

Cross-cultural adaptation, reliability, and validity of the Turkish version of the Exercise Therapy Burden Questionnaire for individuals with chronic diseases

F. Sari¹, S. Sari²

¹Department of Physiotherapy and Rehabilitation, Faculty of Physical Therapy and Rehabilitation, Bingöl University, Turkey; ²Department of Internal Medicine, Sanliurfa Training and Research Hospital, Sanliurfa, Turkey

SUMMARY

Objective. Chronic diseases, which caused 36 million deaths in 2008, are the most common cause of death worldwide. Exercise is one of the non-pharmacological treatment methods. Although exercise benefits are well known, more than half of the population does not exercise due to the burden of exercise. The objectives of the current study were to evaluate the Turkish version of the Exercise Therapy Burden Questionnaire (ETBQ-T) and to investigate its reliability and validity.

Methods. A total of 100 participants (female: 69, male: 31) who were diagnosed with at least one chronic disease participated in the translation validity and reliability analysis of the study. Cross-cultural adaptation of the ETBQ-T was performed according to Beaton's guidelines. The ETBQ-T, the European Quality of Life 5 Dimensions (EQ-5D), pain, satisfaction, and self-efficacy were applied for convergent validity. The ETBQ-T was retested to examine its reliability after 7 days.

Results. The internal consistency and reliability were excellent (intraclass correlation coefficient=0.959; Cronbach's α =0.919). The standard error of measurement was reported as 5.35. The minimum detectable difference was also demonstrated at 1.35. The ETBQ-T had a good correlation with pain ($r=0.545$, $p<0.001$), satisfaction ($r=0.501$, $p<0.001$), and self-efficacy ($r=0.579$, $p<0.001$). However, the correlation of the ETBQ-T with EQ-5D ($r=0.340$, $p=0.001$) was weak. A factor was extracted, accounting for 58.289% of the total variation. There were no floor or ceiling effects.

Conclusions. The ETBQ-T is a reliable and valid tool to evaluate the exercise burden in the Turkish population with chronic disease.

Key words: Chronic disease, Turkish, reliability, validity, translation.

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INTRODUCTION

Chronic diseases are the most common cause of death worldwide, and their prevalence is increasing day by day (1). Health services for chronic diseases are divided into pharmacological and non-pharmacological treatment methods (2, 3). The main aim of exercise, one of the non-pharmacological treatment methods, is to reduce pain, maintain normal joint range of motion, prevent loss of function in daily activities and work, and increase the quality of life, exercise capacity, cardiovascular capacity, and muscle strength. Exercise therapy

is also effective in reducing mortality and morbidity associated with musculoskeletal, cardiovascular, respiratory, and neurological diseases, diabetes, and cancer (4-6). Moreover, regular exercise can reduce psychological symptoms, reduce the level of fatigue, and improve the quality of life in patients with chronic diseases (7, 8). There is no consensus in the literature regarding treatment burden. While the aforementioned studies have highlighted its negative impact on patient function (9), it is clear that the burden of treatment not only affects treatment efficacy and well-being but also increases mortality (10, 11). Fur-

Corresponding author:

Fulden Sari
Department of Physiotherapy and Rehabilitation,
Faculty of Physical Therapy and Rehabilitation,
Bingöl University, Turkey
E-mail: fuldensari@hotmail.com

thermore, the burden of treatment may result in a waste of resources. Given these implications, it is necessary and important to evaluate the burden of treatment (12, 13). However, currently, there is only the Treatment Burden Questionnaire (TBQ) to assess the burden of treatment for individuals with chronic diseases. Unfortunately, the TBQ includes only one item related to physical activity (14). This limitation is significant, as it can be difficult for some patients to learn and perform exercises regularly and correctly due to time problems, fear of pain, or motivation issues. Measuring the burden of exercise therapy can help address these problems and improve the success of exercise programs by enabling the creation of personalized exercise programs. Motivational, informational, self-management, or behavior-based interventions effectively increase adherence to exercise regimes (15, 16). As a result, the Exercise Therapy Burden Questionnaire (ETBQ) was developed as an assessment tool (17).

