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RESEARCH METHODOLOGY PAPER

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Faces Anxiety Scale as a screening measure of preoperative anxiety: Validation and diagnostic accuracy study

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Abstract

Aim: The aim of the study was to examine validity and diagnostic accuracy of the single-item Faces Anxiety Scale for the purposes of preoperative anxiety screening.

Background: Anxiety is common in most patients expecting surgery interfering with patients' recovery. Valid and reliable measures for situations with limited time for assessment are needed.

Design: A descriptive cross-sectional design was used to collect the data from both self-report and rating instruments.

Methods: We enrolled 90 consecutive patients admitted for surgery in a university-affiliated hospital from January 2013 to June 2013. Patients were administered the anxiety state subscale of the Spielberger State-Trait Anxiety Inventory and the anxiety subscale of the Hospital Anxiety and Depression Scale, and they were presented the Faces Anxiety Scale. At the same time, patients' anxiety was rated by a nurse.

Results: The correlations among scores of self-report instruments, rating scale, and the Faces Anxiety Scale were high and statistically significant. Of the Faces Anxiety Scale cut-off scores tested, the cut-off score > 2 has an optimal combination of sensitivity and specificity.

Conclusion: The Faces Anxiety Scale is valid and easy to administer. The scale is useful in settings where fast and precise screening is necessary.

KEYWORDS

anxiety, Faces Anxiety Scale, nursing, screening, validity

SUMMARY STATEMENT

What is already known about this topic?

- Anxiety is experienced by most preoperative patients, and if not treated, it has an adverse impact on patients' recovery.
- In the fast surgical environment, administration of existing self-report instruments for preoperative anxiety assessment may be burdensome for some patients and rating of anxiety by observers may lack validity.
- The Faces Anxiety Scale has proved to be valid in critical care nursing.

What this paper adds?

- The Faces Anxiety Scale is valid for screening of preoperative anxiety in various groups of patients admitted for surgery.

- The Faces Anxiety Scale performs well with both self-report and clinical judgment scores of multiple-item measures.
- Sensitivity and specificity analysis showed that patient who responses by indicating the third, fourth, or fifth face of five scale's response options may experience anxiety and may need clinical anxiety assessment.

The implications of this paper:

- The Faces Anxiety Scale is using universal non-verbal stimuli, and therefore, it is easily accessible with no need for cultural adaptation.
- With only one item, the Faces Anxiety Scale overcomes disadvantages of multiple-item measures.
- Promising results of diagnostic accuracy analysis should inspire future research.

1 | INTRODUCTION

Hospitalization for surgery is considered to be a stressful situation. Patients before a planned surgery may experience pain, helplessness, loss of control, concerns about anaesthesia, and forthcoming procedures (Krohne, De Bruin, El-giamal, & Schmukle, 2000). Uneasiness and tension are demonstrated as anxiety, with an incidence from 11% to 80% of patients, depending on the assessment method and diagnosis (Maranets & Kain, 1999). Prolonged and untreated anxiety may have an adverse impact on patients' health before, during, and also after surgery (Kiecolt-Glaser, Page, Marucha, MacCallum, & Glaser, 1998). Preoperatively, anxiety affects physiological data such as heart rate and blood pressure and may cause neuroendocrinological changes (Barlow, 2004). Anxious patients require larger doses of anaesthetics during surgery (Maranets & Kain, 1999). Postoperatively, anxiety contributes to the development of postoperative complications such as increased levels of postoperative pain (Carr, Nicky Thomas, & Wilson-Barnet, 2005; Munafò & Stevenson, 2001; Vaughn, Wichowski, & Bosworth, 2007), weakened immune response (Fehder, 1999), or slower wound healing (Kiecolt-Glaser et al., 1998). These lead to an increased need for medication and longer time required for recovery (Kain, Sevarino, Alexander, Pincus, & Mayes, 2000), a decreased compliance and decreased ability to participate in decisions about treatment procedures (Caumo et al., 2001), an increased economic burden (Kain et al., 2000), and in elderly patients increased morbidity and mortality (Williams et al., 2013).

