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ORIGINAL ARTICLE

Psychometric properties of Iowa Anesthesia Satisfaction Scale Turkish version

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Abstract

Background The Iowa Satisfaction with Anesthesia Scale (ISAS) is a valid and reliable measurement tool developed to evaluate patient satisfaction with anesthesia care during different surgical interventions. It is adapted to various languages and used in many studies. Considering the satisfaction of the patient with anesthesia applied in surgical procedures, the presence of such a measurement tool is crucial.

Aim From this point of view, the study aimed to evaluate psychometric properties of the ISAS by adapting it to Turkish culture.

Methods In this study, a descriptive, methodological and cross-sectional design was used. A total of 210 patients who underwent surgery under general or regional anesthesia were in the study.

Results ISAS Turkish version (ISAS-T) shows good reliability which is obvious with a Cronbach's alpha value of 0.80. The correlation levels of the items with the ISAS total score were calculated between .45 and .73. Test–retest reliability was calculated as 0.83. CFA analysis was applied to the one-dimensional 11-item final version of ISAS. The uni-dimensionality of the 11-item scale was confirmed on a Turkish patient sample. The fit indices for the model obtained were calculated as χ^2/sd = 2.342, RMSEA = .80, SRMR = .04, CFI = .90, GFI = .92. The fit indices of the model have good and acceptable fit values.

Conclusion Based on the psychometric evaluation, ISAS-T is a valid and reliable measurement tool for measuring patient satisfaction with anesthesia applied during different surgical procedures.

Keywords Anesthesia satisfaction · Psychometric properties · Scale

Introduction

One of the significant indicators of quality in health services is the satisfaction of the patients who receive services from that institution. Patient satisfaction is the main point of the patient-centered care model [1]. The results show that when the satisfaction levels of the patients increase, so does compliance with the doctors' recommendations [2]. Additionally, the tendency to sue within the scope of malpractice decreases. At the same time, patient satisfaction is an effective indicator of the quality of a health institution and its recommendation and selection. Whether a health institution is recommended and preferred is among the important factors, especially for health tourism [3]. Therefore, there is a need for tools to measure patient satisfaction in health institutions. In the literature reviews, measurement tools measuring general patient satisfaction, outpatient satisfaction, inpatient satisfaction, and patient satisfaction related to specific medical procedures were present in Turkish culture [4–6]. The satisfaction levels of patients may differ for different procedures in a hospital. Patients benefit from many services, such as outpatient examination and treatment, inpatient treatment, and surgical procedures in health institutions. Evaluation of patient satisfaction based on the procedure or the clinic where the service is received may be beneficial in the following aspects: detection of problems, if any, and intervention to these problems, providing specific feedback to healthcare professionals about that unit, positive results playing a reinforcing role for employees, and improving health services [7].

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One of the procedures in health institutions is anesthesia applications in various situations, such as surgical, diagnostic procedures, and interventional procedures. Anesthesia applications play a vital role in maintaining the patient's surgical procedures well. Both surgical procedures and anesthesia applications have a permanent place in the patient's memory. Therefore, anesthesia satisfaction is also a significant factor [8]. Thus, a measurement tool that evaluates anesthesia patient satisfaction would contribute to the literature and improve clinical applications. In the literature, few studies investigated patient satisfaction related to anesthesia applications in Turkish culture, and only one measurement tool (Quality of Recovery Score–QoR T) exists for measuring patient satisfaction with anesthesia. QoR 40 T is a 40-item measurement tool. It measures postoperative patient satisfaction. It was developed by Myles et al. [9] and adapted to Turkish by Turan [10]. In another study, the patients who underwent transrectal prostate biopsy asked the question "Are you satisfied with the anesthesia applied to you?" and "If you were to have a biopsy again later, would you like to have the same anesthesia again?" It was observed that an evaluation of anesthesia satisfaction with two questions was made [11]. The Iowa Satisfaction with Anesthesia Scale (ISAS) is a valid and reliable measurement tool developed by Dexter et al. [12] to evaluate patients' satisfaction with anesthesia applications. It consists of 11 items in total. The small number of questions may be a reason for preference by researchers and clinicians for the use of ISAS in terms of ease of application. ISAS is a reliable measurement tool that evaluates anesthesia satisfaction in full and as a whole, unlike measurement tools that specifically focus on one part of anesthesia application or a single type of anesthesia [12, 13]. The original form of the scale is English. Later, validity and reliability studies were carried out by translating into French [14], Spanish [15], Persian [16], and Arabic [17] by different scientists. There are scientific studies including the results of the evaluation of anesthesia satisfaction in samples that include more than one clinic in various surgical interventions and anesthesia applications of the measurement tool [13, 18–20]. However, there was no study showing the adaptation of the scale to Turkish and the validity and reliability of results in Turkish culture. From this point of view, the study aimed to evaluate the psychometric properties of ISAS by adapting it to Turkish culture.

