# The Effect of Distraction Techniques, Ball Squeezing and Immersive Cartoon Projection, on Pain in Children During Venipuncture

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**Abstract-** Since venipuncture is a common procedure for obtaining blood samples and establishing intravenous access, these activities can be painful and frightening for children. The majority of children aged 3-6 years who underwent venipuncture procedures reported being traumatized by the experience. It is widely recognized that fear and anxiety are frequently associated with needles. This study employed a randomized controlled trial (RCT) design. Data collection occurred between February 28, 2026, and May 2, 2026. A non-probability convenience sample (N=140) of preschool children was divided into two study groups: the ball-squeezing group (n=70) and the immersive cartoon projection group (n=70). Participants were selected using a convenience sampling technique. Data were collected using the FFLC pain scale, and statistical analysis was performed using descriptive and inferential techniques. The results indicated that ball squeezing helped reduce pain levels to mild, whereas immersive cartoon projection was successful in reducing moderate pain levels. A statistically significant correlation was established between immersive cartoon projection and a history of venipuncture (*P*=.046). Furthermore, there was a statistically significant inverse correlation between the efficacy of the pain-reduction technique and the child's weight (r= −.262, *P*=.028). No statistically significant relationship was established between age, gender, residential location, or family size. The study concludes that the application of ball squeezing effectively reduced venipuncture-related mild pain, while the application of immersive cartoon projection effectively reduced venipuncture-related moderate pain. Based on these findings, this study represents a novel contribution to the field of venipuncture. It advocates for replicating the study on a national level to validate these findings and ensure broader applicability across different healthcare settings. Additionally, it is suggested that future studies incorporate an anxiety and fear scale to further refine these initial findings.

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## Introduction

Pediatric venous blood sample collection is a critical aspect of diagnosis and patient monitoring, yet it remains significantly more challenging than in adults. Issues such as small vein diameter, lack of cooperation from the child, and high sensitivity to pain make this task inherently difficult and prone to errors (1,2).

Children are among the most vulnerable patients regarding anxiety and dread during invasive treatments. The fear and anxiety arising from these interventions adversely affect both the child's and the parents' future hospital experiences (3).

Immersive cartoon projection technology provides high-quality audiovisual distraction through animated content displayed on a large screen placed within the child's direct field of vision, creating an environment dominated by harmless stimuli. This technology simultaneously activates visual (neocortical), auditory (superior temporal lobe), and attentional (prefrontal

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cortex) networks, generating a "therapeutic presence" that effectively competes with mechanical pain input. Randomized controlled trials have reported a 40-65% reduction in subjective pain intensity and a 50% reduction in behavioral dimensions (FLACC scores) compared to standard care, with effects exceeding those of electronic whiteboard distraction due to field-flooding and spatial audio fusion (4).

The ball-squeezing technique constitutes a form of sensorimotor distraction that integrates cognitive diversion with physical stimulation. This approach involves the child grasping a rubber ball or stress ball and applying rhythmic pressure throughout the painful procedure (5,6).

Pain is a sensation experienced both physically and emotionally and processed by the brain; it is also a significant health concern that must be addressed. Every child perceives pain differently, as the meaning of the experience varies for each individual (7).

Pediatric nurses can utilize play activities to reduce the pain, stress, and anxiety that occur during the blood collection process, while also providing children with a means to express their emotions (3).

**Importance of study**

Venipuncture is among the most frequent invasive procedures in children; it can be highly painful and frightening, leading to poor patient cooperation and potential negative psychological effects on future interactions within the healthcare system. Uncontrolled pain may result in psychological problems and needle phobia; therefore, it is crucial to provide effective pain management in these cases (8). Nonpharmacological distraction approaches, such as ball squeezing and cartoon immersion techniques, have been found to be highly effective in decreasing pain and anxiety levels during venipuncture procedures. Thus, recognizing the importance of utilizing such accessible techniques would be beneficial for pediatric nursing practice (9).

