RELIABILITY AND VALIDITY OF A MODIFIED AMSTERDAM PREOPERATIVE ANXIETY AND INFORMATION SCALE (APAIS)

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Abstract

Background: Preoperative anxiety is common and can have deleterious effects, such as fluctuations in blood pressure, heart and respiratory rate, resistance to anesthetic induction, higher levels of postoperative pain and poor healing. Our aim was to assess the reliability and validity of the Greek version of the Amsterdam Preoperative Anxiety and Information Scale (APAIS).

Methods: One hundred patients completed a modified (Greek) APAIS questionnaire and the Spielberger's State-Trait Anxiety Inventory (STAI-State) during routine preoperative screening from March to May 2015. Both general and regional anesthesia patients were included and various clinical data, such as age, sex, level of education, marital status, American Society of Anesthesiologists (ASA) physical status classification system and previous surgery were collected.

Findings: Exploratory factor analysis revealed a new two factors model of the Greek version of APAIS: anxiety and need for information related to anesthesia and anxiety and need for information related to procedure (APAIS-anesthesia: Cronbach's α =0.844; APAIS-procedure: Cronbach's α =0.847). We also found a very high correlation between the subscales of APAIS and STAI-State. Furthermore, APAIS discriminated well between sub-groups of patients on the basis of the severity of their procedure.

Conclusions: The Greek version of APAIS with the new structure that emerged can provide anesthesiologists with a reliable and valid instrument to assess easily the preoperative anxiety and the need for information in clinical practice.

Keywords: Preoperative anxiety, Amsterdam Preoperative Anxiety and Information Scale (APAIS), Reliability, Validity.

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Introduction

As the reported incidence of preoperative anxiety in adults ranges from 11% to 80%, depending on the assessment method, the need to evaluate and prevent preoperative anxiety is of high priority in order to improve the patient's experience during the perioperative period[1]. The excessive degrees of preoperative anxiety can lead to deleterious effects. These include fluctuations in blood pressure, heart and respiratory rate, resistance to anesthetic induction, higher levels of postoperative pain and poor healing[1,2].

Although the prescription of sedative premedication is widespread around the world in order to relieve preoperative anxiety, anxious patients can also benefit from more attention and information from the anesthesiologist[3]. The level of preoperative anxiety depends on several factors such as socio-demographic characteristics, previous surgeries, characteristics of the medical surgery, possible complications, the kind of preoperative information or the method of anesthesia and psychosocial variables, such as the general level of anxiety, personality characteristics and psychological or psychiatric comorbidity[4,5]. Therefore, the anesthesiologists' ability to estimate the anxiety of their patients is variable[6].

Until now, several tools have been developed for the evaluation of preoperative anxiety. Spielberger's State-Trait Anxiety Inventory (STAI) is the most commonly used tool and is reported to be reliable and valid. It can be used in clinical settings to diagnose anxiety but it was not developed in order to assess preoperative anxiety. Of note, the STAI has been translated into Greek and validated in 2006[7]. The STAI comprises two separate, 20- item, self-report scales for measuring state and trait anxiety. Trait anxiety refers to anxiety as a personality trait, while state anxiety evaluates how the respondent feels at a given time ("right now"). Although the state scale is used to assess preoperative anxiety, it is too long to be easily applicable and not related to the specific situation.

The Amsterdam Preoperative Anxiety and Information Scale (APAIS) was developed by Moerman et al. in 1996 in Amsterdam[8]. It is a six-item, self-report questionnaire and therefore it is a brief and economical instrument. The original language of APAIS was Dutch. Moerman et al. (1996) included in their article a table with the English translation of APAIS. The APAIS was developed to evaluate patient's preoperative anxiety and need for information, with four and two items representing anxiety about anesthesia / surgical procedure (1, 2, 4, 5 Cronbach's α 0.86) and the need for information about anesthesia and the procedure (3, 6 Cronbach's α 0.72), respectively. The APAIS is very easy and quick to complete by the patient, while it has been validated in surgical patients[8]. In addition to this, the APAIS score is positively associated with severe postoperative pain early after awaking[9,10]. Therefore, the APAIS may have the potential to become the gold standard for the assessment of preoperative anxiety, provided that it is translated and validated in all languages. The aim of the present study was to assess the reliability and the validity of the Greek translation of APAIS (Table 1).

