The Spanish and Italian healthcare professionals' contribution to the Safety Attitudes Questionnaire Short Form in the operating room: construct validity and reliability

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ABSTRACT

Objectives: To determine the construct validity and reliability of the Spanish and Italian versions of the Safety Attitudes Questionnaire Short Form and to study the capability of this scale of distinguishing between different countries, types of healthcare professionals, and attitudes around patient safety.

Method: This was a cross-sectional study of the scale among registered nurses, surgeons, and anesthetists providing direct patient care at surgical inpatient units within public health services in Spain (Sistema Nacional de Salud) and Italy (Servizio Sanitario Nazionale). Construct validity, in both countries, was firstly assessed by exploratory factor analysis. Then, a confirmatory factor analysis was conducted, and finally an assessment was performed by means of hypothesis testing. The reliability of the scale was calculated using Cronbach's alpha coefficient (α).

Results: A total of 499 healthcare professionals completed the questionnaire (Spain, n=183; Italy, n=316). The questionnaire showed excellent internal consistency (α=.85). An exploratory factor analysis identified a new factor model of the scale. The confirmatory factor analysis performed on this new model reflected the fair dimensionality of the construct (chi-squared=1193.63; RMSEA<.05; SRMR<.08; NNFI, IFC, IFI, and GFI values equal to .90, indicating a good fit).

Conclusions: This study provides scientific evidence of the construct validity and reliability of the Safety Attitudes Questionnaire Short Form in both Spain and Italy, showing the capability of this scale of distinguishing between different countries, types of healthcare professionals, and attitudes around patient safety.

Key words: patient safety; operating rooms; attitudes of health personnel; team work; measurement instruments

INTRODUCTION

Constantly managing risk and preventing the operating room patient from harm is essential according to the experienced operating room nurses, who are in a key position to identify threats to patient safety and should be empowered to enhance patient safety as a constant endeavor[1]. For this reason, the operating room is a context where it is necessary to guarantee high levels of safety, as a significant proportion of adverse events occur during surgery.

As compared to other hospital settings, errors in the operating room can be particularly catastrophic and, in some cases, generate great attention from the media, with repercussions for staff and institutions[2]. Operating room-related adverse events represent 39.6% of all adverse events reported in hospitals[3].

The World Health Organization (WHO) has promoted several interventions to improve patient safety in surgery, including additional checking processes to validate procedures and new policies for implementation in the operating room. In the second global patient safety challenge "Safe surgery saves lives"[4], it was found that each year 234 million major surgeries are performed worldwide. Subsequent complications occur in 25% of patients, with mortality rates between 0.5% and 5%. This organization also published the "Guidelines for Safe Surgery", as well as a surgical checklist with the aim of systematically promoting compliance with recommended safety standards to prevent avoidable adverse events[5].

In Spain, surgical interventions are the main reason for admission to public hospitals: 45.3% of hospitalized patients are admitted so that a surgical intervention can be performed[6]. In 2007, the incidence of adverse events in general surgical services was 10.5% (95% CI 8.1–12.5%) and of these, 36.5% were avoidable[7]. In Italy, 40.6% of all acutely hospitalized patients undergo surgery, and in 2007, approximately 4,600,000 individuals were discharged after a surgical intervention[1]. In one retrospective cohort study[8], it was found that of a total of 1501 analyzed medical records, 46 adverse events were recorded, of which 9 (19.6%) occurred in the operating room. In addition, the Ministries of Health and many hospitals in both countries are investing in safety programs in an effort to improve the safety culture in the operating room.

Collecting data on medical errors in surgery is difficult because near-incidents are often not reported and sentinel events can be rare. Therefore, patient safety tools are needed to obtain valid measurements for assessing quality in the surgical setting and to measure the actual effect of interventions on outcomes[2]. There are several tools to measure, evaluate, or analyze constructs relating to the patient safety culture[9]. Among them, the European Network for Patient Safety project (EUNetPaS), funded by the European Commission within the 2007 Public Health Program, published the catalog, "Patient Safety Culture Instruments used in Member States"[10], where Member States were recommended to use three instruments to measure and promote the patient safety culture among healthcare professionals: (i) the Hospital Survey on Patient Safety Culture (HSOPSC) of the Agency for Healthcare Research and Quality (AHRQ) in the United States; (ii) the Manchester Patient Safety Assessment Framework (MaPSaF) of the University of Manchester in the United Kingdom; and (iii) the Safety Attitudes Questionnaire (SAQ) of University of Texas Health Science Center at Houston (UTHealth) in the United States.

