Audiovisual aid viewing immediately before paediatric induction moderates the accompanying parents' anxiety

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ABSTRACT

Background: Parents accompanying their child during induction of anaesthesia experience stress. The impact of audiovisual aid (AVA) on parental state anxiety and assessment of the child's anxiety at induction has been studied previously but needs closer scrutiny.

Methods: One hundred and twenty parents whose children were scheduled for day-care surgery entered this randomized, controlled study. The intervention group (n = 60) was exposed to an audiovisual aid in the holding area. Parental anxiety was measured with the Spielberger State-Trait Anxiety Inventory (STAI) and the Amsterdam Preoperative Anxiety and Information Scale (APAIS) at three time points: 1. on admission [T1]; 2. in the holding area just before entering the operating theatre [T2]; 3. after leaving [T3]. Additionally, at [T3] both the parent and attending anaesthetist evaluated the child's anxiety using a Visual Analogue Scale (VAS). The anaesthetist also filled out the Induction Compliance Checklist (ICC).

Results: On the state anxiety subscale APAIS parental anxiety at T2 ($P = 0.015$) and T3 ($P = 0.009$) was lower in the AVA-intervention group than in the control group. Correlation coefficients between VAS-ICC as measured by anaesthetist and parents differed significantly between the intervention and control group.

Conclusions: Preoperative AVA shown to parents immediately before induction moderates the increase in anxiety associated with the anaesthetic induction of their child. Present results suggest that behavioral characteristics seem better predictors of child anxiety during induction than anxiety ratings *per se* and that anesthesiologists are better in predicting child anxiety during induction than parents.

Keywords: Induction of anaesthesia; Age, Child; Education; Ambulatory, Outpatient

INTRODUCTION

Both children and their accompanying parents experience preoperative fear and anxiety[1-5]. The state anxiety of the accompanying parent – including apprehension, nervousness and worry – can increase the child's anxiety at induction of anaesthesia[6,7]. Since levels of preoperative anxiety in children are known to induce adverse postoperative phenomena, namely emergence delirium and postoperative behavioural changes[8], one should also try to decrease state anxiety of the accompanying parent by providing adequate information about the anaesthetic procedure[9]. A preoperative audiovisual aid (AVA) shown at the right time may be a useful tool in reducing parental anxiety and have a positive influence on the level of their child's anxiety both prior to and during anaesthetic induction[10-12]. Parents who are anxious at induction are significantly more likely to consider their child as upset[13]. Recent findings demonstrated that attending paediatric anaesthetists can more accurately predict the child's anxiety than mothers[14].

The primary aim of this randomized trial was to assess whether or not an AVA shown to accompanying parents just before anaesthesia would have a positive impact on parental state anxiety until after induction. Our hypothesis was that AVA would reduce parental state anxiety. Secondary areas of the study were the impact of AVA on parental assessment of the child's anxiety during induction and a comparison of their assessment with that of the anaesthetist.

METHODS

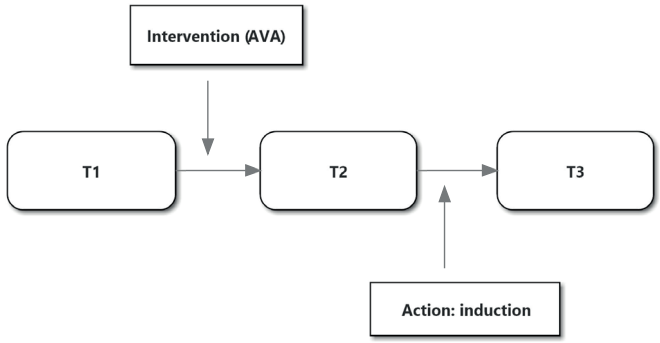
Enrolment and data collection

After approval for this randomized, controlled, single-blind study from the local ethics committee (Ref: 009/OG031/E.C. Approval N° 3541) parents of children planned for day-care surgery in the Queen Paola Children's Hospital in Antwerp were approached to take part in this study. Of the 129 parents approached, 120 parents gave their written informed consent. The study, registered at http://www.controlled-trials.com/ISRCTN66030835, was conducted in accordance with the Declaration of Helsinki and the CONSORT guidelines. The parents were informed about the hospital admission and the anaesthesia procedure. Only the parents of children between the ages of 6 months to 16 years old, with an American Society of Anesthesiologists (ASA) class 1 or 2 status, were included in the study. By picking a computer-generated randomly numbered envelope parents were assigned to either the intervention group or the control group. Demographic data of parents and children were collected. No premedication was administered.