Table 1

Items of the original Amsterdam Preoperative Anxiety and Information Scale and its Greek version

Original items	Greek items
1. I am worried about the anesthetic.	1. Ανησυχώ για την αναισθησία.
2. The anesthetic is on my mind continually.	2. Η αναισθησία είναι στο μυαλό μου διαρκώς.
3. I would like to know as much as possible about the anesthetic.	3. Θα ήθελα να μάθω όσο το δυνατόν περισσότερα για την αναισθησία.
4. I am worried about the procedure.	4. Ανησυχώ για την επέμβαση.
5. The procedure is on my mind continually.	5. Η επέμβαση είναι στο μυαλό μου διαρκώς.
6. I would like to know as much as possible about the procedure.	6. Θα ήθελα να μάθω όσο το δυνατόν περισσότερα για την επέμβαση.

Methods

The study has been approved by the Ethics and Scientific committee of our hospital (276/12-03-15) and was conducted between the March 15th and May 5th, 2015. In our study, we included all consecutive patients who were able to speak and read Greek, older than 18 years old, with American Society of Anesthesiologists (ASA) physical status I-III and who underwent elective surgery. Written informed consent was obtained from all the participants. All the patients with a previously diagnosed psychiatric disorder and/or receiving any psychiatric medication, such as anxiolytics, antidepressants, antipsychotics and mood stabilizers, were excluded from the study.

Various clinical data were collected, such as age, sex, educational and marital status, the ASA physical status score and the experience of previous surgery. The Greek version of the APAIS and the STAI-State questionnaires were filled out by the patients preoperatively, the day before their elective surgery. The items of APAIS are rated on a five-point Likert scale from "1= not at all" to "5= extremely". The scale assessed anxiety about the anesthesia (items 1, 2), anxiety about the procedure (items 4, 5) and the need for information (items 3, 6). Our study conforms to the Helsinki Declaration of 1975 and its later amendments.

Statistical analysis

All the data were entered, checked for missing values and analyzed using SPSS version 17.0 (SPSS Inc., Chicago, IL, USA) and SAS version 7.0 (SAS Institute, Cary, NC, USA) statistical programs. Descriptive statistics, such as the mean, standard deviation and skewness were used to describe the main variables. A significance level of alpha= 0.05 was chosen. The normal distribution of the data was examined using the Kolmogorov-Smirnov test and P-P plots. Translation and back translation were performed. A native English bilingual translator produced the first draft from the English version[8]. A Greek bilingual expert then back translated the items to cross-validate them. Evaluation of the validity of a questionnaire includes factor analysis, convergent validity, subscale validity and the known-groups validity.

Confirmatory factor analysis (CFA) was used to examine and confirm the factor structure of the questionnaire as suggested by the creator of the questionnaire. The *CFA* was carried out using the Analysis of Moment Structure (AMOS) Version 7.0[11]. The size of the sample that is required for the CFA, is based on researchers conventions, ranging for the participants ratio 3:1 to as high as 12:1. Stable factor models can be found with samples as small as 100 and with samples as small as 150 if 10 or more items load at 0.4 or higher[12,13]. The APAIS consisted of six items, thus our sample size of 100 is within the above guidelines.

Rejecting or accepting a model was based on some global fit indices: (1) chi-square tested the fit of the observed covariance matrix obtained under the constraints of the model, (2) the root mean square error of approximation (RMSEA), (3) the comparative fit index (CFI), (4) the normed fit index (NFI), (5) the goodness fit index (GFI), and (6) the adjusted GFI (AGFI). The chi-square-degrees of freedom (d. f.) ratio < 2[14], RMSEA < 0.06[15], CFI >0.9[15], GFI > 0.85[16], AGFI > 0.8[16], NFI > 0.9[17] indicate an acceptable fit.

