective and subjective barriers of HBSE, Visual Analog Scale (VAS) for perceived severity of physical inactivity of HBSE, Exercise Self-Efficacy Scale (ESES) for self-efficacy of HBSE, and Exercise Processes of Change Scale (EPCS) for cues to action of HBSE. For the test-retest reliability, 14 days after the initial assessment, a randomly selected 30 participants were asked to complete the HBSE again.

Instruments

Health Belief Model Scale for Exercise

The scale was developed by Wu et al. and examines the personal exercise and health beliefs (8). The 18-item scale includes 6 subscales perceived benefits (3-items), perceived objective barriers (4-items), perceived subjective barriers (3 items), perceived severity of physical inactivity (2-items), self-efficacy (3-items), and cues to action (3-items). The items were answered on a 5-point Likert system (1-totally disagree to 5-totally agree).

Exercise Benefits/Barriers Scale (EBBS)

The Turkish validity and reliability of the scale originally developed by Sechrist et al. have already been done by Ortabag et al. This scale evaluates the personal perception of benefits and barriers regarding exercise (10, 14). It consists of a total of 43 questions, 14 of which are barriers and 29 of which are benefits. Participants answer the questions as “strongly agree-1, agree-2, disagree-3, strongly disagree-4”. Exercise benefits and exercise barriers are calculated as two subscales and total scores after completing the scale.

Exercise Self-Efficacy Scale (ESES)

It was developed by Bandura (1997), who introduced the concept of self-efficacy (15). The scale consists of 18 items graded from 0% to 100%. According to their self-efficacy beliefs, participants record their answers ranging from 0 (not able to do), 50 (able to moderate) to 100 (definitely able) with 10-unit intervals on a 100-point scale.

Exercise Processes of Change Scale (EPCS)

It was developed by Marcus et al. (16) and translated into Turkish by Gümüş and Yitiş (17). The scale is consisting of 40 items answered on a five-point Likert-type scale. A minimum of 40 and a maximum of 200 points are obtained from the scale. High scores indicate that the probability of deciding on change is high.

The Visual Analog Scale (VAS) is a self-reported scale consisting of a horizontal line with anchor points of “no pain” (on one end "0") and “worst- unbearable pain” (on one end "10"). The participants were instructed to place a mark where they felt the severity of pain on this 10 cm-long horizontal line (described as no pain- 0 and most severe-10) (18).

Table 1. Characteristics of Participants’

Variables (n=180)	Statistics
Age, years	28 (25/36)
Gender, n (%)	
Female	115 (64.1)
Male	65 (35.9)
Height, cm	169 (162/176)
Weight, kg	65 (57/78)
Body Mass Index, kg/m^2	23.14 (20.92/25.78)
Educational level, n (%)	
Primary school	4 (2.3)
High school	24 (13.3)
University	116 (64.6)
Postgraduate	36 (19.9)
Marital Status, n (%)	
Single	99 (55.2)
Married	7 (3.9)
Divorced	74 (40.9)
Regular Exercise Habit, n (%)	
Yes	53 (29.44)
No	127 (71.56)

Categorical variables presented as n (%) and continuous but not normally distributed variables presented as median (1.-3. Quartiles).

Statistical analysis

Statistical analysis was performed using SPSS Version 20. The Kolmogorov-Smirnov test and histogram graphs were used to determine whether the distribution of the data was normal. Continuous variables were expressed as the median (interquartile range) due to the non-normal distribution of the data, while categorical variables were expressed as numbers with percentages (%). All of the results were interpreted at a significance level of $p < 0.05$. To examine the factor structure of HBSE, principal components explanatory factor analysis was applied whose explanatory rate was accepted as minimum 60% (19). Cronbach's alpha coefficient was used to

Table 2. Outcomes of measurements

Variables	Median (IQR)
Health Belief Model Scale for Exercise	
Perceived benefits	14 (3)
Perceived objective barriers	11 (4)
Perceived subjective barriers	7 (3)
Self-efficacy	10 (3)
Perceived severity of physical inactivity	8 (3)
Cues to action	6 (4)
Total score	56 (7)
Exercise Benefits/Barriers Scale	
Benefits Score	92 (16)
Barriers Score	29 (8)
Total Score	121 (19)
Exercise Self-Efficacy Scale	100 (39)
Exercise Decisional Balance Scale	130 (36)
Physical inactivity and not exercising harms my health (VAS, mm)	9 (3)

