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ORIGINAL ARTICLE

Validity and reliability of the Turkish version of Exercise Benefits/ Barriers Scale: Perceived exercise benefits and barriers of patients with different axial spondyloarthritis subtypes

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ABSTRACT

Objectives: The aim of this study was to translate the Exercise Benefits/Barriers Scale (EBBS) into Turkish and investigate the perceptions of Turkish-speaking patients with different axial spondyloarthritis (axSpA) subtypes regarding exercise benefits and barriers.

Patients and methods: This validation study was conducted between June 2018 and December 2021. Patients with axSpA were consecutively assessed regarding physical (age, sex and body mass index) and disease-related characteristics (disease activity, spinal mobility, functional status, quality of life, health status, emotional status, and kinesiophobia). Eligible participants were asked to complete the EBSS and other outcome measurements during their initial visits. EBBS was readministered 7 to 14 days later.

Results: One hundred forty-eight patients (89 males, 59 females; mean age: 44.3±11.8 years; range, 19 to 65 years) were included in the study. Of the patients, 108 had radiographic axSpA, and 40 had nonradiographic axSpA. EBBS-Barriers and EBBS-Benefits subscales demonstrated adequate internal consistency (Cronbach's alphas of 0.82 and 0.95, respectively) and test-retest reliability (intraclass correlation coefficients of 0.837 and 0.807, respectively). No significant differences were observed between axSpA subtypes regarding EBBS-Barriers (p=0.12) and EBBS-Benefits (p=0.10) subscales. Significant relationships were detected between kinesiophobia and EBBS-Barriers scores (r=−0.424, p<0.01), as well as EBBS-Benefits scores (r=−0.344, p<0.01) for all patients. EBBS-Benefits scores were correlated to health status (r=−0.412, p=0.08) and quality of life (r=−0.394, p=0.01) in patients with nonradiographic axSpA.

Conclusion: According to our results, the Turkish EBBS is a valid and reliable tool for patients with axSpA. Perceptions of the patients with axSpA regarding exercise barriers and benefits do not differ according to the disease subtype. It appears that kinesiophobia may be an important parameter regarding exercise perception in axSpA.

Keywords: Arthritis, exercise, patient reported outcome, reliability, validity.

Axial spondyloarthritis (axSpA) is the umbrella term for inflammatory arthritides of the spine, which share common genetic, epidemiological, radiological, and clinical features.[1,2] The prevalence of axSpA demonstrates great variation globally, with a wide range from 6.5 in Japan to 540 in Türkiye in every 100,000 individuals.[3] The radiological status of the spine determines the subtype of the disease as radiographic axSpA (r-axSpA, previously known as ankylosing spondylitis) and nonradiographic axSpA (nr-axSpA).[4,5]

The Assessment of SpondyloArthritis International Society (ASAS) and the European Alliance of Associations for Rheumatology (EULAR) recommend regular exercise as an essential part of the disease management in patients with axSpA.[6,7] Regular exercise not only leads to many health-promoting benefits, such as improved muscle strength, increased exercise capacity, decreased fatigue, and diminished depression, but also helps to decrease disease activity, improve spinal mobility, and enhance functional status in patients with axSpA.[8,9] However, numerous previous studies suggest that patients with axSpA are not as physically active as their healthy peers, and at least half of the patients with axSpA do not exercise as recommended.[5,10,11] Moreover, a recent study revealed that physical activity patterns show differences between patients with r-axSpA and nr-axSpA.[5] Thus, determining the perception of the patients with different disease subtypes regarding the benefits and barriers of exercise may be beneficial for implementing recommendations. However, to our knowledge, the differences in the perception of exercise benefits and barriers were not compared between axSpA subtypes.

Perceptions of exercise benefits and barriers of patients with axSpA were previously evaluated in a French-speaking cohort by using the Exercise Benefits/Barriers Scale (EBBS).[11] However, even though a previous attempt was made to translate EBBS into Turkish for a healthy population,[12] the utility of EBBS for Turkish-speaking patients with axSpA was not investigated. Therefore, this study aimed to achieve three main goals: *(i)* formally and systematically translating EBBS into the Turkish language and investigating its psychometric properties in Turkish-speaking patients with axSpA, *(ii)* comparing the perceptions regarding exercise barriers and benefits between different axSpA subtypes, and *(iii)* investigating the relationships between perceived barriers/benefits of exercise and disease-specific indices in patients with r-axSpA and nr-axSpA.