Material and method

In this study, a descriptive, methodological and cross-sectional design was used. The study plan was in accordance with the recommendations for transcultural adaptation [21].

Study group

The study group consisted of patients who underwent surgery at Ordu University Training and Research Hospital between January 2022 and June 2022. Some inclusion and exclusion criteria were present in determining the patients included in the study and not included in the study. The inclusion criteria were as follows: patients who will undergo elective surgery between the ages of 18–65, and who have Turkish as their native language. On the other hand, the following are exclusion criteria: the patients who have a cognitive impairment, who have American Society of Anesthesiologists (ASA) physical condition IV or above, who have a psychiatric disease, who have a history of alcohol or any other substance abuse, who most likely need postoperative mechanical ventilation (e.g., cardiovascular surgery requiring cardiopulmonary by-pass, microvascular reconstruction surgery for oral and maxillofacial cancer), who were unable to answer the questionnaire appropriately due to mental status change or sedation during postoperative evaluation, and patients with severe postoperative complications were not in the study.

Sample size

In determining the sample size, the sample determination method proposed by Bonett [22] was accepted, and the calculations took place in the G Power program. Taking the acceptable Cronbach's alpha value as 0.70 [23] and the target Cronbach's alpha value as 0.80 [12], the number of people to be included in the study with a 95% confidence interval (1-a) and 95% test power (1-B) was 175 for the 11-item scale (Fig. 1).

The number of people included in the study was determined to be 219 by taking the 20% non-response rate (Drop-out) [22, 24]. Therefore, the study had 219 people. A total of 219 people who met the inclusion criteria participated in the study. From 219 eligible patients, five refused to participate in this study, resulting in a 97.7% recruitment rate (214 patients). The scales completed by four individuals were not included in the study because they contained incomplete information. Analysis was started with the data from 210 (95.89%) patients. Some descriptive data on the patients in the study are in Table 1.

Filling the scales

After the surgery was completed and awakened, the patients without any abnormal vital signs or complications and whose sedation scale evaluation was 5 points by the anesthesiologist answered the questions in ISAS. The sedation scale

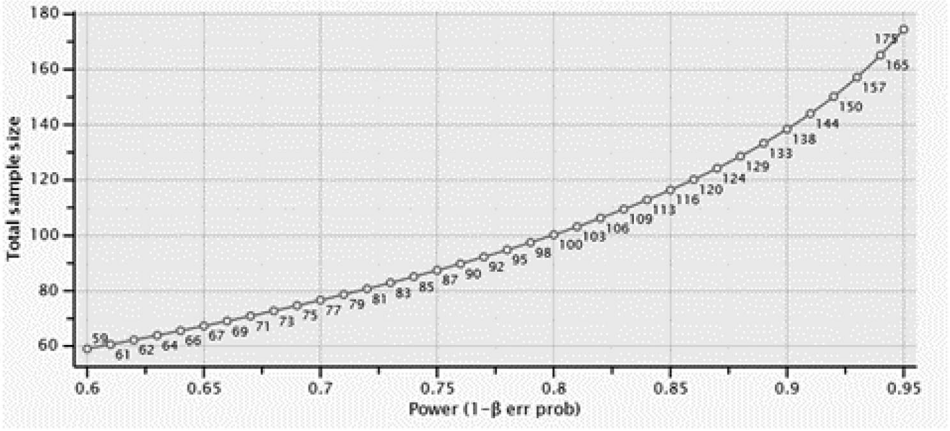

Fig. 1 Theminimum sample size of this research

by Singla et al. [25] determined the patient's sedation level. Information on scoring the patient's sedation level according to this scale is in Table 2.

