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Validity and reliability of the Turkish version of the Sustainable and Healthy Eating Behaviors Scale

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Abstract

This study was conducted to determine the validity and reliability of the Turkish version of the Sustainable and Healthy Eating (SHE) Behaviors Scale. The original scale included eight factors and thirty-four items related to the SHE behaviors of adults. The research was carried out in three stages with a total of 586 participants aged 19 to 50 years. The Cronbach alpha coefficient was used to evaluate internal consistency reliability and the test–retest method was applied. Exploratory factor analysis (EFA) was performed to determine the factor structure. The model obtained with EFA was evaluated with confirmatory factor analysis (CFA). The Cronbachαcoefficient of the scale was found to be excellent at 0·912, and the intra-class correlation coefficient was found to be good at 0·832 using the test–retest method. Considering the suitability of the data for factor analysis, the Kaiser–Meier–Olkin coefficient was 0·859, and the significance level of the Bartlett test of sphericity was less than 0·05 (χ^2=3·803,25; $P < 0·05$). As a result of EFA, the items of the scale were found to be distributed in seven factor dimensions. The factor loadings of the items were between 0·516 and 0·890, and the factors explained 67 % of the variance. Considering the fit indices obtained as a result of the analysis of this model with CFA, it was seen that the model had an acceptable fit ($\chi^2/SD = 2·593$, comparative fit index = 0·915, Tucker–Lewis index=0·902, standardised root mean square error = 0·0754 and root mean square error of approximation = 0·067). In conclusion, the Turkish version of the SHE Behaviors Scale has credible reliability and construct validity to assess the sustainable and healthy eating behaviours of the Turkish adult population.

Keywords: **Sustainability: Sustainable nutrition: Healthy eating: Validity and reliability**

Consuming a healthy diet throughout the course of life helps to prevent malnutrition in all its forms as well as various non-communicable diseases and conditions. However, increased production of processed foods, rapid urbanisation and changing lifestyles have led to a shift in dietary patterns. People are now consuming more foods high in energy, fats, free sugars and salt/Na, and many people do not eat enough fruits, vegetables and other dietary fibres such as whole grains[1]. In recent years, governments have become aware that this kind of dietary pattern has adverse effects not only on human health but also on environmental health. Hence, researchers are now focusing on the potential impacts of the sustainability of the ecosystem regarding individual and community health, and a significant relationship between human health and the health of the planet has been claimed[2]. It is clear that by adapting healthy diets, more environmentally friendly eating habits are formed, and this contributes to the improvement of public health[3]. In addition, the amount and the quality of the food consumed should be sufficient as a whole, food culture should be protected and food diversity should be supported in line with the nutritional guidelines established by scientific authorities. Promoting biodiversity is crucial not only in the cultural and ecological fields but also in the fight against malnutrition[4].

The concept of sustainable nutrition was proposed to define a diet that avoids the excessive degradation and consumption of natural resources and that also adheres to principles of nutrition that will maintain long-term health[5]. Although not universally accepted, it was defined by the FAO of the UN as follows: 'Sustainable diets, contributing to food security for the healthy life of the current and future generations, have low environmental impacts, are protective of and sensitive to biodiversity and ecosystem, and are culturally acceptable, accessible, economically viable and affordable, nutritionally adequate, safe and healthy diets that make the best use of natural and human resources'[2].

At the Second International Nutrition Conference in 2014, the FAO and WHO devoted nine of sixty nutritional recommendations to sustainable food system actions that promote healthy food. In September 2015, the UN adopted the sustainable development

Abbreviations: CFA, confirmatory factor analysis; EFA, Exploratory factor analysis; RMSEA, root mean square error of approximation; SDG, Sustainable Development Goal; SHE, Sustainable and Healthy Eating; SRMR, standardized root mean square error.

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goals (SDG), a set of seventeen global goals with specific targets aimed at ending poverty, protecting the planet and ensuring prosperity for all by 2030. It is noteworthy that achieving several SDG is crucial for achieving the nutrition goal. 'Nutrition' is an essential component for achieving many of the other SDG. The need for better nutrition was recognised in the SDG, which aim to 'end hunger, achieve food security, improve nutrition, and promote sustainable agriculture.' Unfortunately, the world is not making overall progress toward the SDG, such as ensuring access to safe, nutritious and sufficient food for all people year round and eradicating all forms of malnutrition. Regarding policy, work needs to be done at the production level to provide easier and healthier food choices at the consumption level[6]. Considering the situation in Turkey, Turkey ranks 70th out of 165 countries according to the Sustainable Development Reports. This means that Turkey is a country that still requires significant development in terms of sustainability[7]. The FAO declared that one of the pathways to food system transformation is changing consumer behaviours to strengthen food environments and promote dietary patterns that have positive impacts on human health and the environment[8]. Therefore, it is clear that more emphasis should be placed on sustainability worldwide.