PATIENTS AND METHODS

This validation study was performed at the İzmir Katip Çelebi University, Atatürk Training and Research Hospital between June 2018 and December 2021. Participants were recruited from the patients who were on regular follow-ups at the rheumatology department. The inclusion criteria were as follows: *(i)* being between 18 and 65 years old and *(ii)* being classified as axSpA according to the ASAS axSpA classification criteria.[13] The exclusion criteria were as follows: *(i)* having additional health conditions that may affect performing regular exercise (e.g., pregnancy, neurological disorder, and acute orthopedic injury) and *(ii)* having difficulties in understanding/reading the Turkish language.

Exercise Benefits/Barriers Scale was developed in 1987 by Sechrist et al.[14] to evaluate the perceptions of individuals on the benefits and barriers of the exercise. The permissions were obtained from Dr. Sechrist prior to the study via electronic mail. The psychometric properties of the original EBBS were reported to be acceptable (intraclass correlation coefficient [ICC]=0.89, Cronbach's alpha= 0.954).[14] The EBBS has a 4-point Likert-type layout with answers ranging from 4 (strongly agree) to 1 (strongly disagree). EBBS consists of two main parts, EBBS-Benefits subscale (29 items; scores ranging from 14 to 56) and EBBS-Barriers subscale (14 items; scores ranging from 29 to 116). EBBS-Barriers subscale items (items: 4, 6, 9, 12, 14, 16, 19, 21, 24, 28, 33, 37, 40, and 42) are reverse-scored. Missing data are handled in one of two ways. If more than 5% of the items are unanswered, it is recommended that the response be discarded.[14] If the missing item response rate is less than 5%, median substitution prevents falsely low scores. These subscales are generally used separately. Lower scores indicate a higher exercise barrier perception for the EBBS-Barriers subscale, and higher scores suggest a more positive perception regarding exercise for the EBBS-Benefits subscale.

The protocol described by Beaton et al.[15] was employed for the translation of the EBBS. First, the original English version of the EBBS was translated into Turkish by two independent native Turkish speakers (one with a medical background, one without) who had excellent proficiency in English. Disagreements between translators were resolved by a third person. Following the generation of the initial Turkish version, two different independent translators who had proficiency in the Turkish language and native speakers of the English language without a medical background translated EBBS back into English. A committee formed of researchers and the translators of the study checked the back-translated version for any major disagreements or poor wording choices.

Following these steps, 30 healthy individuals assessed the form in terms of language use and clarity, and none suggested any major revisions. Following minor revisions, the final version of the Turkish EBBS was generated and used in the present study (Appendix). The face validity of the final version of Turkish EBBS was reassessed by 44 patients with axSpA at the end of the study.

Physical features (age, sex and body mass index), and disease-related characteristics (axSpA subtype and medications) were recorded using a structured form. The following aspects of the disease were evaluated: *(i)* disease activity with the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI);[16] *(ii)* spinal mobility with the Bath Ankylosing Spondylitis Metrology Index (BASMI);[17] *(iii)* functional status with the Bath Ankylosing Spondylitis Functional Index (BASFI);[18] *(iv)* disease-related quality of life with the Ankylosing Spondylitis Quality of Life Questionnaire (ASQoL);[19] *(v)* health status with the ASAS Health Index (ASAS-HI);[20] *(vi)* emotional status with the Hospital Anxiety and Depression Scale (HADS);[21] *(vii)* kinesiophobia with the Tampa Scale of Kinesiophobia (TSK).[22,23] Higher scores in BASDAI, BASMI, BASFI, ASQoL, HADS, and TSK indicate poorer outcomes, whereas lower scores in ASAS-HI are associated with a poorer health status.

Eligible participants were asked to complete the EBSS and other outcome measurements during their initial visits. The EBBS was subsequently readministered seven to 14 days after the initial visit to investigate test-retest reliability.

Statistical analysis

Statistical analysis was performed using SPSS version 16.0 software (SPSS Inc., Chicago, IL, USA). The normality of distribution was analyzed using the Kolmogorov-Smirnov test and histograms. As data were normally distributed, continuous data were expressed as mean ± standard deviation (SD). Face validity was considered ≥75% agreement of the patients that no changes were needed on the final version of Turkish EBBS. Internal consistency was checked with corrected item-total correlation levels ($r \geq 0.30$)[24] and Cronbach's alpha values (≥0.80).[25] ICCs in 95% confidence interval (CI) (two-way mixed-effects model, single measures) were used to examine the test-retest reliability.