IQR= Interquartile range, VAS= Visual analog scale

Table 3. Intra-rater reliability, Cronbach α values if item deleted and factor loadings for the each items of Health Belief Model Scale for Exercise

HBSE Sub-scores	Items	Intra-rater reliability [ICC(95%CI)]	Cronbach α	Cronbach α if item deleted	Factor loadings
Perceived benefits	**Item 1**	0.816 (0.612-0.913)	0.796	0.731	0.828
	Item 2	0.905 (0.800-0.955)		0.669	0.859
	Item 3	0.867 (0.723-0.936)		0.754	0.795
Perceived objective barriers	**Item 4**	0.801 (0.581-0.905)	0.706	0.662	0.717
	Item 5	0.712 (0.602-0.863)		0.645	0.732
	Item 6	0.932 (0.857-0.697)		0.587	0.786
	Item 7	0.862 (0.712-0.934)		0.674	0.664
Perceived subjective barriers	**Item 8**	0.806 (0.690-0.908)	0.784	0.782	0.728
	Item 9	0.710 (0.601-0.861)		0.611	0.893
	Item 10	0.749 (0.568-0.881)		0.721	0.811
Self-efficacy	**Item 11**	0.718 (0.501-0.866)	0.842	0.799	0.837
	Item 12	0.813 (0.612-0.911)		0.705	0.900
	Item 13	0.833 (0.654-0.920)		0.824	0.824
Perceived severity of physical inactivity	**Item 14**	0.839 (0.665-0.923)	0.766	0.621	0.851
	Item 15	0.711 (0.592-0.862)		0.621	0.882
Cues to action	**Item 16**	0.814 (0.609-0.912)	0.758	0.668	0.841
	Item 17	0.956 (0.907-0.979)		0.616	0.847
	Item 18	0.798 (0.580-0.904)		0.743	0.793

HBSE: Health Belief Model Scale for Exercise, ICC: Intra-class correlation coefficent; CI: confidence interval

measure internal consistency; a value of at least 0.70 indicated adequate internal consistency (20). The interclass correlation coefficient (ICC) model (the two-way random effects and absolute agreement methods) at 95% confidence interval was used for test-retest reliability. Reliability was considered acceptable if the ICC was between 0.50 and 0.75, considered good if values were 0.75-0.90, and excellent if it was above 0.90 (21). The HBSE and other variables' Spearman's correlation coefficients were used to examine the concurrent validity, which was provided within a 95% confidence interval. The coefficients were reported as follows: |0.00/0.10| = negligible correlation; |0.10/0.39| = weak

Table 4. Construct validity of the Health Belief Model Scale for Exercise

	Rho (95%CI)	***p[a]***
Convergent Validity		
Perceived Benefits Subscale of HBSE-*Exercise Benefits Subscale of EBBS*	0.752 (0.681-0.806)	<0.001
Perceived Objective Barriers Subscale of HBSE-*Exercise Barriers Subscale of EBBS*	0.660 (0.548-0.753)	<0.001
Perceived Subjective Barriers Subscale of HBSE-*Exercise Barriers Subscale of EBBS*	0.614 (0.500-0.709)	<0.001
Self-Efficacy Subscale of HBSE- ESES	0.741 (0.665-0.802)	<0.001
Perceived Severity of Physical Inactivity Subscale of HBSE – *Physical inactivity and not exercising harms my health (VAS)*	0.689 (0.588-0.770)	<0.001
Cues to Action Subscale of HBSE - *EDBS*	0.672 (0.563-0.769)	<0.001
Total Score HBSE– *Total Score of EBBS*	0.607 (0.491-0.707)	<0.001
Divergent Validity		
Age	0.019	0.779
BMI	0.170	0.022

HBSE= Health Belief Model Scale for Exercise, EBBS= Exercise Benefits/Barriers Scale, ESES= Exercise Self-Efficacy Scale, VAS= Visual analog scale, EDBS=Exercise Decisional Balance Scale