In this context, interventions targeting the general population are needed to educate people and promote behaviour change toward the adoption of healthy and sustainable diets within daily routines. Healthcare providers should be involved in promoting such goals and educating populations for healthier and more sustainable lifestyles. Promoting food sustainability requires more attention to the cultural and social contexts of consumers[9]. By determining the level of awareness, behaviours and attitudes of individuals regarding sustainability and to increase their awareness, it is important to provide education and create policies in this context. Therefore, as the first step, scales and questionnaires related to this issue are critical. Several validated measurement scales exist for assessing various aspects of sustainable food-related behaviours (e.g. Index of Sustainability of Food Practices, Sustainable Food Behavior Scale or Green Eating Behavior Scale)[10–12]. However, these scales determine sustainable behaviours without considering the principles of healthy nutrition. The Sustainable and Healthy Eating (SHE) Behaviors Scale was developed by Żakowska-Biemans et al. to measure the self-reported sustainable and healthy eating behaviours of young adults[3]. Because it deals with the concepts of both sustainability and healthy nutrition, the SHE Behaviors Scale was used in this study. In this process, it was also important to confirm the validity and reliability of the scale in Turkish as there are no other scales for assessing sustainable and healthy eating behaviours.

This study therefore aimed to evaluate the validity and reliability of the SHE Behaviors Scale developed by Żakowska-Biemans et al.[3] in the Turkish population.

Methods

Study design and participants

This cross-sectional study was conducted between September 2019 and December 2020 in three stages with participants aged between 19 and 50 years (X ± SD: 27·7 ± 8·65 years) who were living in Ankara, the capital city of Turkey, and were selected by the snowball sampling method. Individuals were excluded from the study if they had any psychological disorder and/or chronic disease requiring the following of a specific diet, had any eating disorder, were pregnant and/or breastfeeding or did not agree to participate in the study.

In the first stage, the language validity of the SHE Behaviors Scale developed by Żakowska-Biemans et al.[3] was conducted with twenty individuals.

In the second stage, it was planned to apply the original scale consisting of eight factors and thirty-four items to at least 170 individuals. That decision was reached based on the suggestion that the number of individuals should be at least 5–10 times greater than the number of items in a scale when determining sample size for explanatory factor analysis (EFA) in studies developed in different languages and/or cultures[13]. In this context, 226 individuals were reached. To evaluate the reliability of the scale, it was re-administered to fifty people 15 d later using the test–retest method.

In the third stage of the study, since it was not appropriate to use the same dataset in the analysis of the model obtained by EFA for confirmatory factor analysis (CFA), a different data set of similar size was used, and this stage was completed with 360 individuals[14]. A flowchart of the study is provided in Fig. 1.

For the validity and reliability analysis of the scale, permission was obtained from the authors of the original scale via e-mail. Permission was subsequently obtained from the Gazi University Ethics Committee (dated 26·06·2019 and numbered 07), and the study was carried out in accordance with the principles of the Declaration of Helsinki.

Sustainable and healthy eating behaviors scale

The SHE Behaviors Scale was developed by Żakowska-Biemans et al.[3] to identify how young adults interpret the concept of SHE with an instrument that measures self-reported consumer SHE behaviours. This scale consists of eight factors and thirty-four items in total. The eight factors are Healthy and Balanced Nutrition, Quality Labels (Local and Organic), Meat Reduction, Local Food, Low Fat, Avoiding Food Waste, Animal Welfare and Seasonal Foods. The thirty-four items are scored on a Likert-type scale (Table 1). Factor 1 contains ten questions, factor 2 contains five, factor 3 contains four and factors 4–8 each contain three questions. Participants are asked to score each item as 'never,' 'very rarely,' 'rarely,' 'sometimes,' 'often,' 'very often,' or 'always.' 'Never' is rated as 1 point and 'always' as 7 points. Factor scores are calculated by taking the average of the scores (between 1 and 7 points) given to the items in that factor. In calculating the total scale score, the average of the scores given to all factors is taken[3] (Table 1).