Assessment procedure

Anxiety of the accompanying parent was measured with the Spielberger State-Trait Anxiety Inventory (STAI)[15,16] and the Amsterdam Preoperative Anxiety and Information Scale (APAIS)[17] at three time points: 1. on admission [T1]; 2. in the holding area just before entering the operating theatre [T2]; 3. after leaving [T3]. After the first assessment [T1] the accompanying parent and child were conveyed to a child-friendly holding area for 10 minutes just before entering the operating theatre. The intervention group then received the AVA-intervention. Immediately after seeing the AVA and just before entering the operating theatre, the second assessment [T2] was performed. Thereafter the child and the accompanying parent entered the theatre where inhalation induction was commenced. The third measurement [T3] was completed immediately after induction**.** At this moment, parents were also asked to estimate their child's anxiety at induction by using a Visual Analogue Scale (VAS) marking two extremes: *not anxious at all - very anxious*. The seven blinded anaesthetists in this study assessed the children's anxiety using an Induction Compliance Checklist (ICC) (Figure 1) as well as a VAS.

Figure 1 Flow diagram of the different time points in relation to the intervention (AVA) and induction



Intervention

The intervention group (including children) was exposed to the 4-minute AVA, a video recorded at the day-care unit, the holding area and the operating theatre of our hospital. It portrays the fairytale-like journey of a little boy and his cuddly bear 'mister Dragon', travelling to *Greenland* (which resembles our operating theatre) together with his mum. This video – conceptually based on McEwen's video[11] – is intended to model what parent and child will experience during the whole procedure. It shows the admission to the day-care, the entrance to the operating theatre and the child undergoing an inhalation induction. The end sequence reveals the boy leaving the hospital together with his parents.

Finally, parents were invited to fill in a short additional questionnaire, consisting of four general VAS items for both groups and one extra intervention group VAS item, in order to assess their general satisfaction level and the quality of the provided preoperative information (Table 6).

Parental anxiety assessment tools

The internationally often applied STAI[15], which has been validated for the Dutch population[16]. It consists of two parts: the state anxiety measures the current emotional state; the trait anxiety estimates the subject's disposition to anxiety in general. Each part consists of 20 items, on which respondents are asked to evaluate themselves on a 4-point scale. The total score ranges between 20 and 80. A cut-off value of ≥ 46 on the state subscale of STAI was used to make a dichotomy between: 1. anxious; 2. not or slightly anxious parents[17,18].

The APAIS[17] – a validated self-report instrument – measures the preoperative anxiety level and the need for information of the attending parent on a 6-item scale. Every item can be scored on a Likert scale ranging from 1 to 5. The anxiety part, which correlates (r = 0.74) strongly with the state part of the STAI, has been validated for the Dutch population and for parents of paediatric surgery patients[19]. A cut-off value of ≥ 13 on the state subscale of APAIS was used to dichotomize levels of parental anxiety[17].

Child anxiety assessment tools

The ICC[20], in this study considered as a surrogate outcome for the assessment of anxiety[1,21], was developed to rate the child's behaviour during the induction of anaesthesia. It consists of 11 items indicating the level of compliance of the child at induction stratified into three categories: 1. perfect induction (ICC = 0); 2. moderate compliance (ICC = 1-3); 3. poor compliance (ICC ≥ 4)[22]. A perfect induction (that is to say without exhibition of negative behaviour, fear or anxiety) is scored as 0. The total score reflects a summation of scores on the categories checked and ranges from 0 to 10.

The ICC displays an excellent inter- and intraobserver reliability interclass: r > 0.995.

The level of a child's anxiety experienced at induction was also estimated by applying a VAS – a widely employed scale to assess general anxiety[23] and preoperative anxiety[14], showing a 100mm horizontal line indicating two behavioural extremes.

Statistical analysis

An a priori power analysis was performed using GPOWER (version 3.1.2, Franz Faul, Universität Kiel, Germany). Based on previous studies a criterion of 10% difference was used in mean state anxiety as clinically significant[9-11]. To reach a power of 80% with an effect size of 0.8 one hundred and twenty parents were included.

