

Original Articles: Quantitative Research

THE EFFECT OF NONPHARMACOLOGICAL PAIN MANAGEMENT (BEHAVIORAL INTERVENTION) ON ANXIETY AND CRYING TIME IN PRESCHOOLERS DURING INVASIVE PROCEDURES AT RSI JEMURSARI SURABAYA

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Abstract

Background: Preschool children often experience high anxiety during invasive procedures, which may lead to refusal, prolonged crying, and the risk of psychological trauma. Behavioral interventions are nonpharmacological strategies aimed at reducing these negative responses.

Purpose: To determine the effectiveness of behavioral intervention in reducing anxiety levels and crying duration among preschool children undergoing invasive procedures.

Methods: A quasi-experimental study with a post-test control group design was conducted among 80 preschool children aged 3–6 years undergoing intravenous cannulation at RSI Jemursari Surabaya. Participants were randomly assigned to an intervention group (n = 40) and a control group (n = 40). The intervention group received behavioral intervention, while the control group received standard care. Anxiety levels were measured using the Face Anxiety Scale, and crying duration was recorded using a stopwatch. Data were analyzed using the Mann–Whitney U test.

Results: The intervention group showed significantly lower anxiety levels and shorter crying duration compared to the control group. The mean anxiety score in the intervention group was 1.53, while the control group scored 3.03. The mean crying duration was 47.83 seconds in the intervention group and 138.25 seconds in the control group, indicating the effectiveness of behavioral intervention.

Conclusion: Behavioral intervention effectively reduces anxiety and crying duration in preschool children during invasive procedures. This intervention supports holistic nursing care by addressing psychological and emotional needs. Nurses are encouraged to routinely apply behavioral interventions with parental involvement to promote child-centered care.

INTRODUCTION

Preschool-age children are the most vulnerable group to experiencing anxiety when undergoing invasive medical procedures, such as IV insertion or blood collection (Muslih et al., 2024). Limited cognitive abilities in understanding medical situations, unfamiliar hospital environments, and perceived

threats to pain lead to high emotional responses such as fear, stress, and excessive crying (Handajani et al., 2020). This condition not only complicates the implementation of the procedure, but also increases the risk of long-term psychological trauma and hinders the healing process (Listianingsih et al., 2021). This phenomenon is reported globally in both developing and developed countries, making procedural anxiety in children an international health issue that requires effective and evidence-based interventions (Wang et al., 2025).

Various international studies show that up to 30–40% of preschoolers experience significant anxiety during invasive procedures, while in Indonesia the prevalence of anxiety in preschoolers reaches 45% (Susenias, 2010). In several local hospitals, a proportion of moderate to severe anxiety was also found in preschoolers undergoing invasive procedures (Handajani et al., 2020). Untreated anxiety can trigger an increased duration of action, prolong the crying response, and increase the risk of clinical complications. Despite this, most healthcare facilities still do not consistently implement psychological interventions to lower anxiety during invasive procedures.

One approach that has proven to be effective globally is intervention *behavioral intervention*, which includes distraction, positive reinforcement, desensitization, and parental involvement (Maulana et al., 2024). Behavioral interventions work by modifying the child's psychological and behavioral responses to frightening stimuli thereby lowering anxiety and crying responses. Classical behavioral theory and child emotion regulation theory explain that focus shift and adaptive reinforcement can interrupt the stress cycle thereby lowering physiological activation during medical procedures (Dewi et al., 2023).

Although various studies have proven the effectiveness of behavioral interventions in reducing anxiety, most focus on just one variable, such as anxiety or pain response (Handajani et al., 2020; Listianingsih et al., 2021). The research gap arises because there is still limited research that simultaneously evaluates the influence of behavioral interventions on two main responses: Anxiety levels, and Duration of crying, which is the most dominant behavioral indicator in preschoolers during invasive procedures.

This research was constructed using a conceptual framework that combines child anxiety theory, behavioral theory, and emotion regulation models (Wang et al., 2025). The framework explains that behavioral interventions act as independent variables that affect two dependent variables, namely anxiety and crying time. The empirical literature supports that adaptive behavioral changes resulting from interventions can decrease children's emotional and physiological responses when faced with threatening procedures (McMurtry et al., 2010).