Language validity

In the process of adapting the scale to Turkish, studies were first carried out to ensure language validity. As a translation technique, the standard procedure recommended by Brislin (1986) and Prieto (1992) was followed, whereby the scale was translated from English to the target language (Turkish) by researchers who knew both languages well[15,16].

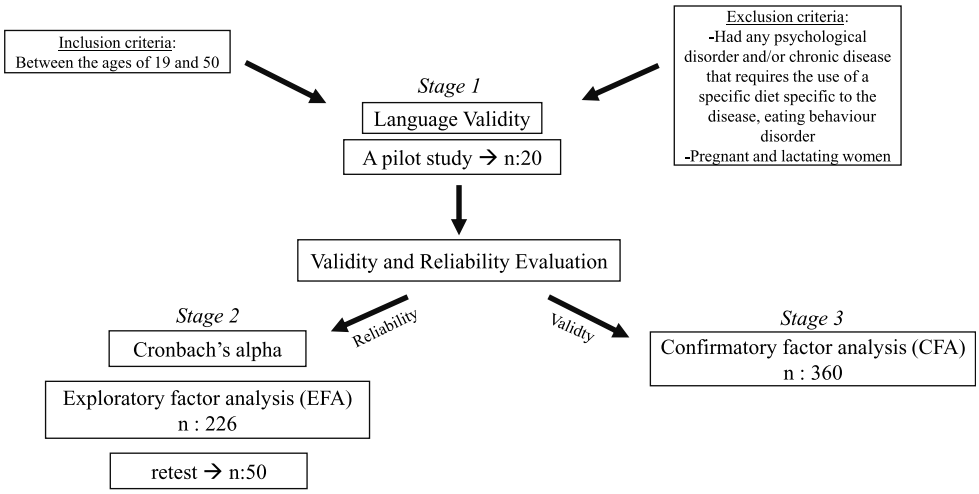

Fig. 1. Flowchart for this study.

The original scale was independently translated from English to Turkish by three experts with a good command of English. In the language adaptation, the standard translation–back translation method was used to minimise differences in expression. The translation from English was done by native Turkish speakers who had not seen the original English version of the scale and were fluent in both languages. To ensure the clarity of the scale and its suitability for both the research and the culture, the researchers reviewed it. The researchers examined the agreement in meaning and the Turkish text was obtained from the most appropriate expressions. After all statements of the scale were corrected by the researchers, it was applied to twenty individuals who met the inclusion criteria and was finalised in line with their recommendations about the meaning. The data obtained as a result of this pre-application were not used in the later stages of the study.

Reliability and validity evaluation

After the scale was adapted to Turkish, its internal consistency reliability was evaluated with the Cronbach α coefficient. While the α coefficient should be at least 0·70, values of 0·80 and above are considered very good and values of 0·90 and above are considered excellent[17].

In addition, since there is no other scale similar to the scale being evaluated here, the scale's reliability was determined by the test–retest method. The intraclass correlation coefficient was obtained as a result of re-administering the scale to fifty people 15 d later. intraclass correlation coefficients are evaluated as reflecting moderate reliability within the range of 0·50–0·75 and good reliability within the range of 0·75–0·90[18].

The scale was evaluated with EFA in terms of construct validity. The Kaiser–Meier–Olkin coefficient was used to test whether the sample size was sufficient in this study, and the Bartlett test of sphericity was used to determine whether there was a correlation between the items that were prerequisites for factor analysis. The Kaiser–Meier–Olkin value should be $\geq$ 0·60 and the significance level of the Bartlett sphericity test should be less than 0·05[19]. To evaluate the necessity of the items in the scale, the factor loadings obtained as a result of EFA and the corrected item-total score correlations were examined[19,20].

After evaluating the scale's suitability for factor analysis, varimax rotation principal component analysis was applied to evaluate the construct validity and factor structure of the scale with EFA. Factors with eigenvalues (λ) of $\geq$ 1·0 obtained by the extraction of principal components were accepted[20].

CFA was used to compare the factor structure of the adapted scale with the factor structure of the original scale in order to identify similarities and differences and to evaluate the suitability of the model for the relevant society[21]. The items in the factor structure that emerged as a result of EFA were also re-examined with CFA without any modifications, and chi-square/degree of freedom (χ^2/SD), root mean square error of approximation (RMSEA), standardised root mean square error, comparative fit index (CFI) and Tucker–Lewis index values were reported as fit indices[22].

