

RESEARCH ARTICLE

Which method, cardiac surgery or interventional catheter angiography, causes parents' anxiety levels to worsen?

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Abstract

Introduction: As the high levels of parental, especially maternal, anxiety may result in some neurodevelopmental problems in their children, we aim to assess the anxiety levels of parents during the preprocedural period for different interventions.

Methods: The study included a total of 131 participants, 73 of whom underwent catheter intervention while 58 of them underwent surgery. State-Trait Anxiety Inventory-2 (STAI-2) and The Beck Anxiety Inventory (BAI) were used. The participants were divided into 3 anxiety classes: mild, moderate, and severe, according to their BAI scores.

Results: Although there were no significant differences between groups regarding the mean STAI-2 score, the mean BAI score was statistically significantly lower in the catheter interventional group than in the surgery group ($p=0.002$). In the total population, we demonstrated that BAI scores were significantly higher in parents with boys than in parents with girls ($p=0.030$). In a separate analysis, the BAI scores of parents with girls were not different in the surgery and catheter groups. However, the BAI scores of parents with boys were almost significantly higher in the surgery group than in the catheter group ($p=0.064$). As the distance between home and hospital increased, the probability of moderate or severe anxiety according to The BAI class increased only in the catheter group ($p=0.017$). However, the same was not seen in the surgery group.

Conclusion: The fact that parents whose children had catheter intervention had lower anxiety levels than those whose children had surgery, may guide the physicians regarding which procedure to choose.

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Interventional or surgical methods can be used in the treatment of congenital heart diseases. Where both methods are applicable, determining whether to use the surgical or angiographic approach depends on the clinician's experience and preference. Both the catheter and the surgical approach increase the level of depression and anxiety in families.^{1,2} High levels of maternal anxiety can cause neurodevelopmental problems in children.^{3,4} According to a study, the factors affecting the anxiety level of mothers before the invasive cardiac procedure were as follows: the father's anxiety level, the severity of heart disease (RACHS-1 score), and the distance between home and hospital.⁵ The RACHS-1 score is calculated by taking into account the patient's age, the severity of the cardiac disease, and the intervention type.⁶

In this study, we aim to measure the anxiety levels of parents before the invasive cardiac procedure and determine whether there is a difference between surgery and catheter angiographic intervention. It is thought that the result obtained will guide physicians in the selection of the procedure best suited to their patients.

Material and Methods

Study population

This is an analytical cross-sectional study conducted in a single centre. Parents of patients under 5 years of age (n=126) who were to undergo invasive cardiac intervention were included in the prospective study. The participants were divided into 2 groups: group 1 (n=68) parents of patients who underwent the catheter interventional procedure and group 2 (n=58) parents of patients who underwent surgical treatment. Foreign parents who do not speak Turkish and parents diagnosed with psychiatric disorders were excluded.

The medical records of the patients, including age, gender, weight, height, and the age, gender, and level of education of parents were obtained. Additionally, the distance between the home and hospital and the RACHS-1 score were recorded. RACHS-1 scores were given on a scale of 1 to 6 according to a previously determined scoring system.⁶

The questionnaire

The participants were surveyed prospectively before the invasive procedure using the State-Trait Anxiety Inventory (STAI-2) and the Beck Anxiety Inventory (BAI). They were asked to fill out the questionnaire forms given by the same researcher. Then, the scales were measured without knowing which group they belonged to.

STAI was developed by Spielberger in 1970⁷ and the validity and reliability of the Turkish version were confirmed by Le Compte and Oner in 1985.⁸ Since then, it has been used in different Turkish studies.^{9,10} Anxiety is observed in two forms: state and trait. State anxiety is a more transient response to a negative situation, while trait anxiety is a personality characteristic that affects how we experience events.¹¹ Accordingly, there are 2 subscales within this measure: the State-Anxiety and Trait-Anxiety subscales. The STAI has 40 items, with 20 items allocated to each subscale. First, the State Anxiety Scale (S-Anxiety) measures the participants' current state of anxiety by asking them how they feel "right now." For this purpose, items measuring subjective feelings such as worry, tension, nervousness, anxiety, and activation/arousal of the autonomic nervous system are used. On the other hand, the Personality Anxiety Scale (T-Anxiety) assesses the participants' tendency to experience anxiety despite their current circumstances. Participants rate statements on a 4-point scale: never (1 point), sometimes (2 points), a lot of times (3 points), and always (4 points). STAI-2 scale includes 13 direct and 7 reverse questions. When the reverse questions are extracted from the direct questions and the number 35 is added to the obtained value, the STAI-2 value is found. As the anxiety level increases, higher STAI-2 values are obtained.