Based on this scientific framework, the research hypothesis states that behavioral interventions have a meaningful influence on lowering anxiety and reducing the length of crying in preschoolers during invasive procedures. The relationship between hypotheses, behavioral theories, and research variables describes the process by which intervention stimuli alter children's emotional and behavioral responses resulting in more positive procedural experiences.

METHODS

Study Design

This study employed a quasi-experimental design using a post-test control group approach. This design was selected to evaluate the effectiveness of behavioral intervention in reducing anxiety levels and crying duration among preschool children undergoing invasive procedures. A quasi-experimental approach is appropriate when randomization at the individual level is limited by ethical and practical considerations in clinical settings, particularly involving pediatric patients.

The post-test control group design allows for comparison between an intervention group and a control group following the implementation of the intervention, without exposing participants to unnecessary pre-test procedures that may increase anxiety. This design is suitable for measuring immediate behavioral and emotional responses after invasive procedures and provides a valid method for assessing the causal effect of behavioral intervention on anxiety and crying outcomes in a real-world nursing context.

Setting and Participants

The study was conducted in a pediatric care unit of a private hospital in Surabaya, Indonesia, between July 20 and August 4, 2025. The hospital identity is not disclosed to maintain institutional confidentiality. The target population consisted of preschool children aged 3–6 years who underwent intravenous cannulation during hospitalization.

A total of 80 participants were recruited using a random sampling technique. Eligible participants were randomly assigned into an intervention group ($n = 40$) and a control group ($n = 40$). Recruitment was carried out after parents or legal guardians received a detailed explanation of the study and provided written informed consent.

The inclusion criteria were preschool children aged 3–6 years undergoing intravenous cannulation for the first time during the current hospitalization, accompanied by a parent or guardian, and able to communicate verbally or nonverbally. Children with cognitive impairment, developmental delays, sedation, severe medical instability, or those receiving pharmacological anxiolytics or analgesics during the procedure were excluded to avoid confounding effects on anxiety and crying responses.

The sample size was determined based on feasibility considerations and prior similar studies evaluating behavioral interventions in pediatric populations. Although formal power analysis was not performed, the sample size was considered adequate to detect meaningful differences between groups and to support nonparametric statistical analysis.

Intervention

The intervention implemented in this study was a behavioral intervention designed to reduce anxiety and crying responses among preschool children during invasive procedures. The intervention was delivered immediately prior to and during intravenous cannulation.

Behavioral intervention components included age-appropriate distraction techniques, positive verbal reinforcement, and emotional support through active parental involvement. Distraction methods consisted of engaging the child in conversation, storytelling, and directing attention to visual or verbal stimuli appropriate to the child's developmental level. Positive reinforcement was provided through calming verbal encouragement to promote cooperation and reduce fear. Parents were encouraged to remain beside the child to offer comfort and reassurance throughout the procedure.

The intervention was administered once for each participant during the invasive procedure and lasted from the preparation phase until completion of intravenous cannulation. The intervention was delivered by trained nurses who had received standardized instructions on the implementation of behavioral techniques to ensure consistency across participants.

Participants in the control group received standard nursing care during intravenous cannulation, which included routine procedural explanations and physical assistance as required, without the application of structured behavioral intervention or guided parental involvement.

Instruments and Data Collection

Data were collected using two instruments: the Face Anxiety Scale (FAS) and a stopwatch. The Face Anxiety Scale is an adopted instrument specifically designed to assess anxiety levels in young children based on observable facial expressions. The scale consists of a series of facial illustrations representing increasing levels of anxiety, scored from 1 to 5, with higher scores indicating greater anxiety. The FAS has been widely used in pediatric clinical settings and has demonstrated acceptable validity and reliability for assessing anxiety in preschool-aged children.

Crying duration was measured using a digital stopwatch to record the total duration of crying in seconds. Crying duration was defined as the time from the onset of continuous crying during the invasive procedure until the child stopped crying continuously for at least 30 seconds. This objective measure was used to minimize observer bias.