UTHealth has developed several versions of the SAQ, including an operating room version, but as no standard method of evaluation has been established, the center does not provide any guidance on their use. UTHealth recommends using the short SAQ questionnaire (SAQ-SF)[11] to assess teamwork and the safety climate. Likewise, the UTHealth website is available to professionals and researchers upon written request. It has been successfully translated, adapted, and validated for use in different contexts, for example, in the Netherlands[12,13], Portugal[14], Denmark[15], Norway[16,17], Switzerland[18], Sweden[19,20], Belgium[9], Turkey[21], and Taiwan[22]. All these versions have shown good psychometric properties in different populations.

Before using an adapted instrument, it is important to evaluate its psychometric properties[23]. Therefore, the objective of this study was to determine the construct validity and reliability of the Spanish and Italian versions of the SAQ in the surgical setting in Castellón (Spain) and Rome (Italy). Specifically, construct validity was evaluated by confirming the following hypotheses regarding professional status:

Hypothesis 1: Spanish nursing staff has more negative attitudes regarding teamwork and the safety climate than anesthetists or surgeons.

Hypothesis 2: Spanish surgeons report better working conditions than other health professionals who work in the operating room.

Hypothesis 3: The job satisfaction of Spanish nursing staff is lower than that of anesthetists or surgeons.

Hypothesis 4: Italian anesthetists have a better perception of operating room management than other professionals.

METHODS

Design, setting, and participants

The translation and cross-cultural adaptation of the SAQ-SF for the Spanish and Italian contexts were recently performed (Supplemental Appendix), with satisfactory psychometric properties found for both countries[24]. It is necessary to evaluate its reliability and construct validity in a larger sample so that the questionnaire can be used in the surgical setting in these countries. Consequently, a cross-sectional study was conducted among nurses, surgeons, and anesthetists providing direct patient care at the surgical services of public healthcare systems in Spain (Sistema Nacional de Salud, SNS) and Italy (Servizio Sanitario Nazionale, SSN).

There is no definitive agreed standard on the number of participants needed to form samples in validation studies[25]. Many previous studies have adopted participant–item ratios for exploratory factor analyses which vary from 1.2 to 10 depending on the consulted literature[26], while other studies have developed guidelines[27,28]. The usual recommendation is to use a sample size that is 10 times greater than the number of items (N=10K, where K is the number of items)[29,30]. Other authors[31] consider a smaller sample of 2 or 3 times the number of variables (N=2K o 3K) to be sufficient, as long as the number of participants is not less than 100. Therefore, a minimum of 150 participants was established, both in Spain and in Italy, forming a sample equivalent to at least 4 participants per item. This ensured that our study had sufficient power to assess psychometric properties.

The selection of subjects within each professional category was carried out through convenience sampling of key informants[32] who met the inclusion criteria both in Spain and Italy: (1) active personnel of both sexes, working in the operating room; (2) with any type of contract (temporary or indefinite).

Personnel of any discipline who were in training or management positions were excluded to ensure knowledge on the reality of the hospital setting.

Instrument

The SAQ-SF questionnaire contains 36 items, of which 31 are grouped into 6 factors that reflect the different attitudes of health professionals: (1) teamwork and organizational climate; (2) safety climate; (3) job satisfaction; (4) stress detection; (5) perception of management (each of the items in this subscale is measured on two levels: that of the unit and the hospital); and (6) working conditions. The other 5 items do not form part of these 6 factors; these items were added because the principal investigators who participated in the pilot studies found them interesting on their own. The assessment of possible responses to each of the items in the questionnaire is carried out using a 5-pointLikert-type scale[11] (Supplemental Appendix).

The demographic characteristics of the participants, such as gender, age, professional category, years working in the operating room, and years working in the hospital, were also included.

Data collection and ethical considerations

Data collection took place from April to June 2016. All participants from both counties were invited to complete the SAQ-SF on paper or online using a tool that contained an electronic version of the scale. The completed questionnaires were returned either directly to the researchers or through the email system. All data from the questionnaires were entered into electronic databases for further analysis.

All participants were provided with information about the purpose of the study and were informed that their participation was voluntary, with the questionnaires being anonymous and informed consent being necessary. A message was included in the email invitation and the questionnaire explaining that the data would be processed anonymously, avoiding any coercion and an informed consent form was signed.