The BAI was developed by Beck et al. in 1988.¹² It includes 21 items which describe common symptoms of anxiety. Using a 4-point scale, participants are asked to rate how bothered they have been by each symptom over the past 7 days. Scores may range from 0 to 63 and reflect different levels of anxiety as follows: minimal (0–7), mild (8–15), moderate (16–25), and severe (26–63). In the current study, after completing BAI, the participants were divided into three anxiety classes, instead of four, as participants with minimal and mild levels of anxiety were grouped together in what we simply referred to as mild BAI anxiety class.

Statistical Analysis

All data were analysed by using the "SPSS (Statistical Package for Social Sciences) for Windows 25" program (IBM Corp., Armonk, N.Y., USA). Normality analysis was performed using histogram, coefficient of variation, Skewness and Kurtosis values and Kolmogorov-Smirnov test. Data that did not follow a normal distribution was presented as median (interquartile range) while data with normal distri-

bution was shown as mean±standard deviation. According to normality analysis, parametric or non-parametric test selection was made. Consequently, Independent-Samples T or Mann-Whitney U Test and One-Way ANOVA test were used for the comparison of numerical data. Chi-square or Fisher's Exact Test was used for the comparison of categorical data. The partial correlation tests were used for the relationship of numerical data. The logistic regression test was used to determine the risk factors through these dependent variables; patients' age, gender, parents' age, education level and RACHS-1 scores. Patients in the mild BAI class and patients in the moderate-to-severe BAI class were used as the independent variables for the logistic regression analysis. The statistical significance limit was accepted as $p < 0.05$.

The study was approved by the Bilkent City Hospital Ethics Committee at the 23.11.2022 with the number; E2-22-2871

Results

Of the total patient population, 46.8% (n=59) were girls and the median age was 16 (1.5-60) months. Detailed characteristics of the participants based on groups are given in Table 1.

Table 1: The basic characteristics of the study population

Data*	Catheter	Surgery	p value
Total number	(n=68)	(n=58)	
Patients' gender; n (%)			
Boys	26 (38.8%)	41 (61.2%)	0.001a
Girls	42 (71.2%)	17 (28.8%)	
The patients' age; months	18.5 (2-60)	13 (1.5-60)	0.182b
The mean weight; kg	10 (3.4-23)	8.5 (3.5-20)	0.169b
The mean height; cm	80 (50-120)	74 (51-121)	0.280b
The parents' age; years,	29.5 (18-44)	27.5 (19-43)	0.260b
Parents' gender; n (%)			
Men	2 (22.2%)	7 (77.8%)	0.079a
Women	66 (56.4%)	51 (43.6%)	
Parents' education level; n (%)			
Primary or Middle school	31 (50.8%)	30 (49.2%)	0.751a
High school	21 (55.3%)	17 (44.7%)	
Post Secondary (including University)	16 (59.3%)	11 (40.7%)	

*Data were presented as n (%) for categorical variables and median (minimum-maximum) or mean±standard deviation for continuous variables.

a= Chi-square test; b= Mann-Whitney U Test

N= number; Kg= kilogram; SD= Standard deviation; Cm= Centimetre; Min= minimum; Max= Maximum

There were no statistically significant differences in the groups regarding the parents' gender, age, education level, and the patients' age, weight and height. However, the number of girls was statistically significantly higher in the catheter group ($p=0.001$)

At first, we compared the groups' STAI-2 and BAI scores. We found a poor positive correlation between the two scales ($r=0.346$, $p=0.001$) as shown in Figure 1. A separate analysis of the groups based on gender revealed that there were no significant differences in terms of the mean STAI-2 scores between surgery and catheter group. Similarly, no difference was observed between the groups in terms of BAI score in girls ($p=0.712$). However, the BAI score was significantly lower in the catheter group for boys ($p=0.029$). Table 2 shows anxiety scores by groups.