Data collection was conducted immediately following the invasive procedure to capture acute anxiety and behavioral responses. Observations were performed by trained nurses who were not involved in administering the intervention to reduce potential observer bias. Prior to data collection, observers received standardized training on the use of the Face Anxiety Scale and stopwatch to ensure consistency and accuracy.

The Face Anxiety Scale used in this study was available in a pictorial format and did not require linguistic translation. No modification or adaptation of the scale was performed. All data were recorded on standardized observation sheets and subsequently entered into a secure database for analysis.

Data Analysis

Quantitative data were analyzed using statistical software. Descriptive statistics were applied to summarize participant characteristics and outcome variables, including mean and standard deviation for anxiety scores and crying duration. Prior to inferential analysis, data distribution was assessed and found to be non-normally distributed.

The Mann Whitney U test was used to compare anxiety levels and crying duration between the intervention and control groups, as this nonparametric test is appropriate for independent samples with non-normal data distribution. The level of statistical significance was set at $p < 0.05$.

All statistical analyses were conducted to evaluate the effectiveness of behavioral intervention in reducing anxiety and crying duration among preschool children during invasive procedures.

Ethical Consideration

This study was approved by the Health Research Ethics Committee of RSI Jemursari Surabaya (Ethical Approval No.: No. 101/KEPK-RSISJS/VII/2025). Ethical approval was obtained prior to data collection.

Written informed consent was obtained from parents or legal guardians of all participating children after they received a complete explanation of the study objectives, procedures, potential risks, and benefits. Participation was voluntary, and parents were informed of their right to withdraw their child from the study at any time without any consequences for the child's care.

Participant anonymity and confidentiality were strictly maintained throughout the study. No personal identifying information was recorded, and all data were coded using numerical identifiers. Data were stored securely and were accessible only to the research team.

All research procedures were conducted in accordance with ethical principles for research involving human participants, including respect for autonomy, beneficence, non-maleficence, and justice

RESULTS

Table 1. Respondent Characteristics.

Respondent Characteristics	K1 (Intervention)		K2 (Control)		Total		Equivalence Test
	f	%	f	%	f	%	p
Age							
3 Years	18	45.0	13	32.5	31	38.7	0.688
4 Years	5	12.5	6	15.0	11	13.7	
5 Years	7	17.5	10	25.0	17	21.3	
6 Years	10	25.0	11	27.5	21	26.3	
Total	40	100	40	100	80	100	
Gender							
Male	20	50.0	21	52.5	41	51.2	0.823
Women	20	50.0	19	47.5	39	48.8	
Total	40	100	40	100	80	100	

Based on Table 1, in the age characteristics, most of the respondents in the intervention group were 3 years old, which was 18 (45.0%) children, while in the control group the most 3-year-old children were also 13 (32.5%) children. Overall, the largest age was 3 years old with a total of 31 (38.7%) children. In terms of gender characteristics, both in the intervention group the number of boys and girls was relatively balanced, namely 20 (50.0%) children each, while in the control group the number of boys was larger, namely 21 (52.5%) children, but overall the number of boys was slightly larger, namely 41 children (51.2%). The p-value in the variables age (0.688) and sex (0.823) > 0.05. Thus, the characteristics of respondents in both groups (intervention and control) were homogeneous/relatively equivalent.

Table 2. Characteristics of Respondents' Parents.

Characteristics of Respondents'		K1		K2		Total		Equivalence
Parents		(Intervention)		(Control)				Test
		f	%	f	%	f	%	p
Age								
Early adults (20-39 years)		37	92.5	38	95.0	75	93.7	0.671
Intermediate Adult (40-64 years old)		3	7.5	2	5.0	5	6.3	
Total		40	100	40	100	80	100	
Final Education		6	15.0	4	10.0	10	12.5	0.627
Elementary (Elementary-Junior High)		21	52.5	19	47.5	40	50.0	
Secondary (SMA/SMK)		13	32.5	17	42.5	30	37.5	
High (Diploma-S3)		40	100	40	100	80	100	
Total								