The questionnaire is designed to evaluate the burden of exercise therapy on patients. It serves as a crucial tool in understanding the factors that affect patients' adherence to and participation in treatment. Additionally, the clinical utilization of ETBQ, by providing relevant patient information to the health-care worker, can enhance the quality of care through personalized treatment and alleviate the burden of exercise therapy. In clinical studies, the ETBQ can also be utilized to better analyze adherence to exercise therapy practices and evaluate interventions aimed at reducing the burden of exercise therapy. Therefore, the ETBQ may assist in the development of clinical guidelines for exercise therapy that take into account patients' experiences. Moreover, the ETBQ can evaluate the burden of exercise programs for many chronic diseases treated with various types of exercise therapies. In the original study, Martin *et al.* found similar average ETBQ scores for musculoskeletal, respiratory, neurological, and cardiovascular diseases, as well as diabetes. Furthermore, they did not observe the specificity of burden based on the type of disease during patient interviews. Hence, they emphasized that ex-

ercise therapy may not be disease-specific (15). Patient-reported outcome measures are increasingly being used and universally accepted as essential for patients to perceive their own health and disability status. These measurement methods are preferred because they are easier to use than traditional measurement methods. Patient-reported outcome measures are used to evaluate the effect of interventions, monitor disease progression, and evaluate the quality of life (18). The purpose of the study was to evaluate the validity and reliability of the Turkish version of the ETBQ (ETBQ-T).

■ MATERIALS AND METHODS

The study was designed as cross-sectional research. For the translation of the ETBQ-T questionnaire, permission was obtained from the authors, who are developers of the ETBQ questionnaire. The Bingol University Ethics Committee granted the study ethical approval (Date: 22/06/2022, Number: 22/13). An informed consent form was obtained from all individuals via an online form, and this study complied with the Declaration of Helsinki.

Translation procedure

In the study by Martin *et al.*, the original version of the questionnaire was in French. Hence, the items were translated from French. The cultural adaptation and translation process of the ETBQ-T questionnaire was carried out in five stages, as described by Beaton *et al.* (19).

Stage 1: initial translation

The ETBQ was translated from French to Turkish by two native Turkish speakers who were fluent in French and Turkish.

Stage 2: synthesis of the translations

The Turkish translations were synthesized and converted into a single translation.

Stage 3: back translation

The synthesized Turkish translation by two professional bilingual translators, who are both native French speakers and fluent in Turkish, was translated into French.

Stage 4: expert committee

The two translations from Turkish to French were synthesized and made into a single translation. The evaluation of compatibility and cultural adaptation in the Turkish language was carried out by a committee of four translators, a methodologist, and a Turkish linguist.

Stage 5: a test of the prefinal version

A pilot study was conducted with 40 people to evaluate comprehensibility. The final version of the ETBQ scale was created (*Supplementary Material 1*).

Patients

A total of 100 individuals (69 female and 31 male) who were diagnosed with chronic diseases (rheumatological disease, cancer, diabetes, respiratory disease, cardiovascular disease, etc.) were included in the study. Out of these individuals, 52 randomly selected individuals were asked to fill out the ETBQ-T again 7 days after the first assessment (Figure 1). It was calculated that 10 participants were needed per question based on the sample (20). Inclusion criteria for participants in the study:

- 1) having at least one diagnosis of chronic disease;
- 2) being between the ages of 18 and 65;
- 3) having Turkish as a first language;
- 4) being literate;
- 5) having a minimum knowledge of smartphone or computer usage or having a person with this knowledge to assist;
- 6) voluntary acceptance to participate in the study.

Exclusion criteria for participants: weak knowledge of the Turkish language. Termination criteria for the study:

- 1) participants wishing to leave the study can do so without providing any reason;
- 2) the data of patients who are unable to comply with the evaluation will not be included in the statistical analysis.

Outcome measures

The ETBQ scale developed in 2017 is used to evaluate the general burden of exercise therapy, pain, treatment satisfaction, and self-sufficiency in patients with at least one

chronic disease diagnosis. The questionnaire, which consists of 10 items, employs a Likert scale of 0 to 10 and scores between 0 and 100. It is a dimension. A higher score shows a greater exercise burden (17).

Individuals' quality of life was assessed with the European Quality of Life 5 Dimensions (EQ-5D) scale developed by the European Quality of Life Study Group. The EQ-5D includes five questions that evaluate health status in different areas, such as mobility, usual activities, anxiety, pain, and self-care, and a visual analog scale (VAS) that asks individuals to rate their overall health status. Each item on the scale has three standard responses: "I do not experience difficulty", "I experience moderate difficulty", and "I experience extreme difficulty". The VAS obtains scores between 0 and 100, and the closer the score is to 100, the greater the improvement in health status (21).