In the first application of the ISAS, scale questions were directed to the patients by the researchers and experienced anesthesia specialty training assistants who were not in the research team. For the test–retest reliability studies of the scale, the measurement tool was applied for the second time (approximately three hours after the first evaluation) to 55 patients in the first group. The second application was performed after the patient was transferred from the postoperative wake-up unit to the service. In this evaluation, the patient responded by marking the scale himself.

Table 1 Patient demographics and clinical characteristics (n=210)

Variable	Mean	Sd
Age (years) (Range 18–65)	44.6	14.76
Body mass index (kg m^{-2})	27.8	5.1
Duration of surgery (min)	62.02	37.78
	n	*%*
Gender		
Male	122	58.1
Female	88	41.9
Education level		
Primary school	107	51.0
High school	76	36.2
University	27	12.9
ASA		
I	22	10.5
II	167	79.5
III	21	10.0
Type of Anesthesia		
General	70	66.7
Regional	140	33.3
Type of Surgery		
Orthopedia	71	33.8
Otolaryngology	13	6.2
Obstetrics	59	28.1
Urology	27	12.9
General Surgery	27	12.9
Neurosurgery	13	6.2

Ethical approval

Ethics committee approval of the study was obtained from the Ordu University Clinical Research Ethics Committee with decision number 233 dated 2021. All patients in the study voluntarily participated and written informed consent was obtained from them. Necessary permission from the scientists who developed the scale was obtained by e-mail to translate the scale into Turkish.

Translating the scale into Turkish and obtaining expert opinions

To translate the scale into Turkish, permission was obtained from Franklin Dexter, who was part of the author team of the original scale. First, three specialist doctors translated the ISAS into Turkish. Necessary corrections were made by examining three different translations by a faculty member from the Turkish department in terms of consistency and adequacy of meaning. Later, the form, which was translated

Table 2 Modified observer's assessment of alertness/sedation scale

Scale item	Score
Agitated	6
Responds readily to name spoken in normal tone (alert)	5
Lethargic response to name spoken in normal tone	4
Responds only after name is called loudly and/or repeatedly	3
Responds only after mild prodding or shaking	2
Does not respond to mild prodding or shaking	1
Does not respond to deep stimulus	0

into Turkish by two native English-speaking language experts, was translated back into English. Finally, the original form of the scale was compared with its translation by an English linguist, and its suitability in terms of meaning was decided. Since the scale has single- and double-factor forms in different languages and includes various scoring forms, expert opinions related to the scale were obtained from a faculty member in the field of measurement and evaluation. In line with this expert opinion, it was decided to obtain a total anesthesia satisfaction score from the scale by reverse scoring the items showing dissatisfaction (1, 3, 5, 7, 9, 11) instead of two sub-dimensions showing one patient's satisfaction and one dissatisfaction. In addition, in line with the opinions of the assessment and evaluation expert, the scale became a five-point Likert assessment (as in the Arabic adaptation study conducted by Baroudi et al. [17]), taking into account the easy answerability of the scale. The expressions to be used in the five-point Likert evaluation were as follows: strongly disagree = 1, very little agree = 2, moderately agree/indecisive = 3, strongly agree = 4, Ttotally agree = 5.

Understandability

Finally, a pilot application was applied to ten people to test the comprehensibility and responsiveness of all items in the ISAS by patients. Patients answered whether they had any problems in understanding or answering the questions and their suggestions about the question to make them clearer if necessary. As all participants answered all questions without difficulty and did not make any suggestions, the final version of the ISAS was considered appropriate for clarity. Then, it was decided to apply the scale to the number of patients calculated for validity and reliability studies. The data of the people who underwent this pilot application were not in the study.