Based on Table 2, in the age characteristics of the respondents' parents, in the intervention group the majority were in the early adult category (20-39 years) which was 37 (92.5%) people, while in the control group most were also in the early adult category, which was 38 (95.0%) people, overall the age of the respondents' parents was in the early adult category (20-39 years) with a total of 75 (93.7%) people. In the last education characteristics, the majority of parents had secondary education (SMA/SMK), namely 21 (52.5%) people in the intervention group and 19 (47.5%) people in the control group, overall the last education of the respondent's parents was in the secondary category (SMA/SMK), which was 40 (50.0%) people. The p-value in the variables of child age (0.688) and sex (0.823) > 0.05. Similarly, the p-value at the age of the parents (0.671) and the last education of the parents (0.627) > 0.05. This shows that the characteristics of the respondents and the characteristics of the parents in both groups (intervention and control) are homogeneous or relatively equivalent.

Table 3. Preschool children's anxiety by intervention and control groups.

Yes	Anxiety Level	Intervention Groups		Control Group	
		f	%	f	%
1.	Lightweight	5	12.5 %	1	2.5 %
2.	Medium	35	88 %	25	62.5 %
3.	Weight	0	0 %	14	35.0 %
Total		40	100 %	40	100 %

Based on Table 3, in the intervention group, most of the preschool children were at moderate anxiety levels, namely 35 children (88.0%), while the level of mild anxiety was only 5 children (12.5%) and none experienced severe anxiety. Meanwhile, in the control group, most of the children were also at moderate anxiety levels as many as 25 children (62.5%), but there were also 14 children (35.0%) who experienced severe anxiety and only 1 child (2.5%) who was in the mild category.

Table 4. Length of crying by intervention and control group.

Groups	Red	Median	Mode	SD	Min	Max
Intervention	32.6	29.5	27, 33	16.0	7.00	63.00
Controls	95.2	95.5	51, 56, 59, 148	47.7	10.00	176.00

Based on Table 4, the mean value in the intervention group was 32.6, lower than the control group of 95.2. The median in the intervention group was 29.5, while in the control group it was 95.5. The modes in the intervention group were 27 and 33, while in the control group it was 51, 56, 59, and 148. The standard deviation (SD) in the intervention group was 16.0, smaller than the control group of 47.7. The minimum–maximum value in the intervention group was 7–63, while in the control group it was 10–176.

Table 5. Mann Whitney Test Results on Intervention and Control Group Anxiety Levels.

Anxiety				
Groups	f	Mean Rank	Z-Value	Effect Size (r)
Intervention	40	29.31	-4.789	0.54
Controls	40	51.69		
Mann Whitney Test Result $p=0.001$				

The results of the Mann Whitney test in Table 5 show that the mean rank value of the intervention group (29.31) is lower than that of the control group (51.69). The Z-Value was -4.789 with $p = 0.001$ (p

< 0.05), which means that there was a significant difference in anxiety levels between the two groups. In addition, an *effect size value* (r) = 0.54 was obtained which was included in the category, so clinically it showed that *behavioral intervention* had a considerable influence in reducing preschool children's anxiety during invasive procedures at RSI Jemursari Surabaya.

Table 6. Results of the *Mann Whitney Test* on the Crying Duration of the Intervention and Control Group.

Long Crying				
Groups	f	Mean Rank	Z-Value	Effect Size (r)
Intervention	40	24.94	-5.991	0.66
Controls	40	56.06		
<i>Mann Whitney Test Result p=0.001</i>				

The results of the *Mann Whitney* test in Table 6 show that the mean rank value of the intervention group (24.94) is lower than that of the control group (56.06). The *Z-Value* was -5.991 with $p = 0.001$ ($p < 0.05$), which means that there was a significant difference in crying time between the two groups. In addition, an *effect size value* (r) = 0.66 was obtained which was included in the strong category, so clinically it showed that behavioral intervention had a great influence in reducing the length of crying in preschoolers during invasive procedures at Jemursari Hospital Surabaya.

DISCUSSION

The findings of this study indicate that behavioral intervention significantly reduces anxiety levels and crying duration among preschool children undergoing invasive procedures. These results directly answer the research questions and support the hypothesis that non-pharmacological pain management through behavioral intervention is effective in minimizing emotional and behavioral distress in children during intravenous cannulation.