Exploratory factor analysis (EFA) was conducted to identify a viable factor structure. EFA, using maximum likelihood extraction method with direct oblimin rotation, was conducted for all participants to determine the factor structure of the six items of the APAIS questionnaire. Items with factor loadings ≥ 0.4 (including values that rounded to 0.4) and those that did not load on more than one factor were retained. Items not meeting these criteria were removed one at a time. Factor analyses were repeated until a solution was attained in which all items included in the analysis met all criteria[18,19].

Convergent validity of the APAIS questionnaire was determined by establishing the correlation between questionnaire's subscales and STAI-State using the Pearson's correlation coefficient. Moderate to high correlation supports the validity of the APAIS questionnaire in measuring important aspects of anxiety status.

Subscale validity was evaluated by examining the subscales correlations, while *known-groups validity* of APAIS questionnaire was examined in terms of the ability of the questionnaire to distinguish

between subgroups of patients formed on the basis of the severity of their procedure coded as "major" and "no major". Independent samples t-test was used for two-group comparisons when the equal variances hypothesis according to the Levene's test was confirmed, whereas the Welch test was used when the equal variances hypothesis was rejected.

Floor or ceiling effects are considered to be present if more than 15% of respondents achieved the lowest or highest possible score, respectively[20]. If floor or ceiling effects are present, it is likely that extreme items are missing in the lower or upper end of the scale, indicating limited content validity.

The estimation of the reliability of a questionnaire includes internal consistency reliability, test-retest reliability and parallel forms reliability.

Internal consistency reliability of the APAIS was determined by calculating Cronbach α coefficient[21]. A Cronbach α coefficient value of 0.7 indicates sufficient reliability for research purposes and suggests that items are interdependent and homogeneous in terms of the construct they measure. For clinical applications $\alpha>0.8$ is desirable[22,23].

Test-retest reliability (stability) indicates the stability of patients' response in time and it was determined by calculating ICC (intraclass correlation coefficient: the error in measurements as a proportion of the total variance) between the scores of the initial assessment of the APAIS subscales and the scores of the reassessment after 8 hours, the day before surgery. The patients were admitted to hospital one day before their elective surgery in order to have their routine preoperative screening. They were asked to complete the questionnaire in the morning of their admission day and 8 hours later, in the afternoon. Because the intraclass correlation coefficient does not correct for systematic differences and agreement by chance, the scores of the 2 assessments were tested for systematic differences by using the Paired *t*-test[24].

Parallel forms reliability is a measure of reliability obtained by administering different forms of APAIS questionnaire to the same group of individuals. The scores from the two forms can then be correlated in order to evaluate the consistency of results across alternate forms[24]. The Parallel forms reliability was examined using a sample of 20 random patients, who were part of the original sample of the 100 patients who were included in the study.

The cut-off point of APAIS-anesthesia and APAIS-procedure scores: A receiver operating curve (ROC) analysis was conducted to investigate the prognostic ability of APAIS subscales to detect anxiety cases using the STAI-State as a "gold standard" and provided the score of 46 as a reference point for anxiety, calculating the respective areas under the curve (AUC) with 95% CI. Using this reference point, the sensitivity and specificity of different cut-off points for APAIS subscales were estimated. ROC curves provided a graphical representation of the overall accuracy of a "test" by plotting sensitivity against (1-specificity) for all thresholds, while the AUC quantified the accuracy of the "test".

Results

From a total of 102 patients only 2 denied to fill out the questionnaires. The final sample consisted of 100 patients (mean age: 57.6 years) who underwent various surgical procedures, including urological, gynecological (except obstetric), breast, endocrine, abdominal, colorectal, hepato-pancreato-biliary, esophago-gastric and vascular. Both general and regional anesthesia was represented. Of them, 57 patients (57%) were male (mean age: 58.5 years) and 43 patients (43%) were female (mean age: 56.3 years), while 83 (83%) of them had a previous procedure, 91 (91%) had an ASA score I-II, and 9 (9%) an ASA score III. Twenty five patients (25%) underwent major procedures and 75 patients (75%) underwent minor and intermediate procedures (no major).