Table 5. Comparison of groups for known group validity

Known Groups	**Health Belief Model Scale for Exercise Total Score**	
	Median (IQR)	***p***
Gender		
Female	57(7)	0.048[a]
Male	55(7)	
Educational level		
Primary school	60(10)	
High school	54(10)	0.447[a]
University	56(7)	
Postgraduate	56(4)	
Marital Status		
Single	55(6)	
Married	57(8)	0.527[b]
Divorced	57(5)	
Regular Exercise Habit		
Yes	57(7)	0.003[a]
No	54(7)	

a= Mann Whitney U, b= Kruskal Wallis

correlation; |0.40/0.69| = moderate correlation; |0.70/0.89| = strong correlation; and |0.90/1.00| = very strong correlation (22). For validity analysis, it was considered acceptable if the coefficients were more than 0.3 (23). We hypothesized that HBSE subscales scores would have moderate to strong correlations between the other scales for convergent validity and poor correlations with age and body mass index (BMI) for divergent validity based on our clinical opinion. Known-group validity was analyzed according to gender, educational level, marital status, and regular exercise habits using the Kruskal Wallis or Independent Samples T test.

For sample size calculation, we considered the recommendations in the literature. The study participants should be range from 2 to 20 subjects per item, with an absolute minimum of 100 to 250 subjects according to Anthoine and colleagues (24). For validity, a minimum 61 participants were required to detect a correlation coefficient of 0.40 with alpha <0.05 and 90% power (25), and for reliability, a minimum sample size of 30 calculated the ICC at a 95% confidence interval (CI) with 90% power was sufficient to detect the value of at least 0.50 (26). In accordance with these recommendations, the study was included a total of 180 participants, and we sent the form to 30 of the participants for the retest.

RESULTS

The sample of the study consisted of 180 participants (female=115, male=65) with median age of 28 (25/36) years (min: 19, max: 61 years). The participants' characteristics and variables are presented in Table 1.

According to the Principal Component Analysis, it was observed that the scale had a 6-factor structure (Items 1, 2, 3: Factor 1; Items 4, 5, 6, 7: Factor 2; Items 8, 9, 10: Factor 3; Items 11, 12, 13: Factor 4, Items 14, 15: Factor 5, Items 16, 17, 18: Factor 6). The factors' explanation ratio was over 60% and the factor loadings ranged from 0.664 to 0.900 (Table 2). The subscales had good internal consistency (Cronbach α coefficients ranged from: 0.706 to 0.842). Cronbach's if item deleted coefficients vary between 0.611 and 0.824. For the total score of the scale, it had excellent intra-rater reliability (ICC: 0.914) and for the subscales, ICC values ranged from 0.710 to 0.956 at a 95% CI (Table 3).

It was observed a strong correlation between the perceived benefits subscale of HBSE with the exercise benefits subscale of EBBS (r=0.752, p<0.001), and between the self-efficacy subscale of HBSE with ESES score (r=0.741, p<0.001). Furthermore, it was found a moderate correlation between the perceived objective and subjective barriers subscales of HBSE with the exercise barriers subscale of EBBS (r=0.660, r=0.614, p<0.001, respectively), between the perceived severity of physical inactivity subscale of HBSE with the question was scored VAS (r=0.689, p<0.001), and between cues to action subscale of HBSE and EPCS scores (r=0.672, p<0.001). All subscales of HBSE scores with age and BMI did not correlate (p>0.05, Table 4). The participants who had regular exercise had higher health beliefs about exercise and males had lower values compared to females (p=0.003, p=0.048, respectively). The HBSE scores were not different among different educational levels and marital status of the participants (p>0.05, Table 5).

DISCUSSION

The Turkish version of the HBSE was demonstrated to be valid and reliable in examining personal health beliefs regarding exercise in our study, which also looked at the scale's internal consistency, test-retest reliability, and construct validity. The HBSE scale is one of the limited tools that comprehensively evaluate exercise-related beliefs. Notably, our study is the first to translate this scale into another language and examine its psychometric properties.

