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Glove Puppet as a Distraction Method: Reducing Hospitalization Response in Preschool Children During Injections

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ABSTRACT

Introduction: Hospitalization and medical procedures such as injections are common causes of anxiety and behavioral distress in preschool children. Non-pharmacological, atraumatic care such as distraction technique is an imperative to reverse such reactions. This study aimed to analyse the effectiveness of glove puppets as a distraction method in reducing hospitalization-related behavioural responses in preschool children undergoing injection procedures.

Methods: This quasi-experimental pretest–post-test non-equivalent control group study was conducted among 32 preschool children aged 3–6 years hospitalized at Dr. Ramelan Naval Hospital, Surabaya, Indonesia. Participants were assigned to an intervention group (n = 16) and a control group (n = 16). Behavioural responses were assessed using a validated observational checklist before and after the injection procedure. Glove puppet distraction therapy was administered to the intervention group prior to the injection procedure. Data were analysed using the McNemar test to evaluate categorical changes and the Wilcoxon test to compare pre–post scores.

Results: Before the intervention, 87.5% of children in the intervention group and 75% in the control group exhibited high levels of behavioural distress. After the intervention, the proportion of high distress in the intervention group decreased significantly to 25%, while no meaningful change occurred in the control group (81.3%). A significant reduction in distress was observed in the intervention group ($p < 0.001$; Cohen's $d = 1.56$).

Conclusion: Glove puppet distraction is a simple, cost-effective, and developmentally appropriate strategy that significantly reduces hospitalization-related behavioural distress among preschool children.

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INTRODUCTION

Invasive medical procedures are often a scary and traumatic experience for preschool-aged children (1). Hospitalization and procedures such as injections often trigger fear, anxiety, and behavioral resistance, which can negatively impact the child's emotional well-being as well as cooperation during treatment. At this stage of development, the child is not yet able to fully understand that medical measures are being taken for his or her good (2). Active imagination, egocentric thinking, and limited understanding of health concepts make preschool-age children very vulnerable to experiencing behavioral distress related to hospitalization (3,4). Uncontrolled fear, anxiety, and pain during medical procedures can have long-term consequences, including denial of health care and the formation of a phobia of medical procedures (5,6)

Recent research shows that excessive fear and pain due to invasive procedures during hospitalization can hinder the recovery process and affect children's perception of health services in the future. Therefore, play-based nonpharmacological strategies that are tailored to the child's developmental stage are increasingly recommended to help regulate emotions and reduce distress levels (7,8).

The latest data from the Central Statistics Agency (CSA) noted that the number of early childhood children in Indonesia reached more than 30.2 million people in March 2023, with an increasing trend in hospitalization rates in the last two years. It was recorded that 3.67% of children aged 1-4 years and 2.38% of children aged 5-6 years had undergone hospitalization in the past year (9). This increase confirms the need for effective strategies to support children during hospital treatment and reduce distress during medical procedures.

Preschool-age children are particularly vulnerable to anxiety in the hospital due to separation from parents, unfamiliar surroundings, and fear of pain. To address these challenges, distraction interventions and play therapy are becoming key elements in evidence-based pediatric nursing practice (10,11). Hand puppets, as a form of play therapy, stimulate children's imagination, encourage emotional expression, and strengthen communication between nurses and children (12,13). Through interaction with hand puppets, children can channel their fears and turn anxiety into more controlled and safe play scenarios. Empirical evidence from recent research shows that the distraction of using hand puppets is culturally adaptive, low-cost, and effective in reducing hospitalization-related behavioral distress (14,15).

Although the effectiveness of glove puppets has been researched in several countries, its application in Indonesian hospitals is still limited. Most of the research was conducted in Western countries with different health systems and cultural backgrounds. Therefore, it is necessary to conduct research to assess the influence of hand puppet distraction on preschool-age children in Indonesia.

This quasi-experimental research was carried out at the RSPAL dr Ramelan Surabaya to test the effectiveness of hand puppet distraction in reducing hospitalization-related behavioral distress in preschool-aged children undergoing injection procedures. The results of this study are expected to provide empirical evidence for the application of simple, effective, and culturally relevant interventions in pediatric nursing practice to improve emotional comfort and quality of service during hospitalization.

METHOD

This study employs a clear and systematic approach to ensure the reliability and validity of the findings. Below are the components of the methodology:

Research Type

This study is quantitative research with a quasi-experimental design of a pretest-post-test non-equivalent control group. This design was chosen to assess the effectiveness of the glove puppet intervention in reducing the hospitalization response of preschoolers. The sample was divided into two groups, namely the intervention group that received the glove puppet distraction, and the control group that received the standard procedure without intervention. Data were collected through behavioural observation using standardized instruments and analysed with the McNemar and Wilcoxon tests to determine differences in responses before and after the intervention.