The VAS is a scoring system that ranges from 0 to 10 and is located horizontally or vertically at one-point intervals. While 0 shows "no pain", 10 shows "worst pain imaginable". Moreover, the VAS was also used for satisfaction and self-efficacy. While 0 means "absolutely no", 10 indicates "absolutely yes". The lower the score, the higher the individual's poor satisfaction and self-efficacy (22).

Statistical analysis

Statistical analyses were performed using the Statistical Package for the Social Sci-

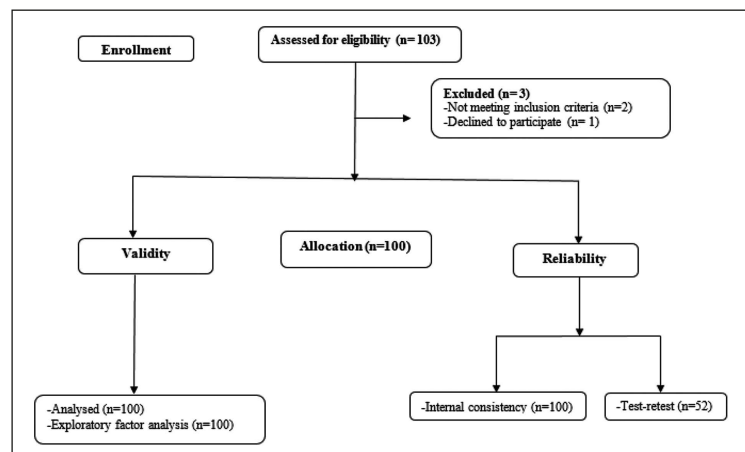


Figure 1 - Flow diagram of the patients.

ences 22.0 (IBM, Armonk, NY, USA). To assess the normal distribution of the data, Kolmogorov-Smirnov test findings, histograms, detrended Q-Q plots, and skewness/kurtosis values, were evaluated. Data indicating a normal distribution are stated as mean \pm standard deviation.

Internal consistency analysis was examined using the Cronbach α and intraclass correlation coefficient (ICC) [95% confidence interval (CI)]. The Cronbach α value between 0.70 and 0.95 indicated high internal consistency. ICC value ranges from 0.00 to 1.00. When the value is between 0.60 and 0.80, it is interpreted as good reliability, and a value above 0.80 also indicates excellent reliability.

Reproducibility was investigated by calculating the standard error of measurement (SEM) and minimal detectable difference (MDD) values. The SEM was examined with the formula $SD \times \sqrt{1-ICC}$. The SEM presents a range around the analyzed value and determines the size of the calculation error contained in a questionnaire (23). The MDD was also determined with the formula $1.96 \times SEM \times \sqrt{2}$. The MDD value demonstrates whether the observed change is real and potentially an assessment error (24).

Construct validity was evaluated through convergent validity. To determine the correlation between the ETBQ and other scales (EQ-5D, pain, satisfaction, and self-efficacy), Pearson Correlation Analysis was used and interpreted as excellent, very good, good, weak, and inadequate (0.81-1.00, 0.61-0.80, 0.41-0.60, 0.21-0.40, and 0-0.20, respectively).

Before factor analysis, the Kaiser Meyer Olkin (KMO) and Bartlett tests were performed to check the suitability of the collected data for factor analysis. The percentage of participants with minimum and maximum scores was analyzed to reveal floor (0%) and ceiling (0%) effects. All values were accepted as statistically significant at $p < 0.05$ (25).

■ RESULTS

A hundred participants were included: 69 females (69%) and 31 males (24%) with a

Table 1 - Sociodemographic characteristics at baseline.