ICCs were interpreted as follows: >0.90, excellent; 0.90-0.71, good; 0.70-0.51, moderate; 0.50-0.31, fair; ≤0.30, negligible.[26] Standard error measurement (SEM) refers to the amount of variability in a test administered to a group that is caused by measurement error when a test is repeated. SEM was calculated using the following formula: $SEM = SD \times \sqrt{1\text{-}ICC}$.[27] Minimal detectable change (MDC) is a statistical estimation of the smallest amount of change that should be present between two performed measurements that indicates a significant change in ability or a true change of the results. MDC in 95% CI values were calculated using the following formula: $MDC = 1.96 \times SEM \times \sqrt{2}$.[27]

Two distinct criteria were employed to evaluate the presence of floor and ceiling effects. First, the percentage of participants who achieved the minimum and maximum scores for each measurement was calculated. Consistent with previous research,[28] values exceeding 15% were considered indicative of the presence of either a floor or ceiling effect. The second criterion was based on absolute skewness ($\gamma 1$) values. It was posited that a $\gamma 1$ value exceeding +1 signified the presence of a floor effect, while a $\gamma 1$ value below −1 signified the presence of a ceiling effect.[29]

Welch one-way analysis of variance test was used to compare EBBS-Barriers and EBBS-Benefits scores between the r-axSpA and nr-axSpA subtypes. Mean differences in 95% CIs and effect sizes (Cohen's d) were calculated using the following formula: $d = (Mean_1 - Mean_2)/\sqrt{[(SD_1^2 + SD_2^2)/2)]}$.[30] Categorical data, such as sex, were compared using the chi-square test. A p-value <0.05 was considered statistically significant.

The level of correlations between BASDAI, BASMI, BASFI, ASQoL, ASAS-HI, HADS, and TSK and EBBS-Barriers and EBBS-Benefits scores were analyzed using Pearson correlation coefficient (r) to investigate potential associations. Correlation coefficients were interpreted as follows: >0.90, excellent; 0.90-0.71, good; 0.70-0.51, moderate; 0.50-0.31, fair; ≤0.30, negligible.[26]

Table 1. Physical and disease-related characteristics

	r-axSpA (n=108)		nr-axSpA (n=40)			All axSpA (n=148)	
	n	Mean±SD	n	Mean±SD	*p**	n	Mean±SD
Physical characteristics							
Age (year)		45.24±12.11		41.75±10.63	0.09b		44.3±11.8
Sex					<0.01a		
Male	75		14			89	
Female	33		26			59	
Body mass index (kg/m^2)		27.11±4.74		25.98±4.83	0.20b		26.81±4.78
Disease-related characteristics							
BASDAI		2.94±2.22		2.78±2.05	0.69b		2.9±2.18
BASFI		2.73±2.28		2.25±2.02	0.22b		2.6±2.22
BASMI		3.47±1.92		2.33±1.36	<0.01b		3.16±1.85
ASQoL		6.53±5.36		6.3±5.23	0.81b		6.47±5.31
ASAS-HI		6.29±4.03		6.17±4.4	0.89b		6.25±4.12
HADS-anxiety		6.49±3.96		6.93±4.04	0.56b		6.6±3.97
HADS-depression		6.14±4.35		6.07±4.64	0.93b		6.13±4.41
Tampa Scale of Kinesiophobia		40.23±6.37		38.47±6.09	0.13b		39.76±6.32

r-axSpA: Radiographic axial spondyloarthritis; nr-axSpA: Nonradiographic axial spondyloarthritis; axSpA: Axial spondyloarthritis; SD: Standard deviation; BASDAI: Bath Ankylosing Spondylitis Disease Activity Index; BASFI: Bath Ankylosing Spondylitis Functional Index; BASMI: Bath Ankylosing Spondylitis Metrology Index; ASQoL: Ankylosing Spondylitis Quality of Life Questionnaire; ASAS HI: The Assessment of SpondyloArthritis international Society Health Index; HADS: Hospital Anxiety and Depression Scale; * p<0.05; a: Chi-square test; b: Welch One-Way ANOVA test.