Results

Within the scope of the adaptation study, since the Likert evaluation of the scale was changed in line with the expert opinions (from six-point evaluation to five-point evaluation) and negative items were scored in reverse instead of two sub-dimensions, it was decided to use it as a one-dimensional anesthesia satisfaction scale, exploratory factor analysis (EFA) was performed on the scale items. Before factor analysis, Kaiser−Meyer−Olkin (KMO) and Bartlett sphericity test calculations determined the suitability of the sample for factor analysis. For the suitability of the data for factor analysis, the KMO value should be higher than 0.60. The calculated chi-square value of the Bartlett sphericity should be statistically significant [26]. In this study, the KMO was 0.81, and the Bartlett sphericity test χ^2 value was 565.608 ($p < 0.001$). These results show that the data are suitable for factor analysis. After the factor analysis without rotation, a single-factor structure explained 34.31% (Table 3) of the total variance. The variance ratio explained for single-factor measurement tools was found to be 0.30 and is considered sufficient [27]. Therefore, the variance rate explained for one-dimensional ISAS-T is sufficient. Table 3 shows the KMO and Bartlett sphericity test values, the factor loadings calculated as a result of EFA for each item in the scale, and the arithmetic means and standard deviation values of the items. The item-total correlation values of the scale, whose structure is determined, should be calculated,

Table 3 ISAS-T Mean, Standart Deviation, Factor Load and Item-Total Correlation Values

	Mean± Sd	Factor Load	Item-Total Correlation
1. I threw up or felt like throwing up	4.16± 0.75	.43	.45**
2. I would want to have the same anesthetic again	4.27±0.97	.64	.64**
3. I itched	4.86±0.44	.45	.42**
4. I felt relaxed	4.27±0.94	.64	.63**
5. I felt pain	4.56±0.89	.66	.65**
6. I felt safe	4.34±0.94	.75	.73**
7. I was too cold or hot	4.11±0.92	.50	.57**
8. I was satisfied with my anesthetic	4.54±0.76	.62	.60**
9. I felt pain during surgery	4.77±0.76	.59	.59**
10. I felt good	4.41±0.86	.63	.62**
11. I hurt	4.62±0.74	.46	.47**
ISAS total	49.32±5.46		

Total Explained Variance Rate = 34.31
Kaiser Meyer Olkin Value (KMO) = 0.812
Barlett Sphericity Test Value = 565.608; df = 55; $p = 0.000$

and the general-purpose serviceability level of each item in a factor should be tested. Table 3 also shows the item-factor correlation values obtained for each item in the ISAS.

The main criterion in evaluating the results of factor analysis is factor loadings. The high factor loadings are seen as an indicator that the variable can be included under the factor in question. In factor analysis, for an item to remain below the determining factor, first, the factor load must be over 0.30 [26]. In the one-dimensional Turkish form of ISAS (ISAS-T), the factor loadings changed between 0.43 and 0.75, which is sufficient. The relationship levels of the items in the scale with the ISAS-T total score were between 0.45 and 0.73. Each item has a significant positive relationship with the overall ISAS-T ($p < 0.01$).

Cronbach's alpha internal consistency coefficient was calculated within the scope of the reliability analysis studies of the scale. The Cronbach's alpha internal consistency coefficient of the ISAS-T was 0.80. In the literature, for a measurement tool to be considered reliable, Cronbach's alpha internal consistency coefficient should be over 0.70 [23]. The Cronbach's alpha value calculated for the ISAS-T showed that the scale was reliable.

Then, confirmatory factor analysis (CFA) was performed for the structure revealed in the EFA. In CFA studies, model fit indices of ISAS, which were adapted to Turkish culture with 11 items and a single factor based on EFA results, were examined. The model had acceptable and good fit values (Table 4). The parameters evaluated for model fit are the chi-square/degree of freedom (χ^2/df), root mean square error of approximation (RMSEA), goodness-of-fit index (GFI), and standardized root mean square error (SRMR) comparative fit index (CFI). The goodness-of-fit values and evaluation criteria of the CFA model established for the 11-item one-dimensional version of the ISAS adapted to Turkish are in Table 4.

As in Table 4, the model fit values for the single-factor 11-item Turkish version of the ISAS are good (χ^2/sd, SRMR, GFI) and acceptable (RMSEA and CFI). The structural equation modeling of ISAS-T is in Fig. 2.