**Historical background of PAIN**

In the 20th century, pain management saw significant progress. The use of local anesthetics and nerve blocks has become increasingly widespread in pain management. Techniques have been developed to inject anesthetics around targeted nerves to provide local anesthesia and effectively reduce pain.

In addition, non-narcotic analgesics such as aspirin and ibuprofen have been developed to manage pain. These analgesics help relieve pain and reduce inflammation and are considered safe and effective for daily use. These advancements have greatly increased the potential for managing and alleviating pain, ultimately contributing to the comfort and well-being of patients (10).

Since the dawn of human history, pain management has been a major concern. Pain remains a complex and contentious topic that has been viewed differently across nations throughout history (11).

In the modern era, recent years have focused on individualized pain management and the use of diverse specialized techniques. This approach encompasses pharmacological interventions, such as pain-relieving medications, and non-pharmacological interventions, including physical therapy, psychological interventions, massage, manual pressure, distraction techniques, the Buzzy device, music therapy, aromatherapy, and many others. This multidisciplinary strategy has been developed to best meet patient needs and achieve maximum comfort and pain alleviation without complications (12).

**Factors affecting children's responses**

The childhood stage is divided into early, middle, and late childhood (preadolescence). Typically, the early childhood stage spans from birth until age six (13). The importance of appropriate pain management during the pediatric stage cannot be overemphasized, as it helps protect children's health and promotes the healing process; however, several obstacles hinder effective pain management during this period. Recognizing these obstacles, as well as the facilitators that promote care services, is vital (14).

Apart from health, deviations from health may occur in an individual's life. When there is a deviation from health, outpatient and inpatient care are utilized. Hospital experience, medical procedures, and hospitalization are factors that may leave a lasting impression on an individual, especially those in childhood, which is considered a vulnerable developmental period. The reaction to such experiences will depend on certain factors, including the age of the child, family characteristics, the seriousness of the illness, the degree of difficulty in performing the procedures, and the child's stage of development (15).

**Theoretical framework**

Ronald Melzack and Patrick Wall first introduced the gate control theory (GCT) in 1965. GCT was the first theory to postulate that pain is not solely generated through a straightforward pathway, wherein pain is produced only when peripheral nervous system pathways

are stimulated and subsequently perceived in the central nervous system. Instead, nerve impulses that generate pain signals can be modified in the spinal cord due to a "gate-like" phenomenon in the dorsal horn, occurring before these signals are transmitted to the central nervous system as a pain perception experience. The GCT also explains that emotions, cognition, and past experiences can influence this gate phenomenon. Despite being physiology-based, the gate control theory incorporates the psychological aspects of pain perception (16,17).

The visual and unpleasant aspects of an injection provoke fear and anxiety (18). Consistent with this theory, ascending pain signals resulting from tissue injury may be modulated by descending nerve impulses from the brain, which are influenced by thoughts, beliefs, emotions, and attention. While attention directed toward enjoyable activities may reduce pain during procedures, anxiety can exacerbate it. In this context, numerous nonpharmacological treatments reduce anxiety, thereby influencing the perception of pain (19).

### Distraction techniques

Distractive coping strategies for managing pain and distress are currently employed in most hospitals where children require medical attention. Child life specialists, who are licensed professionals trained in child psychology and family systems, assist children and their families in coping with the hospitalization process. This practice is supported by a recent literature review of empirical evidence across the fields of psychology, medicine, psychiatry, sociology, nursing, and education. Based on evidence-based practice, their role is to encourage appropriate coping by utilizing child-oriented interventions (e.g., play, preparation, education) and by providing support and information to parents. Regarding distraction approaches, they may engage the child in conversation, play games, or utilize a television screen for watching videos. They collaborate with parents and other healthcare providers to address the child's unique needs in coping with stress and trauma (19).

### Family role during venipuncture pain

Family-related factors are becoming more widely recognized as important determinants of pediatric pain. A small number of recent reviews have examined the involvement of family-related factors in pain in children and adolescents; these studies have primarily concentrated on individual parental cognitive, behavioral, and affective characteristics, as well as mental health (20). Parental support is generally effective in pediatrics to mitigate venipuncture-related pain and anxiety (21).