The descriptive statistics are presented in Table 2. Kolmogorov-Smirnov test and examination of the skewness values show that most of the items are normally distributed.

Confirmatory factor analysis (CFA): A two-factor model was conducted by confirmatory factor analysis giving unacceptable global fit indices. The resulting global fit indices $X^2=117.55$, $p<0.0005$, chi-square-degrees of freedom (d. f.) ratio=14.69, RMSEA=0.372, CFI=0.722, NFI=0.713, GFI=0.727, AGFI=0.284 showed that the two factors solution proposed by the author should be rejected.

Table 2
Descriptive statistics

After initial assessment			
Items of APAIS	**Mean**	**SD**	**Skewness**
1	2.28	1.14	0.69
2	2.07	1.16	0.74
3	2.62	1.11	-0.06
4	2.77	1.21	0.18
5	2.76	1.3	0.15
6	3.11	1.18	-0.44
Descriptive characteristics of the sample (N=100)			
Sex			
Male	57		
Female	43		
Mean age (min-max)	57.6 years (19-83)		
Previous surgery			
Yes	83		
No	17		
ASA score			
I	40		
II	51		
III	9		
Kind of procedure			
Minor-intermediate	75		
Major	25		

Exploratory factor analysis (EFA): The Bartlett Test of Sphericity was 397.92 and it was significant ($p<0.0005$). The Kaiser-Meyer-Olkin Measure of Sampling Adequacy was equal to 0.726, showing that the data is suitable for factor analysis[25].

The 6 items of the APAIS questionnaire were analyzed via maximum likelihood extraction method using direct oblimin rotation. Two factors, with eigenvalue of over 1 and items with factor loadings greater than or equal to 0.4, were identified. We used the scree plot test to determine the number of factors to retain and rotate, which again suggested a two factors solution (Figure 1). None of the items were considered as loadings on more than one factor, as their factor loadings were not greater or equal to 0.4.

Finally, the EFA yielded a 6-item questionnaire with a two factors solution. The eigenvalue for the first factor, anxiety and need for information related to anesthesia (APAIS-anesthesia = items 1, 2, 3) was 3.65, explaining 60.80% of the variance and the eigenvalue for the second factor, anxiety and need for information related to procedure (APAIS-procedure = items 4, 5, 6) was 1.02, explaining 16.10% of the variance. Factor loadings, which are the correlation coefficients between the items and the factors, ranged from 0.545 to 0.992 (Tables 3 and 4).