Sociodemographic characteristics	
Gender, n (%)	
Female	69 (69)
Male	31 (31)
Age (years), mean \pm SD	51.32 \pm 13.96
BMI (kg/m ²)	25.19 \pm 6.48
Marital status, n (%)	
Married	76 (76)
Single	24 (24)
Education, n (%)	
Elementary school	44 (44)
High school	25 (25)
University	31 (31)
Professional status, n (%)	
Employee	54 (54)
Non-employee	34 (34)
Retired	10 (10)
On sick leave	2 (2)
Exercise habit, n (%)	
Yes	61 (61)
No	39 (39)
Sports activities, n (%)	
Swimming	2 (3.3)
Walking	46 (75.4)
Cycling	1 (1.6)
Other	12 (12)
Self-reported compliance (sports activities), mean \pm SD	
Frequency per week	40.49 \pm 27.31
Duration (min/wk)	8.45 \pm 12.60
Home-based exercise program, n (%)	
Yes	28 (28)
No	72 (72)
Self-reported compliance (home-based exercise program), mean \pm SD	
Frequency per week	35.71 \pm 16.14
Duration (min/wk)	4.35 \pm 2.18
Physical therapy, n (%)	
Yes	75 (75)
No	25 (25)
Location (physical therapy), n (%)	
Home	7 (28)
Private practice	13 (52)
Outpatient clinic	5 (20)
Sessions per year, n (%)	
<20	9 (36)
20-50	9 (36)
>50	7 (28)

SD, standard deviation; n, number; BMI, body mass index. All correlations are statistically significant with $p < 0.001$.

mean age of 51.32±13.96 years. Table I shows general characteristics.

The chronic diseases of the participants were as follows: rheumatologic diseases [24 (24%)], cancer [4 (4%)], diabetes [27 (27%)], respiratory diseases [19 (19%)], neurologic diseases [2 (2%)], cardiovascular diseases [19 (19%)] and systemic diseases [5 (5%)]. Of the participants, 49 (49%) had more than one chronic condition (Table II).

Reliability

Test-retest ICC values were between 0.842 and 0.946. In addition, the ICC value of the total score of the ETBQ-T questionnaire was 0.959. The ETBQ-T test-retest findings were excellent according to the ICC values. The Cronbach's α of the ETBQ-T was 0.919, showing excellent internal consistency. When each item of the questionnaire was deleted, Cronbach's α value of the ETBQ-T was between 0.909 and 0.915 (Table III).

Reproducibility

The SEM indicated 5.35 at 95% CI, and MDD was found to be 1.35 at 95% CI.

Validity

Convergent validity

The correlation of the ETBQ-T with pain $r=0.545$ ($p<0.001$); satisfaction $r=-0.501$ ($p<0.001$) and self-efficacy $r=-0.579$ ($p<0.001$)

Table II - Medical characteristics and patient-reported outcomes at baseline.

Medical characteristics	
<i>Chronic condition</i>	
Rheumatologic diseases, n (%)	
Rheumatoid arthritis	6 (6)
Ankylosing spondylitis	4 (4)
Fibromyalgia syndrome	7 (7)
Sjögren's syndrome	2 (2)
Behcet's syndrome	2 (2)
Systemic lupus erythematosus	3 (3)
Cancer, n (%)	
Uterine cancer	2 (2)
Leukemia	2 (2)
Diabetes mellitus, n (%)	27 (27)
Respiratory diseases, n (%)	
Chronic obstructive pulmonary disease	4 (4)
Asthma	10 (10)
Interstitial lung disease	5 (5)
Neurologic diseases, n (%)	2 (2)
Stroke	
Cardiovascular diseases, n (%)	
Hypertension	17 (17)
Cardiac arrhythmia	1 (1)
Atrial septal defect	1 (1)
Systemic diseases, n (%)	
Chronic renal failure	5 (5)
Patients with >1 chronic condition (self-reported), n (%)	49 (49)
Patient-reported outcomes, mean±SD	
ETBQ-T	39.22±26.44
EQ-5D	7.09±1.92
Pain	3.52±3.16
Satisfaction	4.48±3.10
Self-efficacy	4.49±3.30

SD, standard deviation; n, number; ETBQ-T, Exercise Therapy Burden Questionnaire-Turkish; EQ-5D, European Quality of Life-5 Dimensions. All correlations are statistically significant with $p<0.001$.

Table III - Intraclass correlation coefficient and Cronbach's α if item deleted results for the Turkish Exercise Therapy Burden Questionnaire.