Table 2. Internal consistency of EBBS-Barriers subscale (n=148)

	Scale mean if item deleted	Scale variance if item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted
Item 4	37.01	26.72	0.45	0.81
Item 6	37.34	27.46	0.32	0.82
Item 9	37.00	25.73	0.57	0.80
Item 12	36.64	26.41	0.46	0.81
Item 14	36.71	26.44	0.51	0.81
Item 16	36.95	26.25	0.44	0.81
Item 19	37.23	26.25	0.46	0.81
Item 21	36.82	27.31	0.28	0.83
Item 24	36.76	28.16	0.25	0.82
Item 28	36.55	26.58	0.44	0.81
Item 33	36.76	26.60	0.41	0.81
Item 37	36.80	25.26	0.62	0.80
Item 40	36.95	25.45	0.56	0.80
Item 42	36.89	25.61	0.53	0.81
Cronbach's alpha for total EBBS-Barriers subscale				**0.82**

EBBS: Exercise Benefits/Barriers Scale.

Table 3. Internal consistency of EBBS-Benefits subscale (n=148)

	Scale mean if item deleted	Scale variance if item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted
Item 1	82.97	155.16	0.62	0.95
Item 2	82.80	154.77	0.67	0.95
Item 3	82.79	156.07	0.63	0.95
Item 5	82.86	158.61	0.53	0.95
Item 7	82.70	157.59	0.69	0.95
Item 8	82.84	155.40	0.71	0.95
Item 10	82.74	155.07	0.72	0.95
Item 11	82.98	156.87	0.56	0.95
Item 13	82.89	158.56	0.58	0.95
Item 15	82.69	157.03	0.64	0.95
Item 17	82.75	156.91	0.68	0.95
Item 18	82.64	158.75	0.64	0.95
Item 20	82.79	153.51	0.77	0.95
Item 22	82.82	155.46	0.67	0.95
Item 23	82.71	155.48	0.76	0.95
Item 25	83.26	156.83	0.54	0.95
Item 26	82.84	154.57	0.74	0.95
Item 27	83.00	156.56	0.52	0.95
Item 29	83.03	154.31	0.69	0.95
Item 30	83.09	157.62	0.48	0.95
Item 31	82.68	155.02	0.79	0.95
Item 32	82.79	156.59	0.69	0.95
Item 34	83.09	161.11	0.31	0.96
Item 35	82.85	155.20	0.72	0.95
Item 36	82.84	155.88	0.70	0.95
Item 38	82.97	154.82	0.73	0.95
Item 39	83.41	160.42	0.38	0.95
Item 41	82.72	156.55	0.73	0.95
Item 43	82.76	156.89	0.65	0.95
Cronbach's alpha for total EBBS-Barriers subscale				**0.95**

EBBS: Exercise Benefits/Barriers Scale.

RESULTS

The study was completed with 148 patients (89 males, 59 females mean age: 44.3±11.8 years; range, 19 to 65 years) with axSpA (108 with r-axSpA and 40 with nr-axSpA). There were significant differences in sex distribution ($p<0.01$) and BASMI scores ($p<0.01$) between subtypes (Table 1). No other significant differences were detected between axSpA subtypes ($p>0.05$, Table 1). Five patients were not on any medication, 48 were using nonsteroid anti-inflammatory drugs, four were using disease-modifying antirheumatic drugs, 81 patients were on tumor necrosis factor-alpha inhibitors, and nine were using other biological agents.

The face validity of the final version of Turkish EBBS was assessed by 44 patients (26 males, 18 females; mean age: 43.8±9.9 years; range, 19 to 65 years) with axSpA (36 with r-axSpA and 8 with nr-axSpA) at the end of the study. Seventeen (39%) of the patients had a primary education (8 years of education), 11 (25%) had a secondary education (high school or equivalent 12 years of education), and 16 (36%) had a higher education degree (bachelor or higher with at least 14 years of education). Thirty-three (75%) of patients did not offer any changes to the final version of the Turkish EBBS. Three (7%) patients recommended minor word changes (e.g., using "to motivate" instead of "to encourage"). Three (7%) patients indicated that some items (items 13, 25, 28, and 29) sounded irrelevant/funny. One (2%) patient declared that some items inquired the same things and that the number of items could be decreased. One patient reported that EBBS might not be suitable for patients with advanced disease, and one patient raised concerns that the questions were not for every level of education. One patient suggested a dichotomous (yes/no) way of answering would be easier.

The internal consistencies of both EBBS-Barriers and EBBS-Benefits were good, with Cronbach's alpha values of 0.82 and 0.95, respectively. Item-total correlation analyses demonstrated that the extraction of the items did not cause a significant increase (≥10%) in total correlation (Tables 2, 3).