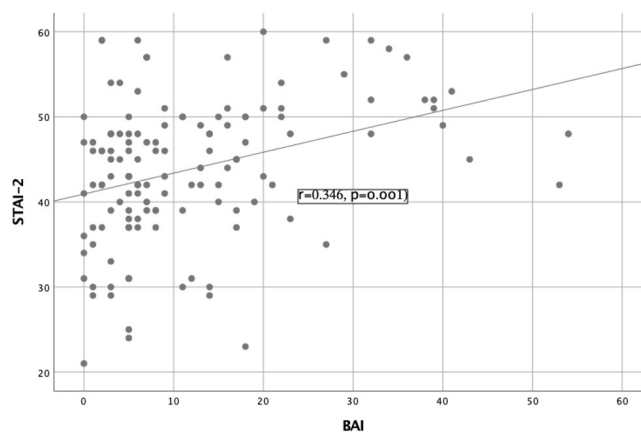


Figure 1: The correlation analysis between Beck anxiety inventory (BAI) and State-Trait Anxiety Inventory-2 (STAI-2).

Table 2: Anxiety scores according to groups

	Catheter (n=73)		Surgery (n=58)		p	p1
	Boys (n=41)	Girls (n=26)	Boys	Girls		
STAI-2 score (mean±SD)	42.46±7.31	45.21±7.04	43.80±7.73	43.59 ±13.14	0.482a	0.540 ^a
BAI score (median, min-max)	5 (0-53)	6 (1-39)	14 (0-54)	8 (0-27)	0.029b	0.712 ^b

Significant difference ($p < 0.05$)

p= p value for boys; p1=p value for girls

a= Independent-Samples T test; b= Mann-Whitney U test

STAI-2= The State-Trait Anxiety Inventory; BAI= Beck anxiety inventory; SD= Standard deviation

The catheter interventional and surgery groups were compared according to their BAI score classes for each gender. Since few participants belonged to the severe BAI anxiety class, we compared the mild anxiety class with moderate-to-severe anxiety class.

Accordingly, no difference was found between the surgery and catheter groups in terms of BAI class in either boys or girls ($p=0.226$, and $p=0.384$, respectively)

When looking at the factors affecting the anxiety level of all the parents, we found that the mean of both STAI-2 and BAI scores for different education levels and parents' genders were not significantly different. Also, the partial correlation analysis done for the total population when controlling for patients' age, showed that there was no significant relationship between RACHS score, parents' age, the distance between home and hospital, and either STAI-2 or BAI scores.

We also performed univariate logistic regression analysis after separating the groups to uncover the factors associated with moderate to severe BAI scores. In the surgery group, patients' age, gender, parents' age, education level, RACHS scores and the presence of comorbidities were not significant predictors of membership in the moderate to severe BAI class. However, interestingly, in the catheter group, the home-hospital distance among these variables was a significant predictor of belonging in the moderate to severe BAI class. As the distance between home and hospital increased, the probability of moderate or severe anxiety levels significantly increased ($OR=1.005$, $p=0.017$). Moreover, in the total population, as the RACHS score increased from 1 to 3, the BAI score also increased, although this was not statistically significant. A decrease in BAI score was observed in those participants with a RACHS score of 4.

Discussion

In the current study, we used two different anxiety scales: STAI-2 and BAI. STAI-1, though we did not use it in this study, indicates situational anxiety. STAI-2 shows trait anxiety. A study comparing STAI and BAI showed that, while STAI-1 and Beck's scale had a moderate positive correlation, STAI-2 and Beck's scale had a poor positive correlation in preoperative patients.¹³ Although we found a poor positive correlation between STAI-2 and BAI, concurring with Peker K.'s study, a significant difference between the catheter and surgery groups was demonstrated only in the BAI score values. According to the literature, the STAI is also highly correlated with depression. Because it has not been able to distinguish anxious patients from depressed ones, it has a poor discriminant validity for individuals with and without anxiety disorders, especially in the elder-

ly.^{14,15} On the other hand, the BAI is used in efforts to obtain a purer measure of anxiety that is relatively independent of depression. Therefore, the significant difference found in BAI scores in this study is valuable because it is more accurate in indicating anxiety.