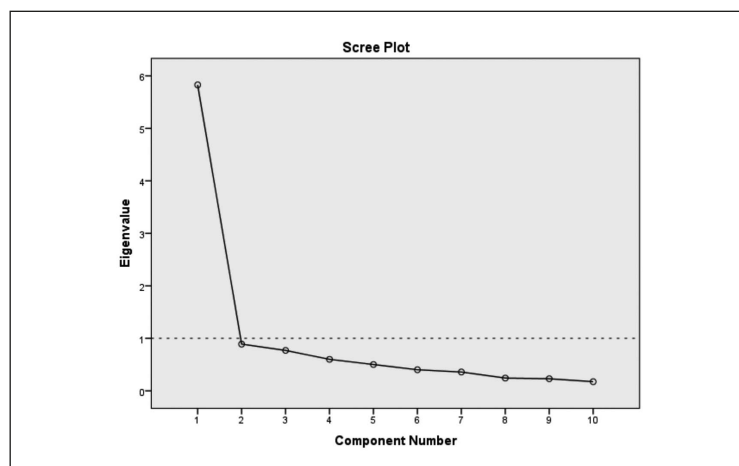
ETBQ-T	ICC (95% confidence interval) Lower-Upper Bound	Cronbach's α if item deleted	
Item 1	0.842 (0.725-0.909)	Except for item 1	0.909
Item 2	0.926 (0.871-0.958)	Except for item 2	0.910
Item 3	0.861 (0.757-0.920)	Except for item 3	0.910
Item 4	0.898 (0.822-0.941)	Except for item 4	0.909
Item 5	0.876 (0.784-0.929)	Except for item 5	0.913
Item 6	0.946 (0.906-0.969)	Except for item 6	0.913
Item 7	0.932 (0.881-0.961)	Except for item 7	0.910
Item 8	0.861 (0.759-0.920)	Except for item 8	0.915
Item 9	0.855 (0.747-0.917)	Except for item 9	0.911
Item 10	0.855 (0.748-0.917)	Except for item 10	0.915
Total score	0.959 (0.929-0.977)	Total score	0.919

ICC, intraclass correlation coefficient; ETBQ-T, Exercise Therapy Burden Questionnaire-Turkish

Table IV - Convergent validity of the Turkish Exercise Therapy Burden Questionnaire.

ETBO-T	EQ-5D		Pain		Satisfaction		Self-efficacy	
	r	p	r	p	r	p	r	p
	0.340	0.001	0.545	<0.001	-0.501	<0.001	-0.579	<0.001

ETBQ-T, Exercise Therapy Burden Questionnaire-Turkish; EQ-5D, European Quality of Life-5 Dimensions; r, Pearson correlation coefficient; p, statistical significance level.

**Figure 2** - Principal component analysis, scree plot.

were good while EQ-5D $r=0.340$ ($p=0.001$) was weak (Table IV).

Structural validity

The results of the KMO (0.889) and Bartlett tests (604.846, $p<0.001$) show that the sample was adequate for factor analysis ($p<0.001$). There is a single-factor dimension indicated by the scree plot graph in the questionnaire (Figure 2). The factor of the ETBQ-T comprises 58.289% of the total variance, which indicates the questionnaire has a factor dimension.

Floor and ceiling effects

The participants did not present the maximum or minimum score for the ETBQ-T (range score 0-95), and no floor (0 %) and ceiling (0 %) effects were found.

■ DISCUSSION AND CONCLUSIONS

The purpose of the current study was to examine the validity and reliability of ETBQ among Turkish participants with chronic diseases. The translation and cross-cultural

adaptation processes followed Beaton's guidelines, and no systematic problems were encountered at any stage of the guidelines in this study (19). The most essential result of this study was that the ETBQ-T was found to be a valid and reliable evaluation instrument for the Turkish population with chronic diseases.

Evidence from previous studies has highlighted the significance of exercise in the prevention of chronic diseases and the improvement of health and well-being. Studies associated sedentary lifestyles with obesity, type 2 diabetes, and cancer, while regular exercise habits were reported to reduce the severity of many chronic diseases (26-28). Despite the evidence of regular exercise benefits, more than half of the population does not engage in regular exercise (29, 30).

In addition, validation studies of scales are essential for eliminating research and clinical limitations when evaluating patients. Disease-specific questionnaires are often more important than general measurement tools. Given these factors, these studies retain their significance in terms of clinical advancements from the past to the present and into the future. In this regard, bringing ETBQ-T to the literature will certainly contribute to the existing body of knowledge.

The original version of the ETBQ's internal consistency was excellent, with a Cronbach's α of 0.860 (95% CI 0.820-0.890) (17). Similarly, the Spanish version of the ETBQ had excellent Cronbach's α rates of 0.871 (31). The ETBQ-T, with Cronbach's α of 0.919, demonstrated higher internal consistency than the original and the Spanish versions. This Cronbach's α value indicates the significant reliability and excellent level of internal consistency of the ETBQ-T, consistent with previous studies (17, 31). We believe that the scale items effectively

conveyed their intended meanings, resulting in high internal consistency. Additionally, the number of items was adequate for the assessment of exercise burden. Obtaining excellent internal consistency for items is crucial for ensuring reliability in assessing a pathology.