Statistical analysis

Means, standard deviations (± SD), and percentages were calculated. Participant scores were presented by sex (female, male), age groups (<25 years, 25–30 years, 31–40 years, 41–50 years,> 51 years), job position (nurse, surgeon, anesthetist), years working at the hospital (<1 year, 1–5 years, 6–

10 years,> 10 years), and years working in the operating room (<1 year, 1–5 years, 6–10 years,> 10 years).

The validity of the construct, both in Spain and Italy, was first evaluated by exploratory factor analysis (EFA), then by confirmatory factor analysis (CFA), and finally by hypothesis evaluation. The reliability of the scale was calculated using Cronbach´s alpha coefficient (α) considering values ≥ 0.70 as appropriate[33].

For the EFA, the Kaiser–Meyer–Olkin (KMO) test and Barlett´s test of sphericity were performed to confirm the adequacy of the sample and items. For a satisfactory factor analysis, KMO statistic values must be greater than 0.5, and the significance level (p) for Bartlett´s test should be <0.05[34-36].

CFA was carried out to analyze whether the data collected in our populations conformed adequately to the structure of the6-factor model predetermined by the authors of the original questionnaire[37]. According to some recommendations in the literature on CFA[38], when there are a minimum of 5 categorical variables among the response options (as is the case of the SAQ-SF), the standard theory of maximum likelihood (applicable to continuous variables) should be applied. Thus, the following goodness of fit indices of the SAQ-SF scale were evaluated: the chi-squared statistic (χ^2) with $p<0.05$[39] and χ^2/DF ratios≤ 2 o 3[40,41] indicating a good fit, as well as the Normed Fit Index (NFI), the Non-Normed Fit Index (NNFI), the Comparative Fit Index (CFI), the Incremental Fit Index (GFI), and the Goodness of Fit Index (GFI), with values ≥.9 indicating an acceptable fit[42-45]. The Standardized Root Mean Square Residual (SRMR) and the Root Mean Square Error of Approximation (RMSEA) were also calculated. Reference values for SRMR ≤ 0.8 indicate a good fit[43]. References values for RMSEA ≤ 0.05 are acceptable[46].

Regarding hypothesis evaluation, the basic principle of construct validation is that the hypotheses are formulated based on the relationships between the scores of the instrument under study and the scores of other instruments that measure constructs that are similar or distinct[47]. Therefore, the 4 previously described hypotheses related to the job position were formulated to evaluate construct validity.

All statistical analyses were performed with IBM SPSS Statistics V22.0 and EQS 6.1.

RESULTS

Sample characteristics

The detailed demographic characteristics of the participants are shown in Table 1. In total, 183 healthcare professionals completed the questionnaire in Spain. These were: nurses (n=108, 59.0%), surgeons (n=14, 7.7%), and anesthetists (n=54, 29.5%). In Italy, participation was higher, with 316 healthcare professionals included as follows: nurses (n=218, 69.0%), surgeons (n=28, 8.9%), and anesthetists (n=55, 17.4%). Most of the participants were women (64.9%). In both countries the required minimum sample size of 150 questionnaires was reached.

The mean age of the overall sample was 42.6 years (SD = 11.2). In Spain, 27.9% of the professionals were aged between 31 and 40 years, and 27.3% were older than 51 years. In the case of Italy, 37% of the health professionals were between 41 and 50 years of age, and none were aged under 25 years. Regarding professional category in both countries, 65.3% of staff were nursing personnel, 8.4% were surgeons, and 21.8% were anesthetists.

Overall, the mean number of years working in the hospital was 9.6 years (SD = 8.4). In total, 48.1% of participants had been working in the hospital for over 10 years, somewhat guaranteeing their knowledge regarding the hospital and its safety culture. A similar situation was found in relation to the time the participants had spent working in the operating room, with approximately 42.1% of the staff having been employed in this setting for more than 10 years. In any case, less than 10% of professionals had been working in the operating room for under a year. Thus, most of professionals in the sample had greater knowledge of the unit due to their time spent working there.

Exploratory factor analysis

Separate analyses were performed on the Spanish (n=183) and Italian (n=316) samples, with a final analysis then being performed on the overall sample (n=499). We thus checked whether the results diverged or, on the contrary, there was a certain degree of consistency in the data.