In the evaluation of these fit indices, chi-square/degree of freedom (χ^2/SD) values of $<$ 3, CFI and Tucker–Lewis index values of $\geq$ 0·90, and standardised root mean square error and RMSEA values of $\leq$ 0·08 were considered as acceptable fit criteria[22,23].

Statistical evaluation

In the evaluation of the data, IBM SPSS Statistics 22.0 was used for EFA, reliability analysis and descriptive statistics, and IBM SPSS Amos was used for CFA. Item scores from the scale are given as mean (X) and standard deviation (SD) values.

Results

Study population

To determine the reliability of the scale, 226 individuals were reached. The mean age of these individuals was 21·6 ± 1·86 years and 91·2 % of them were women. To determine the validity, 360 individuals were reached. The mean age of these individuals was 27·7 ± 8·65 years and 58·1 % were women.

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Table 1. Mean (X), standard deviation (SD), total item score correlations and Cronbach's α values of the Sustainable and Healthy Eating Behaviors scale

Factors	Items	Score x	Score SD	Total item score correlation	Confidence coefficient (α)
Quality labels (regional and organic)		4·6	0·76		0·837
	1. I eat five portions of fruits and vegetables a day.	4·5	1·19	0·385	
	2. I choose whole grains products.	5·0	0·90	0·447	
	3. I choose food that contains no additives.	4·7	1·31	0·366	
	4. I choose food that contains natural ingredients.	4·5	1·07	0·536	
	5. I choose food that contains no artificial ingredients.	4·7	0·92	0·535	
	6. Whenever possible, I buy organic food.	4·1	1·27	0·491	
	7. When buying food, I check certificates and quality marks on labels.	5·0	0·93	0·468	
	8. I choose food products with a regional certificate.	4·4	1·18	0·488	
Seasonal food and avoiding food waste		3·9	0·99		0·845
	9. I don't waste food.	4·6	1·26	0·542	
	10. I reuse leftovers from food.	4·5	1·51	0·395	
	11. I buy regional food.	3·2	1·43	0·531	
	12. I eat seasonal fruits and vegetables.	4·1	1·41	0·538	
	13. In season, I shop at farmer's market.	3·4	1·41	0·605	
	14. I avoid sugary drinks.	3·5	1·21	0·612	
	15. I limit my salt usage.	3·7	1·36	0·651	
Animal welfare		3·2	1·27		0·833
	28. I choose free-range eggs.	3·2	1·57	0·420	
	29. I avoid buying battery eggs.	3·4	1·54	0·584	
	30. Whenever possible, I buy fish from sustainable fishing.	3·0	1·52	0·606	
	31. I avoid food products containing lots of fat.	3·0	1·60	0·586	
Meat reduction		4·1	1·22		0·789*/0·901**
	23. I buy locally produced foods.	4·1	1·24	0·542	
	24. I try to eat as many pulses as possible in order to reduce meat consumption.	4·1	1·18	0·518	
	25. Pulses replace meat in my cooking.	4·1	1·26	0·484	
	26. I try to eat as much plant–protein source food products as possible. e.g. pulses.	4·8	1·27	0·276	
	27. I avoid eating meat.	5·1	1·30	0·185	
Healthy and balanced diet		2·9	1·04		0·764
	16. I choose food that contains a lot of vitamins and minerals.	3·7	1·36	0·334	
	17. I choose food that keeps me healthy.	2·4	1·41	0·392	
	18. I choose food that is nutritious.	3·5	1·31	0·461	
	19. I try to have a balanced diet.	2·1	1·37	0·370	
Local food		2·8	1·28		0·802
	20. I choose food that is produced in an environmental friendly way.	2·5	1·48	0·470	
	21. I buy fruits and vegetables directly from the farmer.	2·3	1·60	0·386	
	22. Whenever possible, I choose fruits and vegetables from my own allotments (plots).	3·5	1·46	0·552	
Low fat		4·3	1·21		0·782
	32. I choose low fat food products.	3·9	1·47	0·416	
	33. Whenever possible, I choose low fat food products.	4·1	1·59	0·391	
	34. I try not to throw away food.	4·9	1·25	0·366	
Total		3·6	0·65		
Confidence coefficient for the whole scale (α)					0·911*/0·912**

* Items 26 and 27 are coefficient included in the model.
** Items 26 and 27 are non-model coefficient.