We investigated the anxiety of parents with kids under the age of 5 because addressing parental anxiety and depression is crucial in preventing early mental health disorders for this age group.¹⁷ In some cases, there is still no consensus on whether surgery or catheter should be performed in the treatment of children with congenital heart defects.^{18,19} While there was no difference in RACHS scores between the groups, the higher BAI scores observed in the surgical group among parents of boys may be attributed to the type of procedure. Before the procedure, parents should be assessed for anxiety and informed about the potential risks and benefits of the procedure.

The BAI score was lower only in parents of boys who had catheters than surgical intervention, but there was no difference in parents of girls. We attributed this notable difference to sociocultural characteristics. Some factors such as living in rural areas, being born to mothers with little education, and coming from poor families may lead parents to favor sons.²⁰ Therefore, having boys undergo surgery may cause more anxiety in families than girls because the possible loss of boys raises anxiety.

Unlike Werner O et al.'s study,⁵ we did not find significantly higher anxiety scores in parents whose children have comorbidity, higher RACHS-1 scores, and higher distance between home and hospital. Only one-quarter of parents had a secondary degree. Low education levels may explain difficulties in perceiving the seriousness of the disease and in having awareness of comorbidities. However, our results may be more reliable due to our larger study population. Furthermore, we found in a separate analysis of the catheter group that the distance between home and hospital was a significant predictor of membership in the moderate to severe BAI class. The patients' parents may think that surgery permanently solves the problems, unlike catheter angiography. Therefore, living far from the hospital may not have been seen as an issue.

Study limitations

We did not use the STAI-1 scale. The STAI-1 scale would give more information to compare the state and trait anxiety of the parents along BAI. Ano-

ther limitation is that in our country, mothers are the primary caregivers, so we could not compare fathers' anxiety with that of mothers. Also, this is a single-centre study so the available data is limited.

Conclusion

To our knowledge, there are no studies discussing this issue. The fact that the parents' BAI scores were lower in the catheterization group than in the surgery group, may guide the clinician in choosing the procedure for some patients. Future studies with a larger number of patients using the STAI-1 scale along with the STAI-2 would be beneficial.

Conflict of Interest: The authors have no conflicts of interest to declare.

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Researchers' Contribution Rate Statement:

Concept/Design: M.BE.; Analysis/Interpretation: M.BE ; Data Collection: M.A.E, M.Y and M. BA; Writer: M.B; Critical Review: D.B, AA; Approver: M.BE, M.A.E, M.BA, M.Y and D.B.

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References

1. Üzger A, Başpınar O, Bülbül F, Yavuz S, Kılınç M. Evaluation of depression and anxiety in parents of children undergoing cardiac catheterization. *Turk Kardiyol Dern Ars.* 2015;43(6):536-541. doi:10.5543/tkda.2015.28928
2. Lisanti AJ, Kumar A, Quinn R, Chittams JL, Medoff-Cooper B, Demianczyk AC. Role alteration predicts anxiety and depressive symptoms in parents of infants with congenital heart disease: a pilot study. *Cardiol Young.* 2021;31(11):1842-1849. doi:10.1017/S1047951121001037
3. Roberts SD, Kazazian V, Ford MK, et al. The association between parent stress, coping and mental health, and neurodevelopmental outcomes of infants with congenital heart disease. *Clin Neuropsychol.* 2021;35(5):948-972. doi:10.1080/13854046.2021.1896037
4. Phua DY, Kee MZL, Meaney MJ. Positive Maternal Mental Health, Parenting, and Child Development. *Biol Psychiatry.* 2020;87(4):328-337. doi:10.1016/j.biopsych.2019.09.028