Table 4 Statistical Values Regarding the Compliance of ISAS-T scale model

Measurement	Good Fit	Acceptable Fit	ISAS-T Model Fit Indices
(χ^2/sd)	≤ 3	≤ 4-5	2.342**
RMSEA	≤ 0.05	0.06-0.08	0.080*
SRMR	≤ 0.05	0.06-0.08	0.040**
CFI	≥ 0.95	0.94-0.90	0.902*
GFI	≥ 0.90	0.89-0.85	0.917**

*Acceptable fit; **good fit (Kline [27])

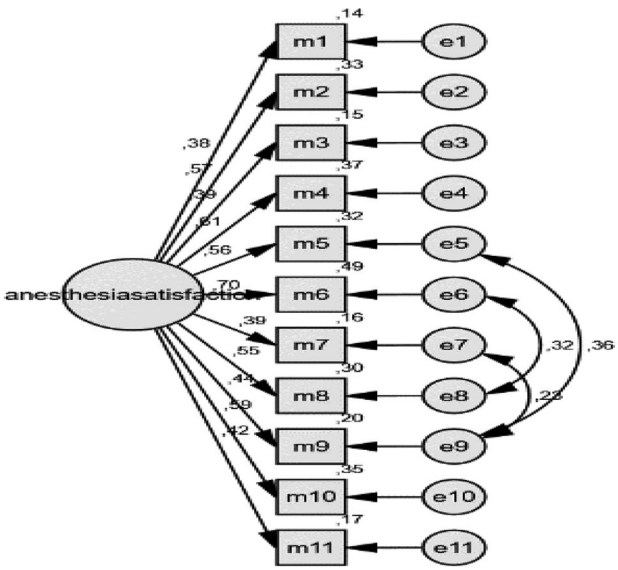

Fig. 2 ISAS-T Structural Equality Model

Stability analysis (test–retest)

The stability level of the scale was determined using the test–retest method. Fifty-five patients re-answered the single sub-dimension and the 11-item final form of the scale three hours after their first completion. The relationship between the scores at the end of both applications was examined. The correlation value between the first and second measurements was 0.82 (95% confidence interval [CI], 0.79 to 0.89).

Specificity

In our study, the difference between the lower 27% and the upper 27% in determining the specificity of ISAS-T was analyzed statistically. For this purpose, first, the raw scores obtained from the scale were listed from large to small, and then the lower and upper groups of 57 people, which consisted of the lower 27% and upper 27% groups, were determined. The mean scores of the groups were compared with the independent group's *t*-test. The obtained *t*-value (− 17.077) was significant at the level of $p < 0.001$. This shows that ISAS-T is specific.

Convergent validity

Within the scope of ISAS-T's convergent validity study, the method in ISAS's original development study and Arabic adaptation studies was used [12, 17]. In these studies, considering that patients with high anesthesia satisfaction would like to recommend the anesthesia applied to them during the surgery, the question "When you consider your anesthesia experience in the surgery you have experienced, would you

recommend another patient to have surgery in this hospital?" "In this study, a 3-point Likert (0 = no suggestion, 1 = undecided, 2 = suggestion) anesthesia experience recommendation score was created by asking the same question to the patients, and its correlation with ISAS-T was examined for convergent validity. Between the score of recommending the anesthesia applied to others and ISAS-T, the correlation level was 0.74 (95% confidence interval [CI], 0.65 to 0.82).

Acceptability and feasibility

A percentage of 95.89% of the patients completed the study protocol to provide the information required by the research. The mean time for patients to respond to the scale was 165.23 s (Sd = 40.10) for the first application and 140.76 s for the second application. The maximum filling time of the patients was 315 s for the first application and 265 s for the second application.