Reliability and validity analysis

After the scale was adapted to Turkish, its internal consistency reliability was calculated with the Cronbach α reliability coefficient and was found to be excellent at 0·912. The lowest Cronbach α coefficient of the factors was that for the Healthy and Balanced Nutrition factor at 0·764, and after removing two items (items 26 and 27) with item-total correlations of less than 0·30, the highest was determined to be 0·901 for the factor of Meat Reduction. In the evaluation of the reliability of the scale after applying the test–retest method, the intraclass correlation coefficient value was determined to be 0·832, signifying good reliability. When the mean values of the factors of the scale were examined, it was found that the highest mean score was 4·6 ± 0·76 for quality labels (local and organic) and the lowest mean score was 2·8 ± 1·28 for local food (Table 1).

EFA was performed to determine how many factors the thirty-four items in the scale were distributed in and to reveal the factor structure of the scale. The result obtained for the Kaiser–Meier–Olkin coefficient showed that the sample size was sufficient (Kaiser–Meier–Olkin = 0·859). As a result of the Bartlett test of sphericity, the correlation level between the items was found to be sufficient for factor analysis ($\chi^2 = 3{\cdot}803{,}25$; $P < 0{\cdot}05$). As

a result, eight-factor rotation was applied, as in the original version of the scale. When the factor structures that emerged as a result of rotation with eight factors were examined, it was observed that there were seven factors with eigenvalues above 1, unlike the original, and the items were distributed among these factors. In addition, as a result of EFA, the factor loadings of two of the thirty-four items (items 26 and 27) were excluded from the scale because they overlapped with another factor. The difference was less than 0·1 and the item-total correlations were less than 0·30. After this stage, two items were removed and EFA analysis was performed again with thirty-two items. As a result of this updated EFA, it was seen that the factor loadings of the items in the seven factors with eigenvalues of greater than 1 were greater than 0·50 and the scale explained 67 % of the total variance. As can be seen in Table 2, the distribution of the remaining thirty-two items in the final version of the scale was as follows: items 1–8 were grouped within the first factor, items 9–15 within the second factor, items 28–31 within the third factor, items 23–25 within the fourth factor, items 16–19 within the fifth factor, items 20–22 within the sixth factor and items 32–34 within the seventh factor (Table 2).

The items in the factor structure that emerged as a result of EFA were re-examined with CFA without changing them and the χ^2/SD, RMSEA, standardised root mean square error, CFI and Tucker–Lewis index fit indices were calculated, as shown in Table 3. According to the fit indices used in this study, the model has an acceptable fit. According to these results, the values obtained from the scale confirm the acceptability and applicability of the Turkish version (Annex 1) of the SHE Behaviors Scale (Table 3).

Discussion

Consumers play a crucial role in promoting sustainable food systems, influencing them through choices and habits, and they also have an incomparable impact on the environment and natural resources[24]. As promoting food sustainability requires much more attention to cultural and social contexts, we aimed to demonstrate the validity and reliability of the SHE Behaviors Scale among Turkish adults. This scale was developed for adults, and Turkish validity and reliability studies were also conducted among adults. Accordingly, this scale is suitable for use in the adult population of this society. It is thought that those who work in other fields of health, and especially nutrition and dietetics, can also use this scale to contribute to the development of nutritional behaviour.

According to the results of this study, the Turkish version of the SHE Behaviors Scale is valid and reliable with seven factors and thirty-two items. As a result of EFA, higher total variance was explained than the total variance (64·7 %) in the original study. The Cronbach α internal reliability coefficients of the study ranged from 0·764 to 0·901, similar to those of the original scale (0·60–0·92). Similarly to this study, the χ^2/SD, CFI and RMSEA values were also evaluated in the original study and the desired high values were obtained.

It was seen that the CFI was 0·96 while the χ^2/SD and RMSEA values, which are desired to be low, were 1·74 and 0·059, respectively. In this study, both these fit indices and others were found to have suitable values, as in the original.