Test-retest reliability of EBBS was analyzed in 57 patients with axSpA. ICC analyses revealed that both EBBS-Barriers (ICC=0.837, 95% CI: 0.738-0.900) and EBBS-Benefits (ICC=0.807, 95% CI: 0.693-0.882) scales showed good to excellent reliability. The details of reliability analyses and the calculated SEM and MDC values are presented in Table 4.

None of the patients received a maximum or minimum score neither in EBBS-Barriers nor EBBS-Benefits subscales, indicating the absence of a floor-ceiling effect. The $\gamma 1$ value was calculated as -0.885 for EBBS-Barriers and –0.257 for EBBS-Benefits, signifying the lack of a floor or ceiling effect.

No significant differences were detected between r-axSpA and nr-axSpA subtypes regarding EBBS-Barriers (p=0.12, d=0.27) and EBBS-Benefits scores (p=0.10, d=0.29, Table 5).

ASAS-HI scores (r=–0.412, p=0.01) and ASQoL scores (r=–0.394, p=0.01) showed fair relationships with EBBS-Benefits scores for patients with nr-axSpA. While there were other statistically significant relationships between

Table 4. Test-retest reliability, SEM, and MDC (n=57)

	Test	Re-test						
	Mean±SD	Mean±SD	ICC	95% CI	SEM	95% CI	MDC	95% CI
EBBS-Barriers	36.77±4.31	39.5±4.24	0.837	0.738-0.900	1.74	1.36-2.2	6.82	5.33-8.62
EBBS-Benefits	83.52±9.82	85.47±8.69	0.807	0.693-0.882	4.31	3.37-5.44	16.89	13.21-21.32

SEM: Standard error measurement; MDC: Minimal detectable change; SD: Standard deviation; EBBS: Exercise Benefits/Barriers scale; ICC: Intraclass correlation coefficient; CI: Confidence interval.

Table 5. Comparison of EBBS scores between r-axSpA and nr-axSpA subtypes

	r-axSpA (n=108)	nr-axSpA (n=40)				
	Mean±SD	Mean±SD	*p**	Mean differences	95% CI	Cohen's *d*
EBBS-Barriers (score)	36.59±5.39	37.92±4.2	0.12	–1.33	–3.2 to 0.53	0.27
EBBS-Benefits (score)	84.87±13.58	88.4±10.76	0.10	–3.52	–7.78 to 0.74	0.29

EBBS: Exercise Benefits/Barriers scale; r-axSpA: Radiographic axial spondyloarthritis; nr-axSpA: Nonradiographic axial spondyloarthritis; SD: Standard deviation; CI: Confidence interval; * Welch One-Way ANOVA test; p<0.05; d: effect size.

Table 6. Associations of EBBS-Barriers and EBBS-Benefits with the disease indices

		r-axSpA (n=108)		nr-axSpA (n=40)		All axSpA (n=148)	
		EBBS-Barriers	EBBS-Benefits	EBBS-Barriers	EBBS-Benefits	EBBS-Barriers	EBBS-Benefits
TSK*	r	**−0.394**	**−0.329**	**−0.502**	**−0.357**	**−0.424**	**−0.344**
	p	**<0.01**	**<0.01**	**<0.01**	**0.02**	**<0.01**	**<0.01**
BASDAI	r	−0.175	−0.001	−0.172	−0.295	−0.176	−0.065
	p	0.07	>0.99	0.29	0.07	0.03	0.43
BASFI	r	−0.105	−0.126	−0.148	−0.258	−0.123	−0.162
	p	0.29	0.20	0.36	0.11	0.14	0.05
BASMI	r	−0.185	−0.208	−0.121	−0.141	−0.198	−0.221
	p	0.06	<0.01	0.46	0.39	0.02	0.01
ASQoL	r	−0.223	−0.239	−0.250	**−0.394**	−0.228	−0.273
	p	0.02	0.01	0.12	**0.01**	<0.01	<0.01
ASAS-HI	r	−0.251	−0.258	−0.282	**−0.412**	−0.255	−0.291
	p	0.01	0.01	0.08	**0.01**	<0.01	<0.01
HADS-anxiety	r	−0.187	−0.257	−0.290	−0.267	−0.201	−0.249
	p	0.05	0.01	0.07	0.10	0.01	<0.01
HADS-depression	r	−0.165	−0.285	−0.123	−0.237	−0.154	−0.271
	p	0.09	<0.01	0.45	0.14	0.06	<0.01