Fig. 1
Scree plot

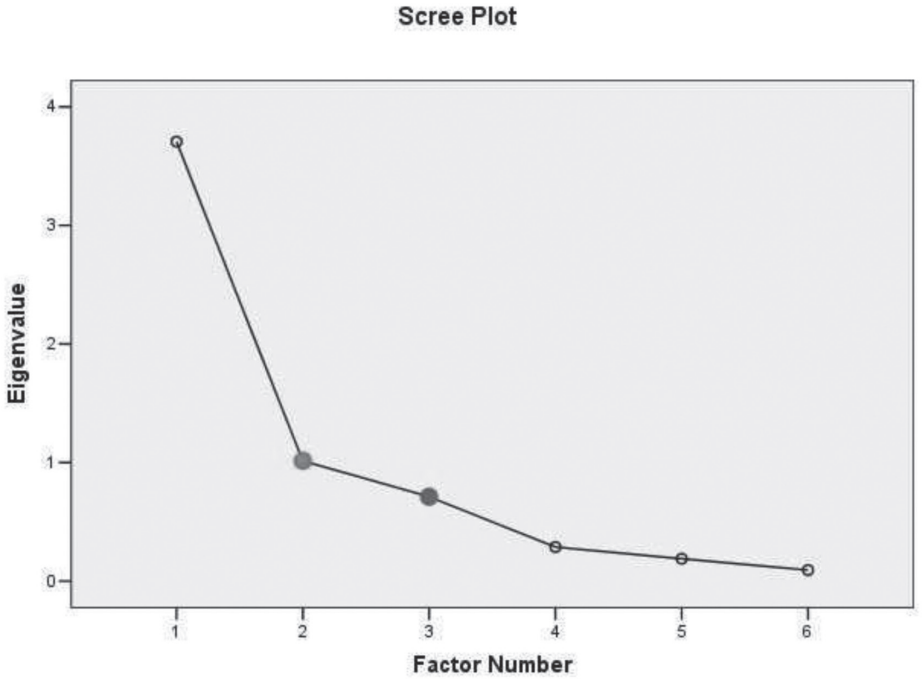

Table 3
Eigenvalues and explained variance

Items	Eigenvalues	% of variance	Cumulative %
1	3.648	60.8	60.8
2	1.012	16.09	76.89
3	0.795	13.25	90.14
4	0.307	5.11	95.25
5	0.183	3.06	98.31
6	0.101	1.69	100

Items refer to items of APAIS.

Table 4
Factor loadings

Items of APAIS	APAIS-anesthesia	APAIS-procedure
1	0.979	-
2	0.865	-
3	0.545	-
4	-	0.769
5	-	0.992
6	-	0.693

Extraction method: maximum likelihood.
Rotation method: direct oblimin with Kaiser normalization.
All loadings below 0.35 are not presented.
APAIS-anesthesia refers to items 1, 2, 3 of APAIS questionnaire.
APAIS-procedure refers to items 4, 5, 6 of APAIS questionnaire.

Convergent validity of APAIS was determined by establishing the correlation of the subscales of APAIS with the STAI-State scale. The correlations with the STAI-State scale were 0.502 for APAIS-anesthesia and 0.765 for APAIS-procedure ($p<0.0005$). The above results indicated moderate to high correlation between the questionnaire's subscales and the STAI-State scale which satisfied the convergent validity.

Subscale validity: There was a moderate correlation between the two factors of APAIS questionnaire ($r=0.445$, $p=0.0005$).

Known-groups validity: The APAIS questionnaire well discriminated between subgroups of patients on the basis of the severity of their procedure. Anxiety and need for information related to anesthesia (APAIS-anesthesia) was statistically significant higher in patients who underwent "no major" procedures compared with those who underwent "major" procedures ($p=0.001$) (Table 5).

Table 5
Known-groups validity.

	Severity of the procedure	N	Mean ± SD	P-value
APAIS-anesthesia	No major	75	7.48 ± 3.04	0.001
	Major	25	5.44 ± 2.27	
APAIS-procedure	No major	75	8.79 ± 3.23	0.434
	Major	25	8.2 ± 3.25	

Floor or ceiling effects: The percentage of patients scoring at the lowest possible level of the subscale and at the highest possible level for the APAIS-anesthesia and the APAIS-procedure were 9%, 2% and 5%, 3% respectively. The critical value of 15% was not surpassed, and thus, it can be conclusively stated that there was neither floor nor ceiling effect for both factors.

Internal consistency Reliability: The internal consistency of the 6 items of the APAIS was measured with Cronbach's α and yielded a value of 0.844 for the APAIS-anesthesia and 0.847 for the APAIS-procedure factor, which indicate excellent internal consistency. The items are interdependent and homogeneous in terms of the construct they measure.

Test-retest reliability: The paired samples t-test between initial assessment and reassessment of both factors of APAIS after 8 hours, the day before surgery indicated no statistically significant differences. Intraclass correlation coefficients (ICC) between initial assessment and reassessment of the subscales of APAIS were 0.965 and 0.970 ($p<0.0005$). The above results of stability indicated that the factors of APAIS were remarkably consistent between the two assessments (Table 6).