However, assessment of anxiety as a part of routine surgery is rare, partially because of a lack of valid and easily administered measures and partially because of a lack of time for the assessment (Frazier et al., 2002; Junttila, Hupli, & Salanterä, 2010). In the preoperative setting, the nurses focus mainly on physiological concerns and record physical and patient safety-related nursing diagnoses (Junttila et al., 2010). To effectively manage patients' anxiety, it is crucial to have valid and reliable scales for anxiety screening and assessment. The clinical context requires instruments that are not demanding in terms of time, energy, or cognitive capacity (Junttila et al., 2010). Instruments like the State-Trait Anxiety Inventory (STAI, Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) and the anxiety subscale of Hospital Anxiety and Depression Scale (HADS-A, Zigmond & Snaith, 1983), although well known, are too lengthy for use on a busy surgery ward (Chlan, 2004; Gustad, Chaboyer, & Wallis, 2008; Romanik, Kański, Soluch, & Szymańska, 2009).

1.1 | Faces Anxiety Scale

The single-item Faces Anxiety Scale (FAS) (McKinley, Coote, & Stein-Parbury, 2003) uses drawings of faces as universal and understandable stimuli. The scale was originally developed for assessment of anxiety in the intensive care unit (ICU) patients (McKinley et al., 2003). Critically ill patients' indicators of anxiety and their symptoms, eg, tachycardia, raised blood pressure, and restlessness, may be easily confounded (McKinley et al., 2003). Many ICU patients due to their health complications are not able to communicate and to respond to existing measures of anxiety. The FAS has been validated (Gallagher, Trotter, & Donoghue, 2010; Gustad et al., 2008; McKinley & Madronio, 2008; McKinley, Stein-Parbury, Chehelnabi, & Lovas, 2004) and used in various studies as a measure of change in state anxiety after intervention mostly in ICU patients (Aghaie et al., 2014; Cooke et al., 2010; Saadatmand et al., 2013). The FAS seems to be fast, economical, intuitive, easily administered and not cognitively demanding, and suitable for both clinical and research purposes (McKinley et al., 2004). However, no data are available on the diagnostic accuracy of the scale. The diagnostic accuracy analysis may address the issue of which FAS scores should be considered as a signal to a nurse that a patient may be experiencing anxiety, and further clinical assessment is needed. Once diagnostic accuracy is verified by computing indicators of sensitivity and specificity, it provides evidence of criterion validity of the scale.

1.2 | Aim

The aim of the present study is to examine validity and diagnostic accuracy of the single-item FAS for the purposes of preoperative anxiety screening.

2 | METHODS

2.1 | Design

This confirmatory study used a convenience sample with a descriptive cross-sectional design.

2.2 | Participants

The sample consisted of patients (n = 90) hospitalized in the University Hospital in Nitra from January 2013 to June 2013. Patients admitted for surgery to one of the three participating departments (Cardiological Department, Clinic of Trauma Surgery and Orthopedics, and Surgical Department) were prospectively enrolled during the time the study was taking place. The criteria for inclusion were age over 18, hospital

stay for surgery (elective or emergency), and the cognitive ability to participate in data collection. The criteria for exclusion from the sample were as follows: no consent for participation and lowered cognitive ability. After excluding ineligible patients (n = 7), the sample comprised 90 patients (65% women) aged 22 to 92 years (M = 60.34; SD = 17.06).

To determine the appropriate sample size for correlational analysis, we used G*Power 3.1.3. The required sample size was determined to be 84 by considering the moderate effect size (0.3), power level of 0.80, α of 0.05. The sample size for diagnostic accuracy analysis was computed in MedCalc 14.10.2. On the basis of an α of 0.05, power level of 0.80, area under receiver operating characteristic (ROC) curve of 0.70, null hypothesis value of 0.5, and ratio of sample sizes in negative/positive group of 2, the calculation revealed that 72 participants were required. Therefore, the sample size used in this study was sufficient for both analyses.

2.3 | Instruments

2.3.1 | Faces Anxiety Scale

The FAS was created by McKinley et al. (2003) to measure anxiety. The FAS is a single-item scale, with five possible responses represented by pictures of faces ranging from the face with neutral facial expression to a face showing extreme fear because both anxiety and fear have the same physical manifestation (McKinley et al., 2003). Validity of the scale was examined by correlation of the score with clinical assessment by expert: r = .64, P < .001 (McKinley et al., 2004), with STAI-S score: ρ = .70, P < .0005 (McKinley & Madronio, 2008) and r = .521, $P \leq .001$ (Gallagher et al., 2010) and with HADS-A scores: r_1 = .45; r_2 = .70; r_3 = .72; all P < .001 (Gustad et al., 2008). The scale was presented to patients on a laminated card.