5. Werner O, El Louali F, Fouilloux V, Amedro P, Ovaert C. Parental anxiety before invasive cardiac procedure in children with congenital heart disease: Contributing factors and consequences. *Congenit Heart Dis.* 2019;14(5):778-784. doi:10.1111/chd.12777
6. Jenkins KJ, Gauvreau K, Newburger JW, Spray TL, Moller JH, Iezzoni LI. Consensus-based method for risk adjustment for surgery for congenital heart disease. *J Thorac Cardiovasc Surg.* 2002;123(1):110-118. doi:10.1067/mtc.2002.119064
7. Spielberger, C. D., Gorsuch, R. L., & Lushe, R. E. . Manual for the State-Trait Anxiety Inventory. Palo Alto, CA: Consulting Psychologists. 1970.
8. Oner N, Le Compte A. Durumluk-Sürekli kaygı envanteri el kitabı, 20. Basım İstanbul: Boğaziçi Üniversitesi Yayınları, 1985. s.3-5.
9. Civan A, Arı R, Görücü A, Özdemir M. Bireysel ve takım sporcularının müsabaka öncesi ve sonrası durumluk ve sürekli kaygı düzeylerinin karşılaştırılması. *Uluslararası İnsan Bilimleri Dergisi* 2010; 7:193-206. 20.
10. Çakmak Ö, Hevedanlı M. Eğitim ve fen edebiyat fakülteleri biyoloji bölümü öğrencilerinin kaygı düzeylerinin çeşitli değişkenler açısından incelenmesi. *Elektronik Sosyal Bilimler Dergisi* 2005; 14: 115-127
11. Saviola F, Pappaianni E, Monti A, Grecucci A, Jovicich J, De Pisapia N. Trait and state anxiety are mapped differently in the human brain. *Sci Rep.* 2020;10(1):11112. Published 2020 Jul 6. doi:10.1038/s41598-020-68008-z
12. Beck AT, Epstein N, Brown G, Steer RA. An inventory for measuring clinical anxiety: psychometric properties. *J Consult Clin Psychol.* 1988;56(6):893-897. doi:10.1037//0022-006x.56.6.893
13. Peker K. Comparison of Beck and State-Trait Anxiety Scales in the Evaluation of Preoperative Anxiety. *Journal of Anesthesiology and Reanimation Specialists' Society.* 2020; 28 (2). doi: 10.5222/jarss.2020.50570
14. Kabacoff RI, Segal DL, Hersen M, Van Haselt VB. Psychometric properties and diagnostic utility of the Beck Anxiety Inventory and the State-Trait Anxiety Inventory with older adult psychiatric outpatients. *J Anxiety Disord* 1997;11:33– 47. 17.
15. Kennedy BL, Schwab JJ, Morris RL, Beldia G. Assessment of state and trait anxiety in subjects with anxiety and depressive disorders. *Psychiatric Quarterly* 2001;72:263–76.

16. Julian L. J. (2011). Measures of anxiety: State-Trait Anxiety Inventory (STAI), Beck Anxiety Inventory (BAI), and Hospital Anxiety and Depression Scale-Anxiety (HADS-A). *Arthritis care & research*, 63 Suppl 11(0 11), S467–S472. <https://doi.org/10.1002/acr.20561>
17. Izett E, Rooney R, Prescott SL, De Palma M, McDevitt M. Prevention of Mental Health Difficulties for Children Aged 0-3 Years: A Review. *Front Psychol*. 2021;11:500361. Published 2021 Sep 29. doi:10.3389/fpsyg.2020.500361
18. Wilder TJ, Van Arsdell GS, Benson L, et al. Young infants with severe tetralogy of Fallot: Early primary surgery versus transcatheter palliation. *J Thorac Cardiovasc Surg*. 2017;154(5):1692-1700.e2. doi:10.1016/j.jtcvs.2017.05.042
19. Sheth SP, Loomba RS. Haemodynamic and clinical variables after surgical systemic to pulmonary artery shunt placement versus arterial ductal stenting. *Cardiol Young*. 2023;33(10):2060-2065. doi:10.1017/S104795112200395X
20. Le K, Nguyen M. Son preference and health disparities in developing countries. *SSM Popul Health*. 2022;17:101036. Published 2022 Jan 26. doi:10.1016/j.ssmph.2022.101036