All data are displayed as means ± SD or median with interquartile range when data distribution was skewed using a D'Agostino-Pearson test for normal distribution. A Friedman one-way ANOVA was utilized to test the groups on changes over time and a Bonferroni corrected multiple Mann-Whitney *U*-test was employed to compare both groups at different time points. A *P*-value of < 0.05 was statistically significant. The correlation between non-parametric data was determined by means of the Spearman correlation coefficient. Statistical analysis was performed using MedCalc, version 11.3, (MedCalc Software plc, Mariakerke, Belgium).

RESULTS

At T1 no significant differences were found between the baseline demographics in the two groups (Table 1). In most cases mothers accompanied their children into one of two similar operating theatres, both staffed with a nurse, an anaesthetist and a research assistant. The most frequent procedures were urology (31.7%) in the control group and Ear Nose Throat (ENT) (35%) in the intervention group. There was no statistical difference relating to all procedures in the two groups.

Table 2 shows parental anxiety as measured with STAI and APAIS at different time points (T1, T2 and T3) with a Friedman one-way ANOVA and Intergroup Bonferroni corrected multiple Mann-Whitney *U*-tests. STAI-scores increased over time, with a significant increase at T3 compared to T1 and T2 in both control ($P < 0.05$) and intervention group ($P < 0.05$). By contrast, when using the APAIS-state subscale, parental anxiety at T3 only increased in the control group ($P < 0.05$).

At T2 and T3 intergroup-comparisons demonstrated significant differences between the intervention and control group, showing less anxiety in the intervention group in both STAI and APAIS.

Table 1 Demographics and types of surgery

	Intervention group (n = 60)	Control group (n = 60)
gender parent (M/F %)[1]	10/90	18.3/81.7
age parent (years)[2]	35.0 (31-39)	31.5 (28-38)
gender child (M/F %)[1]	65/35	78.3/21.7
age child (years)[2]	4.5 (2-7)	3 (1-7.5)
mother tongue[1]		
Dutch	43 (71.7)	41 (68.3)
other	17 (28.3)	19 (31.7)
Surgical service[1]		
maxillofacial	6 (10)	8 (13.3)
gastroenterology	11 (18.3)	13 (21.7)
urology	9 (15)	19 (31.7)
general surgery	9 (15)	2 (3.3)
orthopedic surgery	2 (3.3)	1 (1.7)
ENT	21 (35)	17 (28.3)
ophthalmology	1 (1.7)	
missing data	1 (1.7)	
previous anesthetic[1]	20 (33.3)	20 (33.3)

[1]Data are expressed as *n* (%).
[2]Data are expressed as median with interquartile ranges shown in parentheses.
ENT, ear nose and throat.

Table 2 Measurements of parental anxiety at different time points

		Intervention group (n = 60)	Control group (n=60)	*P value*
STAI/S	T1	38.6 (35.9-41.2)	41.9 (39.4-44.4)	0.08
	T2	38.3 (35.5-41.2)	43.6 (41-46.3)	0.008*
	T3	41.5 (38-44.7)†	46.5 (43.5-49.5)†	0.024*
STAI/T	T1	34.7 (32.5-36.9)	37.6 (35.3-39.9)	0.06
APAIS/S	T1	10 (9.0-10.8)	10.8 (9.9-11.7)	0.25
	T2	9.2 (8.3-10.1)	10.9 (9.9—11.8)	0.015*
	T3	9.4 (8.5-10.4)	11.4 (10.3-12.4)†	0.009*
APAIS/I	T1	7.4 (7.1-7.8)	7.2 (6.7-7.6)	0.37
	T2	7.3 (6.8-7.7)	7.2 (6.8-7.7)	0.82
	T3	7.0 (6.5-7.5)	7.0 (6.4-7.5)	0.97

STAI/S, State-Trait Anxiety Inventory/state; STAI/T, State-Trait Anxiety Inventory/trait.
APAIS/S, Amsterdam Preoperative Anxiety and Information Scale/state.
APAIS/I, Amsterdam Preoperative Anxiety and Information Scale/information.
Data are expressed as mean with 95% confidence intervals for the mean in parentheses.
*$P < 0.05$ as determined with a Mann-Whitney *U*-test.
†$P < 0.05$ as determined with a Friedman one-way ANOVA vs T1, T2.