In Spain, the adequacy of the sample was confirmed by the KMO test (0.80) and Bartlett´s test of sphericity (χ^2=2353.60; DF=630; p<.001), which indicated that the correlations among the items were sufficiently high. The obtained results allowed us to ensure that with 8 factors, 48.03% of the variance

was represented. In Italy, the KMO (0.87) and Bartlett's test of sphericity results (χ^2=3614,48; DF=630; p<.001) confirmed that the factorial model was adequate and that it was pertinent to use the EFA with the data of the sample to be analyzed. The EFA showed that 7 factors represented 44.04% of the variance. For the Spanish and Italian sample together, the KMO test value was greater than 0.5 and the Bartlett´s test of sphericity result was less than 0.001.

Regarding the factorial structure obtained for the total sample ("Model 1), the following conclusions can be drawn: a six-factor structure was obtained, and factors 1 and 2 were grouped together as a new factor (Table 2).

In this model, a series of modifications was made to ensure consistency with the original American questionnaire. The load of item 18 was changed from factor 1 to 2, while that of item 35 was changed from factor 1 to factor 6, and that of item 27 from factor 5 to factor 4. Thus, a new factorial structure was obtained, "Model 2" (similar to Model 1), that serves both the Spanish and Italian contexts. In this model, factors 1 and 2 were grouped together as a new factor denominated "teamwork and safety climate", consisting of the first 13 items of the original scale. Factor 5 was broken down into two new factors: one on the perception of operating room management and the other on the perception of hospital management (Table 2).

Confirmatory factor analysis

It was decided that CFA would only be performed on the Spanish and Italian samples together (n=499) because, as has been seen previously, only the results of the CFA for the total sample allowed for a 6-dimensional model with a structure similar to that of the original American version.

To check whether these first impressions were correct, a CFA was performed on the structures represented by Model 1 (prior to modifying the items proposed by the EFA) and Model 2 (after modification).

The CFA results after applying the standard likelihood theory for continuous variables are shown in Table 2. The values of the goodness of fit indicators of the two models showed a good fit with the observed data. The χ^2 statistic was not significant given that p>0.05 (a desirable situation), so it may be stated that both models are adequate for describing the behavior of the data (Model 1: χ^2=914.982, 579 DF, χ^2/DF=1.58; Model 2: χ^2=1193.625, 579 DF, χ^2/DF=2.06).

For Model 1, the NNFI, IFC, IFI, and GFI values were all above 0.9, indicating a good fit. The SRMR and RMSEA values were below 0.08 and 0.05, respectively, also indicating a good fit. Only the NFI and AGFI values were slightly below 0.9. Meanwhile, Model 2 showed SRMR and RMSEA values below 0.08 and 0.05, respectively, indicating a good fit. However, the values for all the remaining indicators were slightly below 0.9. Thus, given the results obtained through the different analyses, Model 1 would be more acceptable because some of the ad hoc indicator values were slightly higher. However, for consistency with the original instrument, Model 2 was chosen.

A flow diagram providing a graphical representation of the cause–effect relationships for Model 2 can be seen in Figure 1. It was verified that all the standardized coefficients were within the interval -1, +1, except for item 27, which showed a negative estimate. This indicates that latent variables can be measured by the items[48]. Furthermore, the analysis revealed a significant correlation between teamwork and safety climate (factor 1) and job satisfaction (factor 2) (correlation = 0.65). The same situation was found for factor 1 and the perception of operating room management (factor 4) (correlation = 0.53); factor 1 and working conditions (factor 6) (correlation = 0.58); factors 2 and 4 (correlation 0.57); and factors 4 and 6 (correlation = 0.52).

Hypothesis evaluation

The mean scores of the participants by type of healthcare professional (nurses, surgeons, and anesthetists) and country are shown in Table 3. On performing the Kruskal–Wallis statistical test on both samples, it was observed Spanish nursing staff (60.73%) had more negative attitudes regarding teamwork and safety climate than anesthetists (71.35%) or surgeons (72.94%), confirming hypothesis 1 ($p<0.001$).

Spanish surgeons (64.29%) reported better working conditions than the rest of the health professionals working in the operating room, confirming hypothesis 2 ($p=0.002$).

The job satisfaction of Spanish nursing staff (64.64%) was lower than that of anesthetists (69.49%) and surgeons (70.00%), confirming hypothesis 3 (p=0,021).

The perception of Italian anesthetists (73.30%) was better than that of the other professionals, confirming hypothesis 4 ($p<0.001$).