Parallel forms reliability: The scores from the two different forms of APAIS questionnaire were very highly correlated for both factors ($r=0.960$ and $r=0.975$, $p<0.0005$ respectively), which proved the consistency of results across alternate forms.

The cut-off point of APAIS-anesthesia and APAIS-procedure scores: The area under the curve (AUC)

Table 6
Test-retest reliability for the APAIS subscales

Subscales (N=20)	ICC 95% CI	Paired samples T-test		P-value
		Initial assessment	Reassessment	
		Mean ± SD		
APAIS-anesthesia	0.965 (0.93-0.98)*	6.84 ± 2.77	6.69 ± 2.68	NS
APAIS-procedure	0.97 (0.96-0.98)*	8.55 ± 3.1	8.22 ± 2.88	NS

* All correlation coefficients are statistically significant (p<0.0005).
NS: non-significant.

of APAIS-anesthesia was 0.679 (95% CI: 0.57-0.79, p=0.003) with cut-off point 6.5, sensitivity 67% and specificity 60%. Patients with APAIS-anesthesia more than 6.5 have 67% probability of presenting anxiety related to anesthesia, while patients with APAIS-anesthesia less than 6.5 have 60% probability of not presenting anxiety related to anesthesia.

The area under the curve (AUC) of APAIS-procedure was 0.894 (95% CI: 0.83- 0.96, p<0.0005) with cut-off point 8.5, sensitivity 92% and specificity 73%. Patients with APAIS-procedure more than 8.5 have 92% probability of presenting anxiety related to the procedure, while patients with APAIS-procedure less than 8.5 have 73% probability of not presenting anxiety related to the procedure (Table 7).

Discussion

Our findings support the high-quality psychometric properties of the Greek version of APAIS. The new finding is the different structure of APAIS that emerged in our study from the original one, proposed by Moerman *et al* in 1996[8]. In contrast to their expectations, the Dutch version of APAIS questionnaire didn't distinguish well between fear of anesthesia and fear related to the surgical procedure itself. However, our results indicate that the Greek version of the questionnaire may be divided into two different subscales compared to the original one.

The first subscale assesses the anxiety and need for information related to anesthesia. It is called APAIS-anesthesia and includes items 1, 2, 3 of the questionnaire. The second subscale assesses the anxiety related to the surgical procedure and the need for information about its characteristics. It is called APAIS-procedure and it includes items 4, 5, 6. This modified structure of the APAIS questionnaire in Greek population that emerged from our study, gives us the potential to well discriminate between the aforementioned types of anxiety. Using our modified version, the anesthesiologist and the surgeon will be able to assess the preoperative anxiety in a more patient-centered way and provide appropriate information based on the patient's needs. As a result, they will have the ability to recognize those patients who are in need of extra support and to devote attention to what

Table 7
The cut-off point of APAIS-anesthesia and APAIS-procedure scores

	Area	SE	Significance	Cut-off	Sensitivity	Specificity	95% CI	
APAIS-anesthesia	0.679	0.055	0.003	6.5	67%	60%	0.57	0.79
APAIS-procedure	0.894	0.031	<0.0005	8.5	92%	73%	0.83	0.96

Larger test result indicates more positive test.

they are specifically afraid of and want to be informed. Unfortunately, there are no studies which estimate the incidence of preoperative anxiety and the knowledge of patients' regarding anesthesia in the Greek population. Probably, a corresponding study in Greece in the future could explain the different version of APAIS.

The two new APAIS subscales are highly correlated to STAI-State questionnaire (r=0.715), supporting the validity of APAIS in measuring the anxiety status preoperatively. It can be completed in less than 2 min, while its stability in patients' responses which was highlighted with test-retest reliability, makes it a very useful tool in the assessment of preoperative anxiety in clinical practice.