For further analysis, parents were dichotomized into two groups: 1. not or slightly anxious; 2. very anxious parents (Table 3). Cut-off values were ≥ 46 on state anxiety subscale of STAI and ≥ 13 on APAIS. Intergroup comparison as to proportions of anxious parents showed on the STAI a nearly significant trend (p = 0.06) and on the APAIS anxiety subscale a significant (*P* = 0.01) intergroup difference at T3. These intergroup comparisons, demonstrated on both instruments that the proportion of anxious parents was lower in the intervention group.

Table 3 Number of anxious parents as assessed with the state anxiety subscale of STAI/S and APAIS/S

	Intervention group	Control group		Intervention group	Control group	
	STAI/S	**STAI/S**	**P *value***	**APAIS/S**	**APAIS/S**	**P *value***
T1	15 (25%)	17 (28.3%)	0.8	16 (26.7%)	20 (33.3)	0.6
T2	12 (20%)	22 (36.7%)	0.07	11 (18.3%)	21 (35%)	0.06
T3	19 (30%)	30 (50%)	0.06	12 (20%)	26 (43.3%)	0.01*

STAI/S, State-Trait Anxiety Inventory/state with a cut-off value ≥ 46.
APAIS/S, Amsterdam Preoperative Anxiety and Information Scale/state with a cut-off value ≥ 13.
data are expressed as n (%)
*$P < 0.05$ as determined with a Chi-square test for intergroup comparison of two proportions

Table 4 shows the assessment of the child's anxiety at induction by VAS scores of the accompanying parent (VAS_p) and the anaesthetist (VAS_a). Significant differences were found between VAS_p and VAS_a in both the control (*P* = 0.05) and intervention group (*P* = 0.029), with the anesthesiologist rating the child's level of anxiety as lower in both groups.

Table 4 Anxiety scores of the child at induction measured with a VAS

	VAS_p	**VAS_a**	***P* value**
Intervention group (n = 60)	48 (28-64)	20 (8-41)	0.03*
Control group (n = 60)	50 (42-73)	45 (19-68)	0.05*
P Value**	0.32	0.14	

Data are expressed as median score with 95% confidence intervals for the median shown in parentheses.
VAS_p, visual analogue scale parents; VAS_a, visual analogue scale anaesthetist.
*$P \leq 0.05$ comparison between VAS_p and VAS_a in the intervention and control group as determined with a Mann-Whitney *U*-test.
**$P > 0.1$ intergroup comparison of VAS_a and VAS_p in the intervention and control group as determined with a Mann-Whitney *U*-test.

Table 5 displays the results obtained by the ICC; no difference was found between the two groups.

Table 5 Induction Compliance Checklist (ICC) results

	Intervention group (n = 60)	Control group (n = 60)
Perfect induction	30 (50)	23 (38.3)
Moderate compliance	19 (31.7)	21 (35)
Poor compliance	11 (18.3)	16 (26.7)

Data are expressed as *n* (%).
Perfect induction: ICC = 0; Moderate compliance: ICC = 1-3; Poor compliance: ICC ≥ 4.
P = 0.17 between both groups as determined with Mann-Whitney U-test.

By means of a Spearman Rank a very high correlation was found between ICC and VAS_a in the intervention (r = 0.89; $P < 0.0001$) and in the control group (r = 0.82; $P < 0.0001$). These correlation coefficients were not significantly different ($P = 0.16$).

A less strong medium correlation could be demonstrated between ICC and VAS_p in the intervention (r = 0.44; $P = 0.0004$) and in the control group (r = 0.37; $P = 0.0037$). These correlation coefficients were not significantly different ($P = 0.65$). By contrast, correlation coefficients between anaesthetist and parent significantly differed in the intervention ($P < 0.0001$) and control group ($P < 0.0001$).

The VAS scores of the additional questions did not differ significantly between groups (Table 6).

Table 6 Additionally asked VAS questions

	Intervention group (n =60)	Control group (n=60)	*P* value
VAS 1:	87 (76-97)	83 (53-99)	0.39
VAS 2:	96 (85-99)	98 (91-100)	0.07
VAS 3:	97 (89-100)	99 (89-100)	0.96
VAS 4:	95 (88-98)	97 (86-100)	0.45
VAS 5:	95(81-99)	n/a	

VAS, visual analogue scale; AVA, audiovisual aid.
Data are expressed as median with interquartile ranges shown in parentheses.
P value as determined with a Mann-Whitney *U*-test.
n/a, not applicable
VAS 1 Are you satisfied about the given information in connection to the anaesthesia?
VAS 2 Were you really motivated to be present at the induction of anaesthesia?
VAS 3 Do you believe that your presence was useful for your child?
VAS 4 Are you satisfied with the course of the procedure?
VAS 5 Do you think AVA was useful for your preparation of anaesthesia?