The confirmation of these hypotheses shows that both the Spanish (SAQ-SF_ES) and the Italian versions (SAQ-SF_IT) had the capacity to differentiate between the healthcare professionals involved in the study.

Reliability Assessment

Cronbach´s alpha coefficient for both models (1 and 2) was 0.852 for the global scale (Table 2). It was also observed that there were no major changes in the α values when items were changed from Model 1 to Model 2. The Raykov coefficient (ρ) was calculated, and it was found to be similar to that obtained in the psychometric tests of the original scale ($\rho = 0.90$) [11].

DISCUSSION

The SAQ-SF is a brief, easy-to-interpret questionnaire for measuring patient safety culture. It is freely available in different languages, for example Dutch[9,13,49], Portuguese[14], Danish[15], Norwegian[16,17], German[18,20], Turkish[21], and Chinese[22]. Our results indicate that it has good internal consistency for the full scale (α=0.85) and adequate construct validity in the study population, which consisted of nurses, surgeons, and anesthetists.

In a recent study carried out by our group[24], the Spanish and Italian versions of the questionnaire showed adequate cross-cultural validity and test–retest reliability. These results, together with those presented here, confirm that the SAQ-SF is a reliable and valid instrument for measuring attitudes surrounding safety.

Exploratory factor analysis (EFA) is a technique for reducing the dimensionality of the data, with its ultimate purpose being the search for the minimum number of dimensions capable of explaining the maximum amount of information contained in the data. It is known that the SAQ-SF questionnaire, which is widely used throughout the world, is grouped into six dimensions, and that this factorial structure was evaluated using EFA by the authors of the instrument[11,50] and in various publications. Therefore, it would not have been necessary to carry out an EFA because scientific evidence already existed on its structural validity.

However, and as mentioned previously, the dimension relating to the perceptions of healthcare personal regarding management is measured both at the hospital level and at the unit/service level.

As such, two possible structural models were proposed: one grouping all the items within a single dimension, and another with the creation of two dimensions, one with items referring to center management and the other with items referring to surgical unit management. For this reason, it was decided to first perform an EFA to validate the most appropriate factorial structure, and then carry out a CFA.

The EFA carried out on the sample obtained from both countries led to the identification of six dimensions which were coded in Model 2, showing two main findings. Firstly, the data showed a better fit in the structure in which there were two different dimensions for perceptions regarding management. Specifically, these were dimension 4: “perception of operating room management” and dimension 5: “perception of hospital management”. Secondly, there was the grouping of dimension 1: “teamwork” and dimension 2: “safety climate” together as a new and unique dimension composed of 13 items, named dimension 1: “teamwork and safety climate”.

Regarding the first finding, two Norwegian researchers hypothesized a structure in which they separated the perceptions of management and perceptions of the service/unit[17]. The authors of this publication did not indicate the fit of the model to the proposed structure; they judged the construct validity by the goodness of fit of the CFA indicators.

There are no references regarding the second finding in other cross-cultural validation studies of the SAQ-SF. However, the authors of the original questionnaire commented: “*We recommend using the Safety Attitudes Questionnaire – Short Form. We typically use the first thirteen items to measure teamwork and safety climate*”.

In one study carried out in the operating room, the authors only used the six items from the first dimension of the SAQ-SF which measured teamwork, obtaining a response rate above 77%[51]. Another study concluded that the “teamwork” and safety climate” dimensions have received the most research attention and are more often used to direct efforts to improve patient safety[52],while the other four dimensions are generally used to support the interpretation of the first two. Therefore, obtaining a dimension that groups the first 13 items of the SAQ-SF would allow the creation of a new instrument that (1) is supported by scientific evidence regarding its development; (2) facilitates an increased

response rate by being short enough to be used in the operating room by busy healthcare professionals; and (3) measures teamwork and the safety climate in the operating room.

If we focus on this new six-factor model proposed by the EFA, the results regarding reliability (α=0.85) were consistent with those of other studies. Similar Cronbach´s alpha coefficients were found on comparison with the Dutch (0.87)[13], Portuguese (0.90)[14], Danish (0.89)[15], Norwegian (0.83)[16], German (0.83)[18], and Swedish (0,83)[19] versions.

The CFA performed on the six-dimensional model identified by the EFA (Model 1) revealed that the obtained results were better than those of the proposed Model 2 because some of the ad hoc indicator values were slightly higher. However, and for consistency with the original instrument, Model 2 was chosen. This model, judging by the goodness of fit of its indicators, can be considered as satisfactory for describing the behavior of the data: the chi-squared value was not statistically significant and the results for the ad hoc NNFI, CFI, IFI, GFI, SRMR, and RMSEA indicators were all within the reference values, indicating the good dimensionality of the construct.