Reproducibility is shown in the accuracy of repeated ETBQ-T scores. The SEM and MDD are indicated in the same units as the original evaluation tools, and, therefore, both of them have clinical benefits. The SEM and MDD values were not evaluated in the original or Spanish versions (17); our study was the first to calculate SEM and MDD values. The low SEM (5.35) and MDD (1.35) in the current study demonstrated that the ETBQ-T is a sensitive measurement tool for examining patients with chronic diseases. The fact that there is no indication of any floor (0%) or ceiling (0%) effect on the population of the chronic disease in the present study, consistent with the ETBQ, confirms the responsiveness of the ETBQ-T for any evaluation and intervention.

Marx *et al.* reported no significant difference in the test-retest analysis range from 2 days to 2 weeks (32). In our study, participants completed the ETBQ at 1-week intervals for test-retest analysis. While Martin *et al.* found that the test-retest ICC value was 0.93 (0.85-0.97) in the original version, the Spanish version was 0.745 (0.604-0.841) (17, 31). The ETBQ-T, with an ICC of 0.959, demonstrates excellent test-retest reliability and is higher than the original and Spanish versions of the ETBQ.

Factor analysis showed a single factor for approximately 58.289% of the variance, indicating that this one factorial group of the ETBQ-T made it possible to associate all items into a single score. In contrast, the Spanish version identified a 3-factor subgroup (31), while in our study, the factor analysis was similar to the original version because of a single factor (17).

The convergent validity of ETBQ-T was examined with EQ-5D, pain, satisfaction, and self-efficacy using Spearman's correlation coefficient. We found a good positive correlation between ETBQ-T and pain, sat-

isfaction, and self-efficacy, while a weak positive correlation between ETBQ and EQ-5D was determined. The original version of the ETBQ had a weak correlation with EQ-5D ($r=-0.28$, $p=0.0003$), pain ($r=0.37$, $p<0.0001$), and self-efficacy ($r=-0.34$, $p<0.0001$), and a good correlation with TBQ ($r=0.52$, $p<0.0001$), and satisfaction ($r=-0.49$, $p<0.0001$) (17). The relationship of the Spanish ETBQ with EQ-5D and TBQ was evaluated, and correlations ranging from weak to good were found, respectively. However, the correlation of ETBQ with pain and satisfaction was examined and determined to be inadequate in the Spanish version (31). As there is no Turkish version of the TBQ, ETBQ-T was not evaluated for correlation with the TBQ questionnaire. However, its relationship with all scales has been found to be higher than other versions of the ETBQ in the current study.

The current study has several limitations. First, the illness of the participants in this study was not specific, as the ETBQ-T questionnaire assesses different chronic diseases. Future research could perform ETBQ only on patients with one of the illnesses to provide more targeted insights. Second, responsiveness, which is the sensitivity of a scale to clinical changes and changes over time, was not assessed in the ETBQ-T questionnaire because patients had different chronic diseases and were followed by different clinics. For this reason, this should be examined in future studies, as should the responsiveness of the ETBQ. Exercise plays a significant role in the management of chronic diseases. However, currently, there is no scale available to measure the exercise burden of patients. We believe that the most significant strength of this study is its ability to address this gap in clinical practice and research studies. Studies aimed at ensuring the cultural adaptation of questionnaires are crucial and necessary for advancing both research and clinical evaluations.

The current study indicates that the ETBQ-T is a reliable, valid, and suitable clinical and research tool for assessing the exercise burden of patients with chronic diseases.

Furthermore, researchers should consider using the ETBQ-T to assess exercise burden and identify barriers in their studies.

Contributions

FS, the idea for the study; FS, SS, planning the methods to generate a hypothesis, the data collection for study, analysis, and writing. Both authors read and approved the manuscript.

Conflict of interest

The authors declare that they have no conflict of interest.

Ethics approval and consent to participate

Ethical approval of the study was obtained by the Bingol University Ethics Committee (date: 22/06/2022, number: 22/13). This study complied with the Declaration of Helsinki.

Informed consent

An informed consent form was obtained from all individuals *via* an online form.

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Availability of data and materials

Data and materials are available from the corresponding author upon request.

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