Behavioral Intervention and Anxiety Reduction

The significant difference in anxiety levels between the intervention and control groups ($p = 0.001$) demonstrates that behavioral intervention plays a crucial role in managing procedural anxiety in preschool children. Children who received the intervention showed lower anxiety scores and no cases of severe anxiety, while a substantial proportion of children in the control group experienced high anxiety. This finding aligns with previous studies indicating that invasive medical procedures are a major source of fear and anxiety in preschool-aged children, particularly in unfamiliar hospital environments (Liu et al., 2022).

The use of audiovisual distraction in this study supports findings by Wandini and Resandi (2020), who reported that cartoon video distraction significantly reduced anxiety and pain responses in children undergoing invasive procedures. Audiovisual stimuli are effective because they engage multiple sensory pathways, diverting attention away from nociceptive input and reducing the child's perception of threat (Wang et al., 2025). This attentional shift explains the lower anxiety scores observed in the intervention group.

Parental coaching was another key component of the behavioral intervention. Previous research emphasizes that parental presence during invasive procedures contributes to lower anxiety levels in preschool children (Athariq et al., 2023). Parents function as emotional regulators, providing reassurance through physical contact, verbal encouragement, and calm behavior. This emotional regulation mechanism is consistent with theories describing parents as co-regulators of children's emotional responses during stressful situations (Silva et al., 2017).

Effect of Behavioral Intervention on Crying Duration

In addition to reducing anxiety, behavioral intervention significantly shortened crying duration among preschool children, with a strong effect size ($r = 0.66$). Crying is a common behavioral manifestation of distress in children exposed to pain and fear, particularly during invasive procedures (Liu et al., 2022). The shorter crying duration observed in the intervention group indicates that children were better able to cope with procedural stress.

These findings are consistent with studies showing that distraction and supportive parental involvement reduce behavioral distress, including prolonged crying, during medical procedures (Athariq et al., 2023). According to Wang et al. (2025), behavioral interventions reduce stress responses by decreasing sympathetic nervous system activation, which may explain the faster calming responses observed in the intervention group.

Clinically, reduced crying duration facilitates smoother procedural execution, minimizes emotional exhaustion for healthcare providers, and creates a more conducive environment for pediatric care. This aligns with prior evidence that effective non-pharmacological interventions improve cooperation and procedural efficiency in pediatric settings (Silva et al., 2017).

Contributions to Nursing Practice, Policy, and Knowledge

The findings of this study provide important contributions to pediatric nursing practice by reinforcing the effectiveness of behavioral intervention as a simple, safe, and cost-effective non-pharmacological strategy. Integrating distraction techniques and parental coaching into routine nursing care can enhance child-centered care and improve procedural outcomes, as supported by previous research (Wandini & Resandi, 2020).

From a policy perspective, the results support the inclusion of behavioral intervention in standard operating procedures for pediatric invasive procedures. Evidence from this study strengthens the

rationale for institutional policies that promote family involvement and non-pharmacological pain management strategies (Liu et al., 2022)

In terms of scientific knowledge, this study adds to the existing literature by providing empirical evidence from an Indonesian hospital setting, reinforcing the generalizability of behavioral intervention effectiveness across cultural and clinical contexts (Silva et al., 2017).

Strengths and Limitations of the Study

One strength of this study lies in its quasi-experimental design with a control group, which allows for a clear comparison of intervention outcomes. The combination of multiple behavioral components distraction, positive reinforcement, desensitization, and parental coaching enhanced the overall effectiveness of the intervention, as suggested in previous studies (Athariq et al., 2023).

However, several limitations should be acknowledged. The dynamic hospital environment, including noise and concurrent medical activities, may have influenced children's focus during audiovisual distraction. Additionally, the post-test-only design limited the assessment of baseline anxiety and crying duration, which may affect the interpretation of individual changes over time, as noted in similar pediatric studies (Liu et al., 2022).

Scientific Justification of Findings

The effectiveness of behavioral intervention can be scientifically explained through attentional control and emotional regulation mechanisms. Distraction reduces pain perception by redirecting cognitive focus away from noxious stimuli, while parental coaching enhances emotional security and coping abilities (Wang et al., 2025). The synergy of these mechanisms likely contributed to the significant reductions in anxiety and crying duration observed in this study.