The HBM is one of the frameworks that can be used to predict and explain physical activity and exercise behavior (6). The current model of HBM encompasses six domains: perceived benefits, perceived susceptibility, perceived severity, perceived barriers, self-efficacy, and cues to action (6). All these domains of HBM will influence adaptation for physical activity (PA) and exercise behavior. While more perceived benefits will arouse more willingness to do, adapt, and sustain an exercise or PA program, perceived barriers will influence exercise behavior conversely (27). Self-efficacy is one of the most important parts of HBM. It is suggested that a patient's self-efficacy to exercise is among the crucial factors influencing exercise adherence (28). Taking action is an important step in the model of behavior change developed by Prochaska and Diclemente, and it plays a key role in transforming exercise into a wellness behavior (29). Therefore, it is important to evaluate the cues to action. If a person does not understand the potential threat of physical inactivity, she/he won't act for

exercise/find the motivation for exercise, and/or sustain the exercise behavior (30). For this reason, all domains of the HBM are considered necessary for exercise behavior.

In our study, it was observed that the Cronbach alpha ranged from 0.706 to 0.843 for all of the subscales of the Turkish version of the HBSE. Notably, when comparing the Cronbach's alpha of the original and the Turkish version of the HBSE, it was found that the Cronbach alpha of the Turkish version was higher (ranging from 0.63 to 0.84 in the original version of HBSE) (8). In addition, the moderate to strong ICC values revealed that assessment repeated 14-day intervals had a high level of test-retest reliability of the Turkish version of the HBSE. In the original study of this scale, test-retest reliability was not examined (8). In this respect, although we cannot compare it with the original scale, it may be said that the HBSE is a reliable tool to examine exercise beliefs.

It was found in the explanatory factor analysis of the HBSE that the six-factor model was applicable. The original version of the scale consisted of six factors (8) and all of the factors involves the same items in both versions. While factor loads of 18 items in the original version vary between 0.57 and 0.88, factor loads in the Turkish version show a slightly better factor load. (0.664 to 0.900).

In the original study of the scale, validity was not examined (8). However, the construct validity of the Turkish version of the scale was also examined in our study. Each subscale of the HBSE was assessed for convergent validity using valid and reliable scales that were relevant to the domain measured for each part of the HBSE (10,15,17).

Additionally, when comparing the study of the Turkish version with the original study, it could be noted that the Turkish version had a higher percentage of female and younger participants. Although age was not found to be associated with scores in our study, more studies are needed to further explore this issue. Health behaviors and beliefs are triggered by social, demographic, and environmental contexts.

Furthermore, these properties may impact males' and females' health behavior in similar or different ways. For instance, marital status may change behaviors, and marriage can support a healthier life for both females and males. The benefits for males are due to increased social control promoted by marriage (31). Thus, the benefits of marriage for males' health are more significant, whereas those of marriage for females' health tend to develop more gradually (32). It was thought that these differences are similar for PA and exercise. Existing literature highlights that positive influential factors for PA consist of several variables such as male gender, young age, high education level, and being married (33). Our study showed that health beliefs about exercise differ based on gender and regular exercise habits but not educational level and marital status. The literature about exercise behavior has varied results regarding gender differences. It was known that males frequently tend to more in exercise participation than females (34). It is said that gender roles may affect exercise behavior and beliefs in traditional cultures (35,36). Moreover, the gender difference in motivation for PA and exercise is an important predictor of this issue. Males' motivators consist of intrinsic triggers such as competition, individual interest, or gaining strength, while females' motivators include extrinsic triggers such as having a good appearance, losing weight, or attracting attention (37,38). Our results encourage that exercise belief in females was higher than in males. However, this issue may vary based on different health status and further research is needed for a more comprehensive understanding. Another variable found to affect exercise belief in our study is regular exercise habits. It has been observed that people with regular exercise habits tend to have higher exercise beliefs. This relationship can be viewed from both perspectives. The benefits that people gain from regular exercise habits may reinforce their exercise beliefs. Conversely, having a high exercise belief may be struct the groundwork for acquiring a regular exercise habit.

We had some limitations. We investigated the psychometric properties of the scale on young and educated population and our participants had narrow range of age. Additionally, we reached predominantly females more than males. In future studies, it may be considered these limitations and include mixed participants reflecting the general population.