Furthermore, the Greek version of APAIS discriminated well between the various subgroups of patients; patients who underwent a minor or intermediate surgical procedure had statistically significant higher anxiety and need for information related to anesthesia (higher APAIS-anesthesia score) compared with patients who underwent a major procedure. This may indicate that Greek patients who undergo a minor or intermediate surgical procedure are more anxious about the anesthesia than the surgical procedure probably due to insufficient knowledge, attitudes and concerns, necessitating detailed information by the anesthesiologist[26].

Preoperative anxiety is described as an unpleasant state of uneasiness or tension that is secondary to a patient being concerned about a disease, hospitalization, anesthesia and surgery, or the unknown[1]. The preoperative fear can be attributed to anesthesia to a high percentage. The patients are afraid of not waking up or of waking up in the middle of anesthesia and feeling pain. They are anxious about postoperative nausea and vomiting, postoperative pain and disclosing personal matters during loss of control[2,26]. All these fears regarding anesthesia can probably explain the fact that patients who undergo minor and intermediate procedures are more anxious about anesthesia compared to their anxiety related to the surgical procedure and they need to know as much as possible information regarding anesthesia.

As far as the Greek population is concerned further research should be done. We can assume that when a patient undergoes a major procedure, he/she is more anxious and afraid of the procedure itself, the surgical complications during and after surgery, the recovery and the quality of life rather than of the unknown and the anesthesia. Moreover, both the surgeon and the anesthesiologist will devote more time during the preoperative visit to these patients who mostly need to be better informed in order to feel safer.

On the other hand, patients who undergo minor and intermediate procedures are usually informed about the procedure, the possible complications and the length of the recovery by their surgeon and they feel safer. As a consequence, they will be more anxious about anesthesia and they will need to be better informed by the anesthesiologist during the preoperative assessment.

The APAIS was initially validated in Dutch and afterwards in English, Japanese, German, and French language[27-30]. Considering that our study sought to validate the Greek version of APAIS, our results may enhance the preoperative use of APAIS. Early recognition of anxious patients may assist the physicians in improving the patients' experience during the perioperative period. Interestingly, we reported for the first time that the Greek version of APAIS has a different structure than the previous versions. We may conclude that the way that preoperative anxiety is perceived varies among different populations. The Greek version of APAIS is a valuable tool for the detection of anxious patients, but also it can discriminate between the anxiety related to anesthesia from the anxiety related to surgical procedure. The ability to detect the patients who are more anxious about anesthesia gives the anesthesiologists the opportunity to have an empathic attitude at the preoperative visit which is linked to a reduction in preoperative anxiety. In addition to this, ensuring sufficient time for open discussion and questions at the preoperative visit improves patient's satisfaction[31].

In conclusion, the Greek version of APAIS is a valid, reliable and easily applicable screening tool for the assessment of preoperative anxiety. Further research is necessary in order to assess the generalizability of the Greek version of APAIS among different populations.