2.3.2 | State-Trait Anxiety Inventory

The STAI is one of the most widely used self-report scales for the evaluation of anxiety. The inventory consists of two separate 20-item measures (state and trait) with items rated on 4-point Likert-type scales from "not at all (1)" to "very much (4)" for the state subscale (Spielberger et al., 1983). In the present study, only the state subscale (STAI-S) was used. For the STAI-S, authors report high internal consistency (between .86 and .95). Similar coefficients were obtained for the standardized Slovak version used in the study (Müllner, Ruisel, & Farkaš, 1980). Cronbach α of the sum score in the present sample was .95.

2.3.3 | Hospital Anxiety and Depression Scale

The self-report HADS by Zigmond and Snaith (1983) is a traditional tool for measuring the presence and severity of symptoms of anxiety and depression in physically ill patients with excellent case finding ability (Bjelland, Dahl, Haug, & Neckelmann, 2002). The scale consists of 14 items: seven for depression and seven for anxiety, each with four possible answers. Since the HADS has been published as the first, it has been successfully used in psychiatric patients and in the general population and its good psychometric properties have been repeatedly confirmed (Mykletun, Stordal, & Dahl, 2001). In the present study, only the anxiety subscale (HADS-A) was used with modified instruction to address current state of anxiety: "How do you feel at this moment?" Cronbach α of a sum score in the present sample was .93.

2.3.4 | Anxiety Level Rating Scale

The Anxiety Level Rating Scale (ALRS) is a 12-item rating scale developed for use in nursing to screen patients who manifest anxiety. The anxiety symptoms are rated by nurse on a 5-point Likert-type scale from "not at all" (1) to "very much" (5). The 12 anxiety indicators rated were chosen as a result of validation of the nursing diagnosis anxiety in Slovakia (Vanečková, Sollár, & Vörösová, 2012). The scale was validated against STAI-S and HADS-A (Sollár, Turzáková, Romanová, & Sollárová, 2014), and interrater reliability has been repeatedly successfully examined (Turzáková, Sollár, Solgajová, & Vörösová, 2014). Cronbach α of the sum score in the present sample was .94.

2.4 | Data collection and ethical considerations

All patients received information about the study. Only those patients who provided written informed consent prior to the data collection were included. Patients were administered the STAI-S and the HADS-A and were asked to respond to the FAS. At the same time, a nurse trained to work with the ALRS assessed the patient's anxiety. The data collection was carried out by seven nurses who were trained by the researchers to administer the instruments. Design of the study did not allow nurses to be blind to the patients' history and test results. Socio-demographic items were collected from the patients' records. No names were recorded to ensure anonymity. The study was approved by the university hospital's ethics committee. Patients were given the opportunity to withdraw any time during the data collection, which none of them used.

2.5 | Data analysis

In the first step, we described the characteristics of the sample and computed coefficients of skewness and kurtosis to check normality of the FAS, the STAI-S, the HADS-A, and the ALRS scores distribution. The authors of the FAS (McKinley et al., 2003) recommend using parametric tests when outcomes were found to be normally distributed; thus, we employed Pearson correlation coefficient to examine relationships between the instruments. For the purpose of diagnostic accuracy analysis, we used the scores of HADS-A to determine the presence or absence of anxiety. To provide an insight into how FAS responses matched three anxiety groups based on HADS-A cut-off scores (0-7 normal, 8-10 borderline, 11-21 abnormal) recommended by scale developers Zigmond and Snaith (1983), cross-tabulations between HADS-A and FAS scores were computed. Finally, to determine FAS' diagnostic accuracy, the test results were compared with

HADS-A test results and an ROC analysis was used. The statistical analyses were performed by using the IBM SPSS Statistics v20.0 and MedCalc 14.10.2.