Among consumers, local products are perceived as healthier, unprocessed and containing fewer preservatives. Some consumers express their confidence in natural, unprocessed food products and the value of local products is seen to lie in their quality, interpreted as naturalness and freshness[25]. In the present study, when the mean values of the subdimensions of the scale were examined, the Quality Labels factor, which includes regional and organic items, was found to have the highest value. These findings were supported by the results of some other studies that reported that quality is an important criterion in terms of consumer awareness[26,27].

The mean value of the Local Food factor in the scale was found to be the lowest at 2·8 ± 1·28. This may have been due to the fact that these products are not easily available at markets or directly from their producers, and they are expensive. The mean score for the Seasonal Foods and Avoiding Food Waste factor was found to be 3·9 ± 0·99. In the original study of Żakowska-Biemans et al.[3], unlike our study, the highest score was found for these two factors (4·92 ± 1·16 and 4·67 ± 1·16). The Food Sustainability Index scores of 78 countries were published by the Barilla Food and Nutrition Center in 2021[28], and when the rate of food loss was evaluated over the total products produced in the country, Turkey's score was found to be 52·1, reflecting high sustainability. According to this result, it should be emphasised that more attention is being paid to food waste at the end consumer level in this country, although it is still necessary to develop stricter policies to prevent food loss in Turkey. Turkey has been actively fighting food waste with a campaign called 'Save Your Food' launched by FAO, with Turkey cooperating to raise public awareness and promote good practices in the food supply chain. The campaign led to Turkey's first National Strategy and Action Plan on the Prevention and Reduction of Food Loss and Waste, developed by the FAO and the Ministry of Agriculture and Forestry[29]. Furthermore, the mean score for the Meat Reduction factor of the scale was found to be 4·1 ± 1·22. Looking at the Food Sustainability Index, Turkey's sustainability score was found to be 100·0 (high sustainability) due to relatively low meat consumption levels. In this study, it was observed that individuals tended to reduce their meat consumption since the scores obtained for the Meat Reduction factor were high[28].

Conclusion

Sustainable and healthy nutrition is a multi-faceted concept, and all foods that are consumed have environmental effects. Shifting towards a more sustainable food consumption pattern is an important strategy to mitigate climate change. Consumers' sustainable diet preferences also entail characteristics such as cultural acceptability, accessibility, economic fairness and affordability, which highlights the connections among health, environmental sustainability and the food production aspects of a diet with the dietary patterns of consumers as the common denominator. The Turkish version of the SHE Behaviors Scale was found to be valid and reliable for determining sustainable and healthy eating behaviours of adults.

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Table 2. Distribution of SHE behaviors scale items according to factors of a result of EFA, factor loadings, eigenvalues of factors and percentages to explain variance

Item	Factor 1: quality labels (regional and organic)	Factor 2: Seasonal food and avoiding food waste	Factor 3: Animal welfare	Factor 4: Meat reduction	Factor 5: Healthy and balanced diet	Factor 6: Local food	Factor 7: Low fat
1	0·648						
2	0·748						
3	0·563						
4	0·711						
5	0·772						
6	0·534						
7	0·687						
8	0·585						
Eigenvalue coefficient	9·038						
Explained variance (%)	28·243						
9		0·516					
10		0·563					
11		0·728					
12		0·688					
13		0·621					
14		0·609					
15		0·692					
Eigenvalue coefficient	3·323						
Explained variance (%)	38·626						
28			0·630				
29			0·799				
30			0·809				
31			0·651				
Eigenvalue coefficient	2·182						
Explained variance (%)	45·445						
23				0·833			
24				0·890			
25				0·844			
Eigenvalue coefficient	1·921						
Explained variance (%)	56·365						
16					0·646		
17					0·781		
18					0·700		
19					0·681		
Eigenvalue coefficient	1·573						
Explained variance (%)	60·694						
20						0·693	
21						0·829	
22						0·630	
Eigenvalue coefficient	1·216						
Explained variance (%)	64·493						
32							0·796
33							0·804
34							0·699
Eigenvalue coefficient	1·052						
Explained variance (%)	67·779						

Table 3. Fit statistics of model with CFA

Fit indices	Acceptable fit index criterion	SHE Scale Fit indices
χ^2/SD	< 3	2·593
Root mean square error of approximation	≤ 0·08	0·067
Standardised root mean square error	≤ 0·08	0·0754
Comparative fit index	≥ 0·90	0·915
Tucker–Lewis index	≥ 0·90	0·902

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Supplementary material

For supplementary material/s referred to in this article, please visit https://doi.org/10.1017/S0007114522002525

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