IMPLICATIONS AND LIMITATIONS

The findings of this study highlight the practical value of behavioral intervention as an effective non-pharmacological strategy to reduce anxiety and crying duration among preschool children undergoing invasive procedures. For nursing practice, these results support the routine integration of behavioral interventions—such as audiovisual distraction, positive reinforcement, desensitization, and parental coaching—into pediatric nursing care. The application of these interventions can improve children's cooperation during procedures, facilitate smoother clinical workflows, and reduce emotional distress experienced by both children and their parents. Implementing such approaches aligns with principles of child-centered and family-centered nursing care.

From an educational perspective, the results of this study emphasize the importance of incorporating non-pharmacological pain management strategies into nursing curricula. Nursing students and pediatric nurses should be trained to apply behavioral interventions effectively and to involve parents as active partners during invasive procedures. Integrating evidence-based behavioral

strategies into clinical training may enhance nurses' competence in managing pediatric anxiety and behavioral responses in a holistic manner.

The evidence generated by this study supports the development of institutional policies that promote non-pharmacological pain management as a standard component of pediatric care. Healthcare institutions, particularly hospitals providing pediatric services, may consider establishing standard operating procedures that include behavioral intervention during invasive procedures. Such policies could contribute to improved quality of care, increased patient and family satisfaction, and a more supportive clinical environment for children.

The findings of this study provide a foundation for future research on behavioral interventions in pediatric settings. Further studies are recommended to employ stronger experimental designs, such as pre-test and post-test control group designs, to assess baseline changes in anxiety and crying duration. Future research may also explore variations of behavioral interventions, including different forms of distraction, interactive multimedia, or relaxation techniques, as well as examine long-term psychological outcomes following repeated medical procedures.

Despite its contributions, this study has several limitations that should be considered when interpreting the results. The dynamic hospital environment, including background noise and ongoing medical activities, may have influenced children's attention during audiovisual distraction, potentially affecting the consistency of the intervention. Additionally, the post-test-only design limited the ability to measure individual changes in anxiety and crying duration before and after the intervention. The study was conducted in a single hospital setting, which may restrict the generalizability and transferability of the findings to other clinical contexts or populations.

CONCLUSION

This study concludes that behavioral intervention is an effective non-pharmacological approach to reducing anxiety levels and crying duration among preschool children undergoing invasive procedures. In line with the study's purpose, the findings demonstrate that children who received behavioral intervention exhibited significantly lower anxiety scores and shorter crying duration compared to those who did not receive the intervention. These results confirm that behavioral intervention positively influences both emotional and behavioral responses in preschool children during intravenous cannulation.

The significance of these findings extends to the broader field of pediatric nursing by reinforcing the importance of integrating non-pharmacological pain management strategies into routine clinical practice. Behavioral intervention, which combines audiovisual distraction, positive reinforcement, desensitization, and parental coaching, offers a practical, safe, and cost-effective method to improve children's procedural experiences while promoting family-centered care.

Based on the study outcomes, it is recommended that behavioral intervention be routinely implemented as part of standard nursing care during pediatric invasive procedures. Nurses should be

encouraged to actively involve parents and utilize appropriate distraction techniques to minimize children's distress. For future research, studies employing stronger experimental designs, larger sample sizes, and diverse clinical settings are suggested to enhance generalizability. Further investigation into long-term psychological outcomes and variations of behavioral interventions may also provide valuable insights for advancing pediatric nursing practice.

AUTHOR CONTRIBUTION

Wesiana Heris Santy : Conceptualization, Methodology, Investigation, Project administration, Supervision, Data curation, Formal analysis, Writing – original draft, Writing – review & editing.

Nabila Rizqi Syahrizal : Investigation, Data curation, Validation, Visualization, Writing – original draft, Writing – review & editing.

Yurike Septianingrum : Methodology, Formal analysis, Validation, Supervision, Writing – review & editing.

M. Shodiq : Conceptualization, Methodology, Supervision, Resources, Validation, Funding acquisition, Writing – review & editing.

All authors have read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

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CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. All authors have reviewed and approved the final manuscript and agree with its submission for publication.

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Table Captions

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