CONCLUSION

To the best of our knowledge, the present study is the first study to examine the psychometric properties of another language version of the HBSE. There is a need for more studies to explore and determine differences among different nations, cultures, and populations. In this study, some basic determinants for exercise belief were considered. More research is needed, taking into account additional variables

related to exercise behavior and adherence. Especially, environmental variables should be assessed for health beliefs about exercise in future studies.

Acknowledgement: The authors thanks to all of the participants to attend the study.
Author contribution: Concept: MK, EF, İN; Design: MK, İN; Supervision: MK, İN; Data Collection/Processing: MK; Analysis/Interpretation: MK, İN; Literature Review: MK; Manuscript Writing: MK, İN; Critical Review: İN. All authors read and approved the final version of the manuscript.
Conflict of interests: The authors declare no conflict of interest.
Ethical approval: The ethical approval of the study was obtained from Izmir Katip Celebi University, Non Invasive Clinical Research Ethical Committee (Date: 18.03.2021, Decision No: 145) and conducted in accordance with the provisions of the Helsinki Declaration.
Funding: No funding.
Peer-review: Externally peer-reviewed.

REFERENCES

1. Chodzko-Zajko WJ, Proctor DN, Fiatarone Singh MA, et al. Exercise and physical activity for older adults. Med Sci Sports Exerc [Internet]. 2009;41(7):1510–1530.
2. Sallis R, Franklin B, Joy L, Ross R, Sabgir D, Stone J. Strategies for Promoting Physical Activity in Clinical Practice. Prog Cardiovasc Dis. 2015;57(4):375–386.
3. Bauman A, Merom D, Bull FC, Buchner DM, Fiatarone Singh MA. Updating the Evidence for Physical Activity: Summative Reviews of the Epidemiological Evidence, Prevalence, and Interventions to Promote "Active Aging." Gerontologist. 2016;56 (2):S268–S280.
4. Sherwood NE, Jeffery RW. The behavioral determinants of exercise: implications for physical activity interventions. Annu Rev Nutr. 2000;20:21–44.
5. Glanz, Karen, Barbara K. Rimer KV. Health Behavior and Health Education: Theory, Research, and Practice. 4th ed. Karen Glanz, Barbara K. Rimer KV, editor. Vol. 116, Annals of Internal Medicine. John Wiley & Sons; 2008. p. 45–62.
6. Rahmati-Najarkolaei F, Tavafan SS, Fesharaki MG, Jafari MR. Factors predicting nutrition and physical activity behaviors due to cardiovascular disease in tehran university students: application of health belief model. Iran Red Crescent Med J. 2015;17(3):1–6.
7. Dailey KD. Application of the health belief model to increase exercise behavior. California State University; Fullerton: 2001. p. 63.
8. Wu S, Feng X, Sun X. Development and evaluation of the health belief model scale for exercise. Int J Nurs Sci. 2020 Sep 10;7:S23–30.
9. Çiftçi N, Kadıoğlu H. Validity and Reliability of the Exercise Health Belief Model Scale. Clin Exp Heal Sci. 2020;10(4):369–374.
10. Ortabag T, Ceylan S, Akyuz A, Bebs H. The Validity and Reliability of the Exercise Benefits/Barriers Scale for Turkish Military Nursing Students. South African J Res Sport Phys Educ Recreat. 2010;32(2):55–70.
11. Mokkink LB, Terwee CB, Patrick DL, Alonso J, Stratford PW, Knol DL, et al. The COSMIN checklist for assessing the methodological quality of studies on measurement properties of health status measurement instruments: an international Delphi study. Qual Life Res. 2010;19(4):539–549.
12. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine (Phila Pa 1976). 2000;25(24):3186–3191.
13. Liu CC, Tsai LT. Factors Influencing Regular Exercise Habits of Women in Taiwan. Int J Environ Res Public Health. 2021;18(22):11960.
14. Sechrist KR, Walker SN, Pender NJ. Development and psychometric evaluation of the exercise benefits/barriers scale. Res Nurs Health. 1987;10(6):357–365.
15. Urdan T, Pajares F, editors. Guide for constructing self-efficacy scales. In: Self-Efficacy Beliefs of Adolescents. Information Age Publishing; 2006. p. 307–337.
16. Marcus BH, Rakowski W, Rossi JS. Assessing motivational readiness and decision making for exercise. Health Psychol. 1992;11(4):257–261.
17. 17. Gümüş Y, Kitiş Y. The Validity and Reliability of Exercise Behavior Change Scales. J Hacettepe Univ Fac Nurs. 2015;3(2):1–19.
18. Huskisson EC. Measurement of Pain. Lancet. 1974;304(7889):1127–1131.
19. Howard MC. A Review of Exploratory Factor Analysis Decisions and Overview of Current Practices: What We Are Doing and How Can We Improve? Int J Hum-Comput Int. 2016;32(1):51–62.
20. Fitzpatrick R, Davey C, Buxton MJ, Jones DR. Evaluating patient-based outcome measures for use in clinical trials: a review. Health Technol Assess (Rockv). 1998;2(14): 1-74.
21. Koo TK, Li MY. A Guideline of Selecting and Reporting Intraclass Correlation Coefficients for