3 | RESULTS

First, the construct validity was studied using correlations of the STAI-S and HADS-A, and the ALRS with the FAS. The FAS was found to be statistically significantly correlated with both self-report scales scores (r = .757, P < .001 for STAI-S, r = .762, P < .001 for HADS-A) and the rating scale (ALRS) score (r = .769, P < .001) suggesting strong relationship of administered anxiety measures.

Next, the criterion validity was studied using cross-tabulation of FAS and HADS-A and sensitivity and specificity analysis. To provide detailed information on how the FAS responses match HADS-A groups based on cut-off scores (>7 and >10), a cross-tabulation was computed. Results showed that 46% of patients experienced no anxiety (HADS-A scores lower than 8), 18% were borderline (HADS-A scores of 8-10), and 37% reported abnormal anxiety (HADS-A scores of 11 and higher). The first face and second face were chosen by 93% of patients with no anxiety. None of the patients with borderline and abnormal anxiety scores indicated the first face. None of the patients in the no anxiety group indicated the fifth face, and only one indicated the fourth face (2%). All the borderline patients responded by indicating the second face (37.5%) or the third face (62.5%). Most patients (78%) experiencing abnormal anxiety indicated the third face (36%) or the fourth face (42%). In Table 1, distribution of cases diagnosed by HADS-A and the FAS scores is presented.

In the next step, ROC analysis was used to determine optimal FAS cut-off points. To estimate the sensitivity (proportion of patients who experience anxiety and correctly identified) and specificity (proportion of patients who do not experience anxiety and correctly identified) of the FAS, the cut-off scores were tested against the HADS-A. For the HADS-A, a cut-off score > 7 has been verified in most HADS-A diagnostic accuracy studies (as reported by Bjelland et al., 2002) and was used to determine anxiety in the patients, resulting in borderline patients diagnosed as possible cases of anxiety. The ROC curve was produced (Figure 1), with the area under the curve of 0.902 (95% CI, 0.822-0.955).

The optimal threshold value nearest to the top-left corner of the graph diagnosed anxiety with a sensitivity of 80% and specificity of 93% in our sample. In the next step, sensitivity and specificity with confidence intervals were computed for each score (Table 2).

The cut-off score > 2 appeared to achieve the optimal combination of sensitivity and specificity, with value of sensitivity 79.59 and value of specificity 92.68.

4 | DISCUSSION

The aim of the study was to examine validity and diagnostic accuracy of the single-item FAS for the purposes of preoperative anxiety screening.

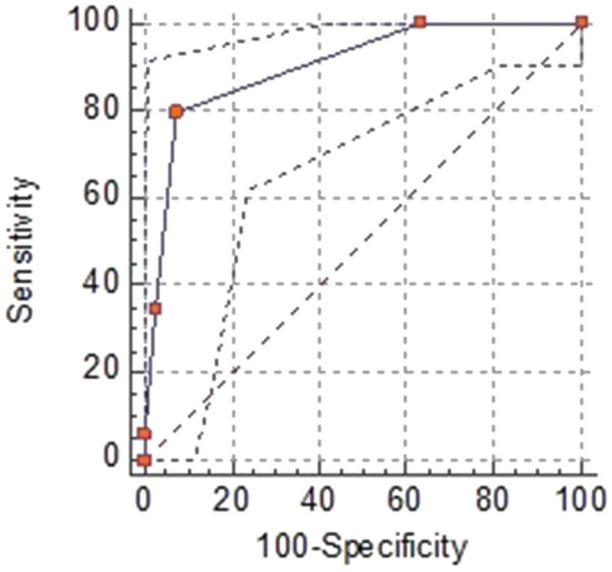

FIGURE 1 Receiver operating characteristic (ROC) curve of the performance of the Faces Anxiety Scale (FAS) as compared with the anxiety subscale of Hospital Anxiety and Depression Scale (HADS-A)

TABLE 1 Distribution of the five FAS responses and three anxiety severity groups based on HADS-A cut-off scores

	FAS Score (1 = no anxiety, 5 = extreme anxiety)						
HADS-A score	1	2	3	4	5	Total	Mdn
Normal (0-7)	15 36.6%	23 56.1%	2 4.9%	1 2.4%	0 0%	41 100%	2
Borderline (8-10)	0 0%	6 37.5%	10 62.5%	0 0%	0 0%	16 100%	3
Abnormal (11-21)	0 0%	4 12.1%	12 36.4%	14 42.4%	3 9.1%	33 100%	4
Total	15 16.7%	33 36.7%	24 26.7%	15 16.7%	3 3.3%	90 100%	2

Abbreviations: FAS, Faces Anxiety Scale; HAD-S, anxiety subscale of Hospital Anxiety and Depression Scale.