Discussion

After passing all the preliminary stages (such as language adaptation, expert opinion and understandability) required for cross-cultural validation in scale adaptations, ISAS-T was evaluated psychometrically. In psychometric evaluation, the following checks were made: construct validity, specificity, internal consistency, convergent validity, and test–retest reliability analysis. In our study, the mean filling time of ISAS-T was 165.23 s for the first application and 140.76 s for the second application. In other words, the scale takes a short time to complete, about 2.5–3 min. Hence, ISAS-T is a measurement tool that can be easily filled in to evaluate postoperative anesthesia satisfaction in patients who underwent surgery in Turkish culture. The original scale took an average of 4.6 min, filling times ranging from 2 to 6.15 min were reported depending on the education level of the sample and whether the practitioner was himself or not, 2 min in French adaptation [14], and 6.15 min in Spanish adaptation [15]. Similar to our study, in the French version [14], which was applied for an average of 2 min, applying the scale to the patient on a single page could be effective in shortening the duration. In our study, the scale was applied on a single page as in the study of Falempin et al. [14]. In addition, as emphasized in other studies, the education level of the group to which the scale was applied may have affected the filling time of the scale.

In our study, Cronbach's alpha internal consistency coefficient of the scale was 80. Cronbach's alpha value in the French version of ISAS was 0.68 [14], in the Spanish version 0.71 [15], and in the Arabic version 0.72 [17]. In the original validity and reliability study of ISAS, Cronbach's alpha value is the same as our study, 0.80 [12]. According to the literature, for a measurement tool to be reliable, its Cronbach's alpha internal consistency coefficient should be over 0.70 [23]. As a result, the ISAS-T is a reliable measurement tool to measure the satisfaction of patients with anesthesia in Turkish culture. The item-total correlations of ISAS-T were also analyzed within the scope of item analysis. There were significant correlations between the items and the ISAS-T total score varying between 0.45 and 0.73. In other words, each item had a significant positive relationship with the ISAS-T (at the 0.01 level). Accordingly, each item serves the purpose of the scale.

In our study, the test–retest method determined whether the ISAS-T made consistent measurements. The correlation value between the two applications of the scale at two separate times was 0.82. It is statistically significant and indicates that the scale makes stable measurements. In the literature, in previous psychometric studies [12, 14, 15, 17] on the ISAS, lower correlations were obtained from our results in test–retest measurements (0.64, 0.57, 0.74, and 0.76). The fact that there are different correlations between the test–retest measurements of the scale in different countries may be because the time of the second measurement in the studies is different from each other, the characteristics of the patient population, and the type of surgical operation performed.

In this study, the difference between the ISAS-T scores of the upper 27% group (57 patients) from the scale and the lower 27% group (57 patients) was compared within the scope of discrimination studies. The obtained $t = -17.077$ value was significant at the level of $p < 0.001$. Hence, ISAS-T can distinguish between patients with high and low anesthesia satisfaction.

Convergent validity indicates the degree of agreement between measurements of the same property obtained by different approaches. Therefore, the correlation values between alternative measurements of the same feature are examined [21]. In our study, the method used by Dexter et al. [12] in the original scale development study and in the Arabic adaptation studies conducted by Baroudi et al. [17] was adopted as an alternative criterion to evaluate anesthesia satisfaction within the scope of convergent validity. In this context, the relationship between ISAS-T scores and the patient's state of recommending the anesthetic experience to other patients was examined. As a result of the correlation analysis, we compared the anesthesia satisfaction score and the patient's recommendation of anesthesia to other patients. There was a positive and significant relationship at the level of 0.74. In other words, the convergent validity of the scale was high.

In our study, the response rate of the scale was calculated as 95.89% (after removing those who refused to answer and the ones with missing data). The response rates in the original [12], French [14], and Arabic versions [17]

of the scale, were 92%, 100%, and 80.3%, respectively. Hence, the study is complete in this respect, too.

In conclusion, the ISAS-T has acceptable psychometrical properties, and can assess the patient's satisfaction with monitored anesthesia care during various procedures. This ISAS-T scale should be useful for future research and should improve the quality of healthcare in Turkish-speaking countries.

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Author contribution Study design: Ali Özgül Saltalı, Tuba Çatak, Ebru Çanakçı; Data collection: Ali Özgül Saltalı, Tuba Çatak, Ebru Çanakçı; Data analysis: Ali Özgül Saltalı; Manuscript writing: Ali Özgül Saltalı, Tuba Çatak, Ebru Çanakçı.

Data availability The datasets generated during and/or analysed during the current study are not publicly available due to [ethical restrictions] but are available from the corresponding author on reasonable request.

Declarations

Conflict interest The authors declared no competing interests.

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