Population and Sample/Informants

The population in this study was preschool children aged 3–6 years who were treated in the children's room of RSPAL dr Ramelan Surabaya, East Java. Out of a total of 47 children who met the population criteria, a sample of 32 children was recruited using the convenience sampling approach, so that it was in accordance with the design of the non-equivalent control group. The sample was then divided into two groups, namely the intervention group (n=16) that received glove puppet distraction, and the control group (n=16) that received standard procedures without intervention. Equal inclusion criteria including age, clinical condition, and hospitalization characteristics were applied to both groups to reduce selection bias, and the division of participants followed space placement and scheduling of medical procedures to improve internal validity and prevent contamination between groups.

Research Location

The study was carried out in the Children's Hospital of RSPAL Dr. Ramelan Surabaya, East Java, in June–July 2024.

Instrumentation or Tools

The instrument is in the form a validated behavioural observation sheet with established psychometric properties for assessing hospitalization-related distress in preschool children. Trials on comparable pediatric samples were used to refine behavioural indicators and scoring procedures. The instrument showed high reliability (Cronbach's $\alpha = 0.88$; ICC between assessors = 0.86) as well as construct validity through consistent score differences between children with and without a history of hospitalization, making it suitable for use as a measure of procedural distress.

The intervention medium used was a glove puppet (a modified medical glove with eyes, mouth, and accessories resembling an animal or figure) that the nurse played to distract the child during the injection procedure. An illustration of the glove puppet used in this study is presented in Figure 1.

Figure 1. Glove puppet used as a distraction tool during injection procedures

Data Collection Procedures

Data collection was carried out directly through structured observation using validated observation sheets.

In the pretest stage, the researcher observes the child's behavioural response before the intervention is given.

Furthermore, at the intervention stage, the intervention group received treatment in the form of a glove puppet distraction given by a trained pediatric nurse for ±3–5 minutes before the insertion of the infusion and continued throughout the procedure. Compliance with the implementation of the intervention was monitored using a fidelity checklist that recorded the time of delivery, continuity of interaction with the puppet, and the completion of the intervention steps to ensure standard implementation, while the control group underwent the standard procedure without additional intervention.

In the post-test stage, re-observation was carried out to assess changes in the child's behavioural response after the intervention.

All parents/guardians are first given an informed consent sheet and instructions regarding the child's participation in the study.

Data Analysis

Quantitative data were analysed using descriptive statistics to describe the demographic characteristics of respondents (age, gender, birth order, and history of hospitalization). Next, the McNemar test was performed to assess changes in the proportion of hospitalization behavioural responses in the group, and the Wilcoxon test to compare pre- and post-intervention scores in the intervention and control groups. All predefined analyses, including Wilcoxon test results, test statistical values, p-value, and effect size (r), are reported to ensure analytical transparency and consistency with the analysis plan. Any analysis that is not performed or irrelevant is explained in the Results section to maintain methodological clarity.

All analyses were carried out using the latest version of SPSS software to ensure the accuracy of statistical calculations.

Ethical Approval

This research has received ethical approval from the Research Ethics Committee of dr. Ramelan Naval Central Hospital with number 126/EC/KEP/2024. In addition, informed consent is obtained from the child's parents/guardians prior to participation. The confidentiality of children's identities and data is guaranteed in accordance with the ethical principles of health research.

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RESULTS

This study evaluated the effectiveness of glove puppets as a distraction method in reducing hospitalization-related behavioural responses during injections in preschool children, using a quasi-experimental pre- and post-test control group design. Data were collected through observation and analyzed using descriptive and inferential statistics. The results include participant demographics and a comparison of behavioural responses before and after the intervention, as presented in Tables 1–3.

Table 1. Characteristics of Respondents (n = 32)

Variable	Category	Control Group (n=16)	Intervention Group (n=16)	P Value
Age (Years)	3-4	11 (68.8 %)	10 (62.5 %)	0.723[a]
	5-6	5 (31.3 %)	6 (37.5 %)	
Gender	Male	9 (56.3 %)	8 (50.0 %)	0.732[b]
	Female	7 (43.8 %)	4 (25.0 %)	
Birth Order	First	8 (50.0 %)	4 (25.0 %)	0.218[b]
	Second	5 (31.3 %)	9 (56.3 %)	
	Third	3 (18.8 %)	3 (18.8 %)	
Prior Hospitalization	Yes	7 (43.8 %)	11 (68.8 %)	0.165[b]
	No	9 (56.3 %)	5 (31.3 %)	

Notes:

[a] Chi-square test

[b] Fisher's Exact Test

Table 1, showed that most children aged 3–4 years were in the control (68.8%) and intervention (62.5%) groups, with the majority being male and first-child. There were no significant differences between the groups ($p > 0.05$), so the two had comparable basic characteristics.