No structural models similar to that obtained in this study were found in the literature, and as such, a comparison of the results cannot be made. However, it should be noted that the original six-dimensional model by Sexton et al.[11] showed adequate construct dimensionality. The model hypothesized in Norway[17] obtained acceptable results, but were far from perfect. Different validation studies conducted in various countries, for example, in the Netherlands[13,49], Portugal[14], Denmark[15], Norway[16,17], Switzerland[18], Sweden[19,20], Belgium[9], Turkey[21], and Taiwan[22], all obtained acceptable goodness of fit indices for the six-dimensional model.

Finally, four hypotheses were confirmed, with statistically significant differences being verified, showing that the SAQ-SF is capable of distinguishing between different countries, types of healthcare professionals, and attitudes around patient safety, providing adequate evidence of construct validity.

Limitations of the study

The main limitation resides in the type of sampling used to capture healthcare professionals working in the field of surgery. Convenience sampling was chosen using strategic informants who met the selection criteria in both Spain and Italy. It is of great interest to locate those people who have the most information about a certain phenomenon or social system[32]. The most important subtype of

sampling with strategic informants is “snowball” sampling, also known as “chain” sampling, which is generally used in special or difficult-to-access populations. To carry out the sampling, a series of initial informants were asked to supply the names of other potential members for the sample who were part of the specific population under study. This type of sampling is, in short, an approximation system to locate informants based on the interrelationships within groups[53,54].

This type of sampling does not guarantee the representativeness of the sample[55], which is why age, sex, type of healthcare professional, years of experience in the hospital, and years of experience in the operating room were measured, providing a global profile regarding the generalizability of the results, or at the very least to whom they refer.

Irrespective of the above considerations, the size of the sample obtained facilitated the inclusion of health professionals from different provinces, hospitals, and surgical settings. This makes it possible to present results that, despite not being strictly generalizable to healthcare professionals working in the operating room, do show the trends and differences between groups based on different factors (sex, age, type of professional, years of experience in the hospital, and years of experience in the operating room).

CONCLUSIONS

This study provides evidence on the construct validity and reliability of the SAQ-SF for measuring the safety climate in daily practice and research in operating rooms in Spain (SAQ-SF_ES) and Italy (SAQ-SF_IT). According to the results, the scale is capable of distinguishing between different countries, types of healthcare professionals, and attitudes around patient safety.

Further research should be performed to explore the six-dimensional factorial structure found in this study and obtain a good multilingual instrument. Therefore, international longitudinal studies are needed to evaluate the responsiveness of the new questionnaire and to be able to monitor improvements in safety culture after its implementation.

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Table 1.

Sample Characteristics.

Variables		Total sample (n=499)	Spain (n=183)	Italy (n=316)
Gender, n (%):	Female	324 (64.9)	110 (60.1)	214 (67.8)
	Male	168 (33.7)	68 (37.2)	100 (31.6)
	Missing data	7 (1.4)	5 (2.7)	2 (.6)
Age, n (%):	< 25 years	3 (.6)	3 (1.6)	-
	25-30 years	72 (14.4)	27 (14.8)	45 (14.2)
	31-40 years	139 (27.9)	51 (27.9)	88 (27.8)
	41-50 years	162 (32.5)	45 (24.6)	117 (37.0)
	> 51 years	115 (23.0)	50 (27.3)	65 (20.6)
	Missing data	8 (1.6)	7 (3.8)	1 (.03)
Position, n (%):	Registered nurse	326 (65.3)	108 (59.0)	218 (69.0)
	Surgeon	42 (8.4)	14 (7.7)	28 (8.9)
	Anesthetist	109 (21.8)	54 (29.5)	55 (17.4)
	Missing data	22 (4.4)	7 (3.8)	15 (4.7)
Years in the hospital, n (%):	< 1 year	33 (6.6)	11 (6.0)	22 (7.0)
	1-5 years	122 (24.4)	54 (29.5)	68 (21.5)
	6-10 years	96 (19.2)	32 (17.5)	64 (20.3)
	>10 years	240 (48.1)	82 (44.8)	158 (50.0)
	Missing data	8 (1.6)	4 (2.2)	4 (1.3)
Years in the OR, n (%):	< 1 year	46 (9.2)	14 (7.7)	32 (10.1)
	1-5 years	144 (28.9)	54 (29.5)	90 (28.5)
	6-10 years	93 (18.6)	32 (17.5)	61 (19.3)
	>10 years	210 (42.1)	80 (43.7)	130 (41.1)
	Missing data	6 (1.2)	3 (1.6)	3 (.09)

Table 2.