EBBS: Exercise Benefits/Barriers scale; r-axSpA: Radiographic axial spondyloarthritis; nr-axSpA: Nonradiographic axial spondyloarthritis; axSpA: Axial spondyloarthritis; TSK: Tampa scale of kinesiophobia; BASDAI: Bath Ankylosing Spondylitis Disease Activity Index; BASFI: Bath Ankylosing Spondylitis Functional Index; BASMI: Bath Ankylosing Spondylitis Metrology Index; ASQoL: Ankylosing Spondylitis Quality of Life Questionnaire; ASAS-HI: The Assessment of SpondyloArthritis international Society Health Index; HADS: Hospital Anxiety and Depression Scale; r: Pearson correlation coefficient; Written in bold: $p<0.05$ and $r>0.3$. * The level of correlations between EBBS scores and TSK were calculated for convergent validity analysis.

Table 7. Top 5 Exercise Barriers and Benefits perceptions of patients with axSpA

	Mean score	SD
Barriers		
1. Exercise tires me	2.38	0.68
2. I am fatigued by exercise	2.49	0.73
3. Exercising takes too much of my time	2.70	0.66
4. Places for me to exercise are too far away	2.72	0.69
5. Exercise facilities do not have convenient schedules for me	2.77	0.75
Benefits		
1. Exercising improves functioning of my cardiovascular system	3.19	0.53
2. My physical endurance is improved by exercising	3.14	0.62
3. Exercising increases my level of physical fitness	3.14	0.62
4. Exercise increases my muscle strength	3.13	0.55
5. Exercise improves my flexibility	3.12	0.61
5*. Exercise improves overall body functioning for me	3.09	0.61

axSpA: Axial spondyloarthritis; SD: Standard deviation; * Radiographic axSpA patients ranked this item fifth according to benefit exercise perception and other disease indices, all were on a negligible level (r<0.30, Table 6).

The five barriers with the lowest mean values and five benefits with the highest mean values that were reported by the patients with axSpA are presented in Table 7.

DISCUSSION

The present study had three main goals regarding exercise benefits and barriers perceptions of patients with axSpA. To achieve these goals, EBBS was systematically and formally translated into Turkish, and its psychometric properties were tested. According to our results, the Turkish version of EBBS showed adequate validity and reliability for both EBBS-Barriers and EBBS-Benefits subscales without any floor or ceiling effects in patients with axSpA. Second, no differences were observed in EBBS scores between r-axSpA and nr-axSpA subtypes. Lastly, exercise barriers and benefits perceptions of the r-axSpA and nr-axSpA patients correlated to kinesiophobia at a fair to moderate level. No other high-level correlations were observed between investigated variables in axSpA subtypes, except for the fair level of correlations between health status, quality of life, and EBBS-Benefits scores.

Most of the patients (75%) who performed the face validity assessment agreed that the final version of Turkish EBBS was clearly understandable and did not need any changes. Eleven (25%) patients raised minor concerns (word modifications or opinions about how to collect the data). However, after a small discussion, they all agreed that the Turkish version of EBBS can be used for assessing the perception of exercise barriers/benefits of patients with axSpA.

Previous studies reported comparable results regarding the validity and reliability of EBBS. In the original study of EBBS in healthy adults, Sechrist et al.[14] found the internal consistency of EBBS-Barriers and EBBS-Benefits subscales as 0.95 and 0.88, respectively. Farahani et al.[31] also calculated the Cronbach's alpha levels for EBBS-Barriers and EBBS-benefits subscales as 0.94 and 0.82 in healthy women. They also calculated the test-retest reliability of EBBS as 0.79 and 0.74 for the benefits and barriers subscales, respectively. Similar to our results, Ortabag et al.[12] reported that their version of Turkish EBBS showed adequate internal validity (Cronbach's alphas =0.87 for total EBBS, 0.95 for EBBS-Benefits, and 0.80 for EBBS-Barriers) and test-retest reliability (ICCs of 0.85 for total EBBS, 0.94 for EBBS-Benefits, and 0.79 for EBBS-Barriers) for healthy military nursing students. To our knowledge, SEM and MDC values for EBBS-Barriers and EBBS-Benefits subscales were calculated for the first time in our study. We believe these values may help in interpreting the results of EBBS scores in future research and clinical settings.