Reliability Research. J Chiropr Med. 2016;15(2):155–163.
22. Schober P, Schwarte LA. Correlation Coefficients: Appropriate Use and Interpretation. Anesth Analg. 2018;126(5):1763–1768.
23. Terwee CB, Mokkink LB, Van Poppel MNM, Chinapaw MJM, Van Mechelen W, De Vet HCW. Qualitative attributes and measurement properties of physical activity questionnaires: a checklist. Sports Med. 2010;40(7):525–537.
24. Anthoine E, Moret L, Regnault A, Sbille V, Hardouin JB. Sample size used to validate a scale: a review of publications on newly-developed patient reported outcomes measures. Health Qual Life Outcomes. 2014;12:176.
25. Andresen EM. Criteria for assessing the tools of disability outcomes research. Arch Phys Med Rehabil. 2000;81(12 Suppl 2):S15-20.
26. Bujang MA, Baharum N. A simplified guide to determination of sample size requirements for estimating the value of intraclass correlation coefficient: A review. Arch Orofac Sci. 2017;12(1):1–11.
27. Bouma AJ, van Wilgen P, Dijkstra A. The barrier-belief approach in the counseling of physical activity. Patient Educ Couns. 2015;98(2):129–136.
28. Ha FJ, Hare DL, Cameron JD, Toukhsati SR. Heart Failure and Exercise: A Narrative Review of the Role of Self-Efficacy. Heart Lung Circ. 2018;27(1):22–27.
29. Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. Am J Heal Promot. 1997;12(1):38–48.
30. Biddle SJ, Psychology C. Theories of exercise behavior. Int J Sport. 2000;31(2):290–304.
31. Umberson D. Gender, marital status and the social control of health behavior. Soc Sci Med. 1992;34(8):907–917.
32. Lillard LA, Waite LJ. 'Til Death Do Us Part: Marital Disruption and Mortality. Am J Sociol. 2015;100(5):1131–1156.
33. Mao HY, Hsu HC, Lee S Da. Gender differences in related influential factors of regular exercise behavior among people in Taiwan in 2007: A cross-sectional study. PLoS One. 2020;15(1):e0228191.
34. Bauman A, Bull F, Chey T, Craig CL, Ainsworth BE, Sallis JF, et al. The International Prevalence Study on Physical Activity: results from 20 countries. Int J Behav Nutr Phys Act. 2009;6:21.
35. Chen YJ, Huang YH, Lu FH, Wu JS, Lin LL, Chang CJ, et al. The correlates of leisure time physical activity among an adults population from southern Taiwan. BMC Public Health. 2011;11:427.
36. Cheah YK, Poh BK. The determinants of participation in physical activity in malaysia. Osong public Heal Res Perspect. 2014;5(1):20–27.
37. Molanorouzi K, Khoo S, Morris T. Motives for adult participation in physical activity: type of activity, age, and gender. BMC Public Health. 2015;15:66.
38. Tsai LT, Lo FE, Yang CC, Keller JJ, Lyu SY. Gender differences in recreational sports participation among Taiwanese adults. Int J Environ Res Public Health. 2015;12(1):829–840.