Exploratory Factor Analysis and Confirmatory Factor Analysis of the SAQ-SF.

Analysis		Original Scale (Sexton et al., 2006b)	Total sample of the current study (n=499)	
			Model 1[a]	Model 2[b]
EFA:	Factors	6	6	6
		1. Teamwork climate (items 1-6)	1. Teamwork climate (items 1-13, 18[d], 35[e])	1. Teamwork and safety climate (items 1-13)
		2. Safety climate (items 7-13)	2. Job satisfaction (items 14-17)	2. Job satisfaction (items 14-18)
		3. Job satisfaction (items 14-18)	3. Stress recognition (items 19-22)	3. Stress recognition (items 19-22)
		4. Stress recognition (items 19-22)	4. Perceptions of the OR management (items 23-26)	4. Perceptions of the OR management (items 23-27)
		5. Perceptions of management (items 23-27)[c]	5. Perceptions of the hospital management (items 27[f]-32)	5. Perceptions of the hospital management (items 28-32)
		6. Working conditions (items 28-31)	6. Working conditions (items 33, 34, 36)	6. Working conditions (items 33-36)
CFA:	Fit indices[g]:			
	χ^2(DF)	10311.270(784)	914.982 (579)	1193.625 (579)
	χ^2/DF	-	1.58	2.06
	NFI	-	.836	.865
	NNFI	-	.926	.876
	CFI	.900	.932	.877
	IFI	-	.933	.880
	GFI	-	.903	.065
	SRMR	.040	.045	.048
	RMSEA	.030	.036	
	Reliability coefficients			
	CRONBACH'S ALFA (α)	-	.852	.852
	RAYKOV'S COEFFICIENT (ρ)	.900	.896	.888

[a] Model 1: Before modifying the item structure proposed by the EFA.

[b] Model 2: After modifying the item structure proposed by the EFA.

[c] Each of these items is measured at two levels – the unit and hospital.

[d] Item 18 is changed from factor 1 to 2.

[e] Item 35 is changed from factor 1 to 6.

[f] Item 27 is changed from factor 5 to 4.

[g] χ^2 (DF) = Chi-squared (Degrees of freedom); NFI=Normed Fit Index; NNFI=Non NFI; CFI=Comparative Fit Index; IFI=Incremental Fit Index; GFI=Goodness of Fit Index; SRMR=Standardized Root Mean Square Residual; RMSEA=Root Mean Square of Error Approximation.

Table 3.

Hypothesis testing.

Country	Position	Factors*					
		1	2	3	4	5	6
Spain	Registered Nurse (IC95%)	60.73 (58.07-63.38)	64.64 (61.98-67.30)	51.10 (47.37-54.82)	51.65 (49.33-53.97)	65.57 (63.50-67.63)	51.61 (48.85-54.37)
	Anesthetist (IC95%)	71.35 (67.04-75.66)	69.49 (64.15-74.83)	50.89 (45.75-56.04)	51.43 (46.97-55.88)	65.82 (62.78-68.85)	57.78 (53.33-62.23)
	Surgeon (IC95%)	72.94 (65.66-80.22)	70.00 (58.85-81.15)	48.21 (34.98-61.45)	45.71 (35.98-55.45)	60.36 (54.76-65.96)	64.29 (58.07-63.38)
	p value**	<.001	.021	.699	.289	.113	.002
Italy	Registered Nurse (IC95%)	57.80 (55.72-59.88)	57.75 (54.84-60.65)	52.40 (49.57-55.23)	44.53 (42.66-46.40)	59.82 (57.04-62.60)	53.56 (51.30-55.82)
	Anesthetist (IC95%)	59.36 (55.97-62.75)	60.85 (56.22-65.47)	48.94 (44.05-53.83)	47.45 (43.87-51.03)	73.30 (69.27-77.34)	50.59 (45.80-55.38)
	Surgeon (IC95%)	61.47 (57.00-65.94)	58.93 (53.21-64.64)	50.67 (43.05-58.29)	42.68 (36.77-48.59)	70.71 (65.19-76.24)	49.33 (43.53-55.13)
	p value**	.263	.712	.357	.208	<.001	.234

* Factors: 1=Teamwork and safety climate; 2=Job satisfaction; 3=Stress recognition; 4=Perceptions of the OR management; 5=Perceptions of the hospital management; 6=Working conditions.
**Kruskal–Wallis test.