As far as we are aware, only Fabre et al.[11] interrogated the perceptions of patients with axSpA regarding exercise barriers and benefits using EBBS in a French speaking cohort. The authors reported the mean EBBS-Barriers score as 30.6 and the mean EBBS-Benefits score as 86.2. These values are slightly better compared to the results of the present study. These slight differences might be attributed to cultural variances between populations; however, the mean differences of Fabre et al.[11] were lower than the SEM and MDC values that were calculated for EBBS in our study. Thus, it can be concluded that exercise barriers and benefits perception of patients with axSpA are comparable between these two populations. Additionally, they detected main exercise barriers as "physical exertion" and "lack of exercise milieu," and exercise benefits as "improvements in physical performance and health" similar to the results of our study. These results underline the importance of fatigue and exercise capacity as possible targets to be improved, particularly for patients with axSpA with a higher perception of exercise barriers.

The present study compared the EBBS-Barriers and EBBS-Benefits scores between patients with axSpA with and without radiographic involvement. Although patients with nr-axSpA presented slightly better scores in EBBS Barriers and EBBS-Benefits subscales, no significant differences were detected between subtypes, and the mean differences were smaller than the calculated MDC values. Our results indicate that both axSpA subtypes have similar perceptions regarding barriers or benefits of exercise. Thus, regardless of the subtype, any patient with axSpA may benefit from further patient education regarding the beneficial effects of the exercise and how to tackle the exercise barriers.

EBBS-Barriers and EBBS-Benefits scores correlated to kinesiophobia at a fair level but not to disease activity, function, spinal mobility, quality of life, or emotional status. To our knowledge, this is the first study to investigate the relationship between exercise barriers/benefits perception and these parameters. Previous studies focused on the relationships between disease-related indices and levels of physical activity and obtained mixed results. Some authors reported no relationships between disease-related indices and physical activity,[10,11,32] while some detected low levels of correlations in patients with axSpA.[5,33,34] However, higher kinesiophobia levels appear to have negative effects on physical activity levels in patients with axSpA[5] and other populations.[35,36] On the other hand, performing a large number of correlation analyses without adjusting for multiple tests may have increased the risk of obtaining pseudosignificant correlations. Evaluating physical activity, kinesiophobia, and exercise barriers/benefits together may help clinicians observe the status of the patients more clearly.

The most important limitation of the present study was the lack of an objective measurement of physical activity. The International Physical Activity Questionnaire (IPAQ) was employed to evaluate the physical activity in previous studies in patients with axSpA. However, different studies showed that IPAQ was not a sensitive measurement for physical activity assessment.[37,38] Thus, the effects of exercise barriers/benefits perceptions of patients with axSpA on physical activity are yet to be investigated in future studies. It is recommended to include at least five patients for each item in the questionnaire, and we aimed to reach at least 215 patients with axSpA.[39] However, the present study was conducted mostly during the COVID-19 (coronavirus disease 2019) pandemic (between June 2018 and December 2021); therefore, we did not reach the planned sample size. Limiting the upper age to be included in the study to 65 years may be counted as another limitation of the study. However, people older than 65 years are considered geriatric patients, and physiological changes due to old age may interfere with the outcomes. Thus, we decided not to include elderly patients to investigate the effects of axSpA solely. Investigating the face validity at the end of the study is also a methodological limitation. However, no major changes were requested by the patients regarding understandability. Lastly, structural validity of the Turkish EBBS could not be investigated due to the relatively small sample size to avoid presenting dubious results.

In conclusion, EBBS-Barriers and EBBS-Benefits scales were demonstrated to be valid and reliable in Turkish-speaking patients with axSpA. Furthermore, the SEM and MDC values were introduced for the first time. The most important barriers to exercise in Turkish patients with axSpA appear to be fatigue due to exercise and lack of exercise milieu, while the main exercise benefits were related to opinions of improvements in physical fitness and general health. It appears that the disease subtype does not significantly affect exercise perception in Turkish patients with axSpA. Lastly, EBBS-Barriers and EBBS-Benefits scores are mostly associated with kinesiophobia. Thus, we recommend that fear of movement, fatigue, and exercise capacity should also be considered prior to exercise prescription/consultation, regardless of the axSpA subtype. The results obtained in this study may also help identify problems with adherence to exercise and determine optimal facilitators in patients with axSpA. Future studies should explore other psychometric properties of EBBS, such as sensitivity and specificity in the axSpA population, investigate the effects of different approaches on regulating barrier/benefit perceptions, and explore the possible differences between cultures regarding exercise perceptions.