References

1. Maranets I and Kain ZN: Preoperative anxiety and intraoperative anesthetic requirements. *Anesth Analg*; 1999, 89:1346-1351.
2. Ramsay MAE: A survey of preoperative-fear. *Anaesthesia*; 1972, 27:396-402.
3. Kain ZN, Mayes LC, Bell C, Weisman S, Hofstadter MB, Rimar S: Premedication in the United States: a status report. *Anesth Analg*; 1997, 84:427-432.
4. Karanci AN, Dirik G: Predictors of pre- and postoperative anxiety in emergency surgery patients. *J Psychosom Res*; 2003, 55:363-369.
5. Mitchell M: Patient anxiety and modern elective surgery: a literature review. *J Clin Nurs*; 2003, 12:806-815.
6. Shafer A, Fish MP, Gregg KM, Seavello J, Kosek P: Preoperative anxiety and fear: a comparison of assessments by patients and anesthesia and surgery residents. *Anesth Analg*; 1996, 83:1285-1291.
7. Fountoulakis KN, Papadopoulou M, Kleanthous S: Reliability and psychometric properties of the Greek translation of the State-Trait Anxiety Inventory form Y: Preliminary data. *Annals of General Psychiatry*; 2006, 5:2.
8. Moerman N, Van Dam FS, Muller MJ, Oosting H: The Amsterdam preoperative anxiety and information scale (APAIS). *Anesth Analg*; 1996, 82:445-451.
9. Sjöling M, Nordahl G, Olofsson N, Asplund K: The impact of preoperative information on state anxiety, postoperative pain and satisfaction with pain management. *Patient Educ Couns*; 2003, 51:169-176.
10. Kalkman CJ, Visser K, Moen J, Bonsel GJ, Grobbee DE, Moons KG: Preoperative prediction of severe postoperative pain. *Pain*; 2003, 105:415-423.
11. Arbuckle JL: AMOS 7.0 user's guide. Chicago, IL: Amos Development Corporation. SPSS, Inc., 2006.
12. Fabrigar LR, Wegener DT, Mac Callum RC, Strahan EJ: Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods*; 1999, 4:272-299.
13. Guadagnoli E, Velicer WF: Relation to sample size to the stability of component patterns. *Psychological Bulletin*; 1988, 103:265-275.
14. Byrne BM: A primer of LISREL: Basic applications and programming for confirmatory factor analytic models. New York: Springer-Verlag, 1989.
15. Li-Tze H, Bentler PM: Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal*; 1999, 6:1-55.
16. McDonald RP, Marsh HW: Choosing a multivariate model: Noncentrality and goodness of fit. *Psychological bulletin*; 1990, 107:247.
17. Bollen, Kenneth A: "Measurement models: The relation between latent and observed variables". Structural equations with latent variables. *John Wiley & Sons*; New York, 1989, 179-225.
18. Gorgush RL: Psychometric Theory: McGraw-Hill, 1978.
19. Harman HH: Modern Factor Analysis. Chicago: University of Chicago Press, 1967.
20. McHorney CA, Tarlov AR: Individual-patient monitoring in clinical practice: are available health status surveys adequate? *Qual Life Res*; 1995, 4:293-307.
21. Cronbach LJ: Coefficient alpha and the internal structure of test. *Psychometrica*; 1951, 16:297-334.
22. Nunnally JC: *Psychometric theory*. New York: McGraw Hill, 1978, 701.
23. Higgins PA, Straub AJ: Understanding the error of our ways: Mapping the concepts of validity and reliability. *Nurs Outlook*; 2006, 54:23-29.
24. Bland JM, Altman DG: Statistics notes: Validating scales and indexes. *Br Med J*; 2002, 324:606-607.
25. Kaiser HF: An index of factorial simplicity. *Psychometrika*; 1974, 39, 31-36.
26. Shevde K, Panagopoulos G: A Survey of 800 Patients' Knowledge, Attitudes, and Concerns Regarding Anesthesia. *Anesth Analg*; 1991, 73:190-198.
27. Boker A, Brownell L, Donen N: The Amsterdam preoperative anxiety and information scale provides a simple and reliable measure of preoperative anxiety. *Can J Anaesth*; 2002, 49:792-798.
28. Nishimori M, Moerman N, Fukuhara S, van Dam FS, Muller MJ, Hanaoka K, et al: Translation and validation of the Amsterdam preoperative anxiety and information scale (APAIS) for use in Japan. *Qual Life Res*; 2002, 11:316-364.
29. Berth H, Petrowski K, Balck F: The Amsterdam preoperative anxiety and information scale (APAIS) - the first trial of a German version. *Psychosoc Med*; 2007, 4: Doc01.
30. Maurice-Szamburski A, Loundou A, Capdevila X, Bruder N, Auquier P: Validation of the French version of the Amsterdam preoperative anxiety and information scale (APAIS). *Health Qual Life Outcomes*; 2013, 11:166.
31. Soltner C, Giquello JA, Monrigal-Martin C, Beydon L: Continuous care and empathic anesthesiologist attitude in the preoperative period: impact on patient anxiety and satisfaction. *Br J Anaesth*; 2011, 106:680.