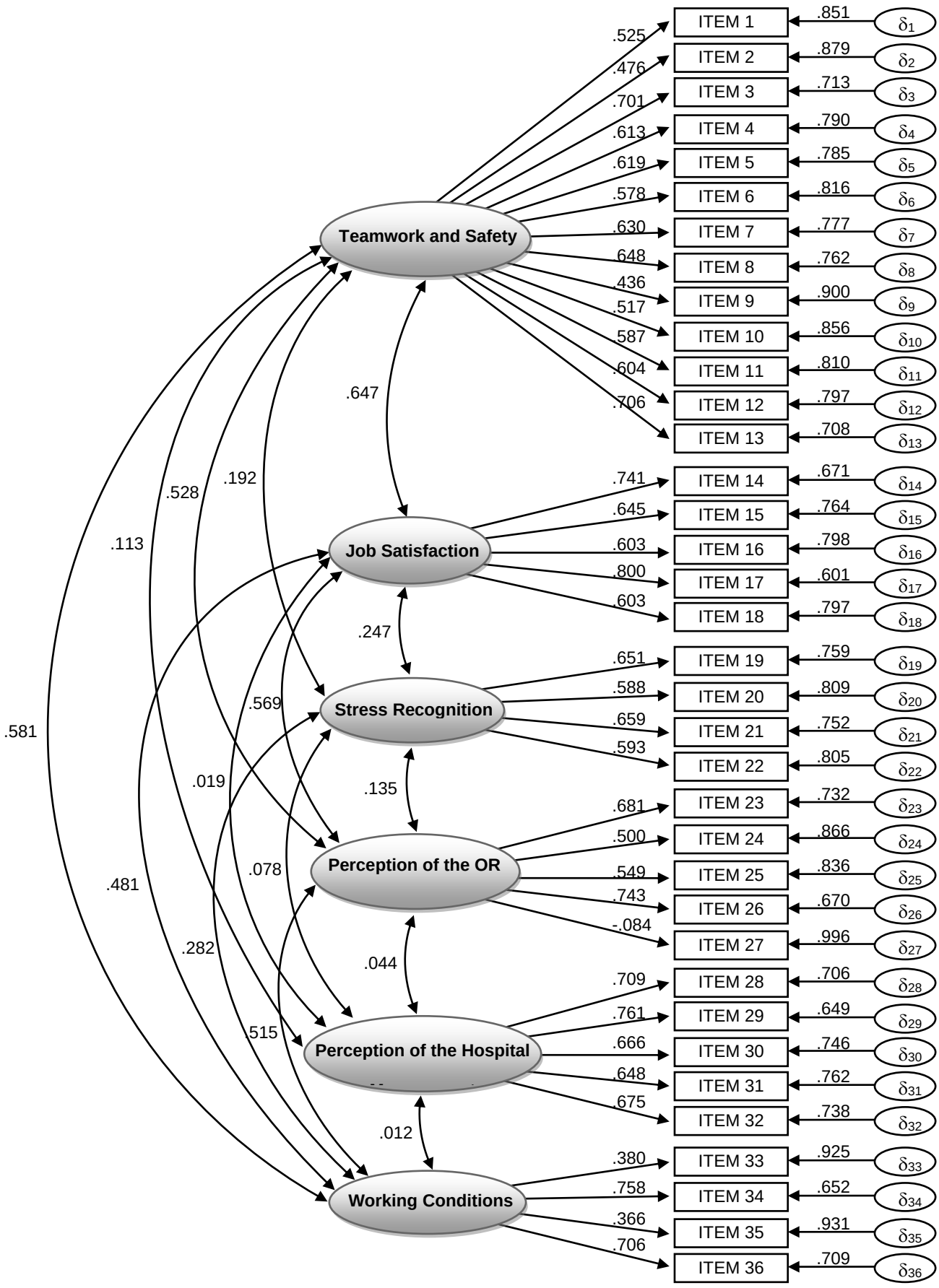

Figure 1. Path diagram for Model 2 (n=499): standardized coefficients and residuals (δ)