Table 2. Behavioural Hospitalization Response Before and After Intervention (n = 32)

Response Level	Time Point	Control Group (n=16)		Intervention Group (n=16)		p value	Effect Size (Cohen's *d*) [95% CI]
		f	%	f	%		
High	Pre-tes	12	75.0	14	87.5		
	Post-tes	13	81.3	4	25.0	< 0.001	1.56 [1.08–2.01]
Low	Pre-tes	4	25.0	2	12.5		
	Post-tes	3	18.8	12	75.0		

Notes:
p-value calculated using Wilcoxon Signed-Rank Test for pre–post comparison.
Effect size calculated using Cohen's d based on pre–post difference within the intervention group

Table 2, showed that the proportion of children with high behavioral distress decreased in the intervention group after being given hand puppet distraction (87.5% to 25.0%), while the control group showed no significant change. The difference was significant ($p < 0.001$; $d = 1.56$; 95% CI = 1.08–2.01).

Table 3. Behavioral Response Changes Before and After Intervention (n = 32)

Group	Pre-Test Response	Post-Tes High	Post-Tes Low	p-value	Effect Size (Cohen's d) [95% CI]
Control Group (n=16)	High (n = 12)	12	0		
	Low (n = 4)	1	3	1.000	0.05 [–0.28 – 0.37]
Intervention Group (n=16)	High (n = 14)	4	10		
	Low (n = 2)	0	2	0.002	1.61 [1.12 – 2.08]

Notes:
McNemar Test was used because data were paired categorical outcomes (High vs Low).
Effect size (Cohen's d) computed from pre–post categorical shifts to represent magnitude of behavioral improvement.

Table 3, showed that the level of distress in the control group did not change (absolute change −6.3%; $d = 0.05$, 95% CI −0.28 to 0.37). In contrast, the intervention group experienced a significant decrease from 87.5% to 25%, with an absolute decrease of 62.5% and a relative of 71.4% ($d = 1.61$, 95% CI 1.12 to 2.08). Comparisons between groups showed much greater improvement in the intervention group, confirming the statistical and clinical significance of glove puppet distraction.

DISCUSSION

Hospitalization in preschool age often leads to anxiety, emotional distress, and behavioural problems, especially during invasive procedures such as injections (7,16,17). The study is in line with previous research that emphasized the importance of atraumatic treatment to minimize the psychological impact of hospitalization (4).

The results of the pre-test study showed that most children in both groups showed high levels of behavioral distress, namely 75% in the control group and 87.5% in the intervention group (Table 2). Based on observational data, children often cry, refuse to cooperate, and show fear during medical procedures. This is in line with studys, which describes the typical responses of preschoolers to hospitalization including crying, clinging to parents, rejection, and withdrawing out of fear of unfamiliar environments and health workers (6,13).

Most of the participants in this study were between 3–4 years old. This age group is particularly vulnerable due to limited emotion regulation and immature coping mechanisms (18). This is in line with the findings study who emphasized that children in this age group are more susceptible to hospitalization-related stress due to environmental exposure, nutritional deficits, and developmental risks that often require inpatient care (6). The stress response is further exacerbated by an unfamiliar hospital environment, which leads to uncooperative, fear, and behavioral regression (10).

In terms of gender, both boys and girls showed equally high behavioral responses during hospitalization, as shown in Table 1. These similarities cannot be explained through physiological or hormonal differences between the sexes, but rather have to do with the developmental characteristics of preschool-age children. At this age, the ability to regulate emotions is still limited, coping mechanisms are immature, and children are highly dependent on external

support when dealing with stressful medical procedures. Evidence suggests that in painful or unfamiliar procedures, preschoolers' affective responses and behaviors are primarily determined by developmental stages, not by sex differences, so expressions of fear, avoidance, or distress are relatively similar (6,18). Thus, the findings of this study are in line with the literature that hospitalization stress in early childhood tends to negate differences in responses based on gender.

Regarding the order of birth, the first child was more common in the control group (50.0%), while the second child was more common in the intervention group (56.3%). Although birth order was not the main determinant in the study, some literature suggests that younger siblings may develop better coping mechanisms through observation of their older siblings, potentially influencing hospital adaptation (19).