Ethics Committee Approval: The study protocol was approved by the İzmir Katip Çelebi University Non-Intervantional Studies Ethics Committee (date: 21.03.2018, no: 117). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Patient Consent for Publication: A written informed consent was obtained from each patient.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: Idea/concept, supervision: D.B., Design: D.B., D.O.K., S.A. Data collection: D.C.S., E.D.E., G.D., E.A.A., S.G.; Analysis and/or interpretation, writing the article: D.C.S.; Literature review: D.B, D.C.S.; Critical review: D.B., D.O.K., S.A.

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APPENDIX

Turkish version of Exercise Benefits/Barriers Scale

EGZERSİZ YARARLARI/ENGELLERİ SKALASI

YÖNERGE: Aşağıda egzersiz ile ilişkili fikirlerinizle ilgili cümleler bulunmaktadır. Lütfen, bu cümlelere ne derecede katıldığınızı belirtmek için düşüncenizi ifade eden sütuna X işareti koyunuz.

		Tamamen katılıyorum	Katılıyorum	Katılmıyorum	Tamamen katılmıyorum
1	Egzersiz yapmaktan zevk alırım.				
2	Egzersiz yapmak stres ve gerginlik hissimi azaltır.				
3	Egzersiz yapmak zihinsel sağlığımı geliştirir.				
4	Egzersiz yapmak çok fazla zamanımı alır.				
5	Egzersiz yaparak kalp krizi ataklarını önlerim.				
6	Egzersiz yapmak beni yorar.				
7	Egzersiz yapmak kas kuvvetimi artırır.				
8	Egzersiz yapmak bana kişisel bir başarı hissi verir.				
9	Benim için egzersiz yapacak yerler çok uzak.				
10	Egzersiz yapmak beni rahatlamış hissettirir.				
11	Egzersiz yapmak keyif aldığım arkadaşlar ve kişiler ile iletişime geçmeme izin verir.				
12	Egzersiz yapmak için çok utangacım.				
13	Egzersiz yapmak beni hipertansiyondan korur.				
14	Egzersiz yapmak çok maliyetli.				
15	Egzersiz yapmak fiziksel uygunluk seviyemi artırır.				
16	Egzersiz yapabileceğim merkezlerin zaman çizelgesi benim için uygun değil.				
17	Egzersiz yaparak kaslarımın tonusu gelişir.				
18	Egzersiz yapmak kalp ve damar sistemi fonksiyonlarımı geliştirir.				
19	Egzersiz yüzünden yorulurum.				
20	Egzersiz yaparak kendimi iyi hissetme duygum gelişti.				
21	Eşim (veya hayat arkadaşım) bana egzersiz yapma konusunda cesaret vermez.				
22	Egzersiz yapmak enerjimi artırır.				
23	Egzersiz yapmak esnekliğimi geliştirir.				
24	Egzersiz yapmak aile ilişkilerimden çok fazla zaman alır.				
25	Kişiliğim egzersiz yapmakla gelişir.				
26	Egzersiz yapmak geceleri daha iyi uyumama yardımcı olur.				
27	Eğer egzersiz yaparsam daha uzun yaşayacağım.				
28	Bence egzersiz kıyafetleri içindeki insanlar komik görünür.				
29	Egzersiz yapmak yorgunluğu azaltmama yardımcı olur.				
30	Egzersiz yapmak benim için yeni insanlarla tanışmak için iyi bir yoldur.				
31	Fiziksel dayanıklılığım egzersiz yaparak gelişir.				
32	Egzersiz yapmak kendi hakkımdaki algımı geliştirir.				
33	Aile üyelerim egzersiz yapmam için beni cesaretlendirmez				
34	Egzersiz yapmak zihinsel dikkatimi artırır.				
35	Egzersiz yapmak normal aktivitelerimi yorulmadan devam ettirmeme izin verir.				
36	Egzersiz yapmak işimin kalitesini geliştirir.				
37	Egzersiz yapmak aile sorumluluklarımdan çok fazla zaman alır.				
38	Egzersiz benim için iyi bir eğlencedir.				
39	Egzersiz yapmak diğer kişiler tarafından kabul edilmemi artırır.				
40	Egzersiz benim için ağır bir iş.				
41	Egzersiz yapmak genel vücut fonksiyonlarımı geliştirir.				
42	Benim açımdan egzersiz yapacak çok az yer var.				
43	Egzersiz vücudumun görünüşünü geliştirir.				