DISCUSSION

The main finding from this study is that an AVA shown to parents immediately before induction moderates the increase in anxiety associated with the anaesthetic induction of their child.

The anxiety subscale of APAIS showed an increase of anxiety after induction in the control group but not in the intervention group. This result was not found in on the STAI-state anxiety subscale. Intergroup comparisons at different time points revealed significant differences at T2 and T3 between both groups with lesser levels of anxiety in the intervention group.

Considering the real-life threatening nature of entering the operating theatre, it is psychologically natural and logical that the parental levels of stress increase at this very moment in both groups[2,3]. This could explain why no significant decrease in anxiety was seen in the intervention group at T2. Parents experience their child's loss of consciousness and separation after induction as the moment of greatest stress which is reflected by an increase in anxiety after induction in both groups[2,4,24]. However, this increase was less pronounced in the intervention group; a non-significant trend shows that the number of anxious parents in both questionnaires decreased in the intervention group just after viewing the AVA, a result not seen in the control group. Considering all above findings AVA is a useful tool in preparing parents, this in accordance with previous findings[9-12].

The secondary aims focus on the assessment of the child's anxiety by the anaesthetist and parent. Previous findings demonstrated that parents judging themselves to be upset at induction were significantly more likely to consider their child as upset[13]. The present study, however, shows that a difference in parental state anxiety does not influence the way parents evaluate their child's anxiety at induction. Previous findings[14] showed that attending paediatric anaesthetists are better in predicting the child's anxiety at induction. Furthermore those findings did not show a correlation between the parental prediction and the actual anxiety of the child at induction. More overt anxiety behavioural signs than usual will be expressed by the child at the very moment of induction which may be easily recognised by the parent[14]. This could explain why a medium correlation was found between ICC and VAS_p. This suggests that anxiety assessment based on overt behavioural characteristics as mentioned in the ICC seems better to predict the level of anxiety and this is consistent with previous findings[14,21]. Our assumption that behavioral characteristics (ICC) seem better predictors of the level of anxiety at induction applies even better to anaesthetists in our study. This is in line with previous studies which also

point to the fact that the anaesthetist may be better equipped to notice the behavioural characteristics of anxiety at induction[14].

Finally, parents in this study were very motivated to be present at induction and strongly believed their presence was useful[4,24]. They were also very satisfied with the course of the procedure this in accordance with previous findings. Both groups were equally satisfied about the given information and the intervention group rated the AVA as very useful which is in accordance with previous findings[9,11]. A possible explanation as to why no difference was found between satisfaction levels in the two groups may be that both groups had already received sufficient general written information[5].

Limitations of the study

When viewing the results of parental levels of anxiety at T1 on the STAI, one sees that bias levels were almost reached, with control parents having higher levels of anxiety at baseline. This may have an impact on the interpretation. Anxious people may react more anxiously in stressful situations, which may in part explain the differences found at T2 and T3. By contrast, state anxiety measured with APAIS did not reach bias level at T1.

Although the ICC assesses a child's anxiety, fear and negative behaviour during induction, it is not an anxiety measurement *per se*[1,20,21]. It should be noted that the anxiety VAS, a subjective assessment of the child's anxiety, and the ICC measure different items. The fact that the same anaesthetist completed both the VAS_a and the ICC may have introduced a so-called informant bias, thus these results should be interpreted carefully.

The clinical significance of our findings should be tailored in the knowledge that preparing parents and their children towards anaesthesia is a complex matter with many interactions. AVA is only one method that could beneficially influence state anxiety of parents and their children for anaesthesia.

CONCLUSIONS

Viewing AVA moderates parental increase in state anxiety towards their child's anaesthetic induction. Present results also suggest that behavioural characteristics seem better predictors of a child's anxiety during induction than anxiety ratings *per se* and that anesthesiologists are better in predicting a child's anxiety during induction than parents.

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