Regarding the history of hospitalization, Table 1 shows that the majority of children in the intervention group had been hospitalized previously (68.8%), while more children in the control group had no prior hospitalization experience (56.3%). Despite this, high levels of behavioral distress were still recorded in both groups (8). Stated that the first hospitalization is often accompanied by increased anxiety due to ignorance. First hospitalization is often accompanied by increased anxiety due to the unfamiliarity with the hospital environment so that family support is needed by the child (13). However, repeated exposure to invasive procedures without adequate coping strategies can also lead to fear and cumulative trauma (14). Thus, both the absence and the repetition of the inpatient experience can significantly affect the child's emotional response (20,21). These findings emphasize the importance of implementing effective coping interventions, such as play therapy, to reduce distress and support children's emotional adjustment during hospitalization (12).

After the intervention, the data in Table 2 show a marked decrease in behavioral disorders in the intervention group—high response decreased from 87.5% to 25%, while low response increased from 12.5% to 75%. In contrast, the control group experienced only minor changes, with high behavioral responses remaining high 81.3% post-test. These differences were statistically significant in the intervention group, as shown by the McNemar test ($p = 0.002$), while no significant change occurred in the control group ($p = 1.000$). These findings prove that distraction using hand puppets is effective in reducing hospitalization-related behavioral distress in preschoolers.

The results of this study are in line with international evidence showing that play-based distraction through therapeutic play, medical clowns, and interactive games significantly reduces children's anxiety and behavioral distress during invasive procedures (22–24). Studies form Turkey, Italy, and Egypt have also reported similar results, where distractions have been shown to distract children, improve emotional regulation, and improve cooperation during procedures. Nevertheless, research from Western countries show that the effectiveness of distractions can vary depending on cultural factors, the level of parental involvement, and the child's experience with technology-based distraction tools (22,25,26).

The present findings provide empirical evidence from Indonesia, showing that simple, inexpensive, and culturally appropriate distraction methods such as hand puppets can have effects comparable to advanced distraction methods used internationally. This reinforce the theoretical perspective that the therapeutic value of distraction is not determined by the complexity of the device, but by the child's ability to engage in symbolic play and regain a sense of control over a stressful medical experience, in accordance with the principles of atraumatic care and child-centered play therapy.

Glove puppets serve as an effective play technique to divert attention and are therapeutic. These results confirm the effectiveness of the glove doll as a therapeutic and attention-diverting play technique. Glove dolls offer a simple and imaginative method to divert children's attention from painful procedures to pleasurable contexts, thereby reducing perceived threats and anxiety (27,28). Child-centered play interventions also support children in processing medical experiences cognitively while regulating emotional responses (11,15,29,30). Hand puppets olso stimulate imagination, helping children conceptualize abstract procedures through visual and tactile engagement (15,29,31). Playing while telling stories allows children to channel emotions, manage fear, and develop a sense of control, confirming that hand puppets act as a distraction as well as a therapeutic tool that improves children's ability to cope with stress during hospitalization (32).

For pediatric nurses, these findings provide strong support for integrating hand puppets as part of non-pharmacological and atraumatic treatment strategies. This approach is cost-effective, according to child development, and easy to apply by health workers.

Although the results of this study show the effectiveness of the intervention, this study has several limitations, namely small sample size, group division following the clinical flow, and implementation in one location. Further research is suggested using larger samples, blinded assessors, as well as multi-site designs to improve the validity and generalization of findings.

CONCLUSION

Hand puppets significantly reduce the behavioral stress associated with hospitalization in preschoolers. This intervention has been shown to be clinically and statistically effective, confirming its potential to be applied more widely in pediatric care to enhance positive experiences during hospitalization, provide emotional comfort, and improve children's adherence to medical procedures.

AUTHOR'S CONTRIBUTION STATEMENT

Faridah Faridah involved in conceptualization, study design, data collection and drafting of the initial manuscript. Diyah Arini participated in supervision, validation and methodology's refinement as well as substantial revision of the manuscript, and acted as a corresponding author. Iis Fatimawati participated in data analysis, results interpretation and critically reviewed the manuscript content. Ainin Ulifah: contributed to the data collection, literature review, and manuscript editing. All authors have read and approved the final version of the manuscript, and they are responsible for all aspects of the manuscript.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest in this study.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The authors assert that no generative AI tools, or AI-assisted authoring tools were used in the composition of this manuscript. All work is original and has been written by the authors in order to maintain validity, credibility, and ethical publication.

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