TABLE 2 Sensitivity and specificity of the criterion values

Criterion	≥1	>1	>2	>3	>4	>5
Sensitivity (95% CI)	100.0 (92.7-100.0)	100.00 (92.7-100.0)	79.59 (65.7-89.8)	34.69 (21.7-49.6)	6.12 (1.3-16.9)	0.00 (0.0-7.3)
Specificity (95% CI)	0.00 (0.0-8.6)	36.59 (22.1-53.1)	92.68 (80.1-98.5)	97.56 (87.1-99.9)	100.00 (91.4-100.0)	100.00 (91.4-100.0)

4.1 | Validity of the FAS

The FAS showed strong relationships with the scores of the STAI-S, the HADS-A, and the ALRS suggesting that the FAS has good construct validity, especially convergent. When comparing the relationship strength of the FAS with STAI-S and HADS-A, we found higher coefficients for HADS-A than for the STAI-S. The STAI-S, although considered to be the instrument of the first choice for anxiety assessment, has the most items (20) of all measures used in the study, and therefore, it could be too long for some patients in our sample, threatening the validity of the results. In accordance to the previous findings (Chlan, 2004; Romanik et al., 2009), we conclude that the STAI-S, due to its length, may be less accurate in some specific samples. The HADS-A only consists of seven items and was developed specifically for physically ill patients, which seems to be an advantage for conditions of our sample. In different samples, eg, ICU patients, even the HADS-A was found to be too long and required too much concentration (Gustad et al., 2008). The ALRS was used as the third measure of anxiety. When comparing the literature, many authors (eg, Frazier et al., 2002; Mitchell, 2003,) report that it is rare to find a significant relationship of anxiety data from self-report and rating. It provides a strong evidence for the FAS validity.

4.2 | Diagnostic accuracy of the FAS

The FAS' diagnostic accuracy was assessed by comparing its scores with those on the HADS-A. As the final step, an ROC curve analysis was conducted. In our sample, the optimal combination of both sensitivity and specificity values over 80% was found for the FAS score > 2. It seems to perform well in various diagnostic groups of patients expecting surgery. Patients who respond by indicating the third, fourth, or the fifth face of five scale's response options may experience anxiety, and they need further clinical anxiety assessment.

4.3 | Limitations

The main limitations of the present study relate to the selection bias and to the screening nature of the assessment methods. The validity of the presented results may be threatened by the fact that the sample consisted of older mostly female patients, from three various preoperative settings. The nurses who assessed anxiety of patients could not be blinded to patients' records and other test results, and the order of administered scales was not randomized.

5 | CONCLUSION

Many nurses report that they do not feel competent to assess the psychological experience of patients (Frazier et al., 2002) and the administration of the FAS means minimal burden for both patient and nurse. The results of this study provide evidence of acceptable validity and diagnostic accuracy of the FAS in the context of preoperative anxiety screening settings. The scale is able to identify the patients who may experience anxiety and need further clinical assessment. At this stage, we can recommend the use of the FAS for anxiety screening in various settings of preoperative hospital care. The FAS seems to balance the demands of valid screening and requirements of everyday practice in the fast and stressful clinical environment. Single-item measures frequently perform almost as well as multi-item scales (McDowell, 2006). Using single-item measures for screening of different problems in clinical practice can be recommended because of its simple use already documented in specific groups like children, ICU patients, or others who would have difficulties in completing questionnaires. Its non-verbal formats help to avoid translation issues in cross-cultural research. Further research of single-item screening measures could be encouraged for different patient populations and also in different countries.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORSHIP STATEMENT

All authors meet the criteria for authorship, namely, Jana Turzáková (conception and design of the study, data analysis, interpretation of the data, and draft of the paper), Tomáš Sollár (conception and design of the study, data analysis, and revising the paper), and Andrea Solgajová (data collection, data analysis, interpretation of the data, and revising the paper). All authors approved the final version of the manuscript and this submission.

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