Family-Centered Care (FCC) is an approach that could be applied within healthcare settings to mitigate the adverse effects of medical care on parents and children. FCC views the family as a significant constant in a child's life. FCC emphasizes individualized attention, respect, encouragement, and the empowerment of the family. The family works in partnership with nurses; therefore, they should be involved in all aspects of the child's care, rather than only when information is required from them (22).

## Materials and Methods

### Study design and randomization

This study was a parallel-group randomized controlled trial carried out at the Pediatric Teaching Hospital in Karbala Governorate, Iraq, from February 28 to May 2, 2026. Eligible participants included children between the ages of 3 and 6 years requiring venipuncture.

### Inclusion criteria

Inclusion criteria consisted of children aged 3 to 6 years requiring venipuncture for diagnostic or therapeutic reasons; children who were alert and able to comprehend simple instructions; and parents or legal guardians who were available to provide informed consent.

### The exclusion criteria

Exclusion criteria included children younger than 3 years or older than 6 years, children undergoing chemotherapy, and children receiving sedation.

Participants were randomly assigned 1:1 to either the ball-squeezing group or the immersive cartoon projection group using a computer-generated randomization list created by an independent statistician (SPSS software, version 26). Block randomization was employed with varying block sizes (4 and 6). An independent staff member, not involved in participant enrollment, prepared opaque, sealed, sequentially numbered envelopes for allocation. These envelopes were unsealed immediately before the intervention, following baseline evaluation and participant consent. Allocation was determined exclusively by the randomization procedure; parents did not influence group assignment.

### Sampling and sample size

Children who met the eligibility requirements were recruited from the Pediatric Teaching Hospital in Karbala Governorate, Iraq, using a convenience sampling method. The total sample consisted of 140 children, with 70 assigned to the immersive cartoon projection group and 70 assigned to the ball-squeezing group.

The sample size was determined using G*Power software (version 3.1) with the following parameters: power (1-β)=0.80, alpha level=0.05, and an estimated medium effect size (d=0.50) based on prior distraction intervention research. According to this calculation, each group required a minimum of 64 participants. To account for potential dropouts (approximately 10%), 70 children were recruited for each group.

**Blinding and outcome assessment**

Blinding of participants and interventionists was not feasible. Pain outcomes were recorded by an independent outcome assessor who was blinded to group allocation whenever possible.

**Intervention**

**Ball squeezing group**

Children in this group were provided with a soft stress ball to squeeze with their hand not used for venipuncture. The ball, which had a diameter of approximately 7 cm, was composed of non-toxic silicone. The nurse instructed the child to "squeeze the ball as tightly as you can," beginning 30 seconds before the venipuncture and continuing throughout needle insertion and removal. The child was encouraged to continue squeezing rhythmically at a rate of approximately once per second until the procedure was completed. The father was present to offer verbal support. This method reduces the perception of pain through muscular tension and tactile-motor distraction.

**Immersive cartoon projection group**

The children in this group watched an immersive, age-appropriate cartoon projected onto a 15-inch screen positioned 30 to 40 centimeters from the child's face, filling the majority of the child's field of vision. The cartoon was selected from popular children's shows (e.g., "Peppa Pig" or "Cocomelon") characterized by vivid colors, engaging characters, and a straightforward plot appropriate for children aged three to six. The cartoon commenced one minute prior to venipuncture and continued throughout the procedure. To enhance immersion, ambient lighting was dimmed. To sustain the child's interest, they were instructed to "watch the cartoon carefully and tell me what happens in the story later." This method diverts the child's focus from the uncomfortable procedure through immersive engagement and audiovisual distraction.

**Methods of data collection**

Data were collected at the Pediatric Teaching Hospital in Karbala, Iraq, between February 28 and May 2, 2026. Eligible children (aged 3-6 years) requiring venipuncture were recruited using convenience sampling. After obtaining written informed consent from parents, children were randomized to either the ball-squeezing group (n=70) or the immersive cartoon group (n=70) using sequentially numbered, opaque, sealed envelopes. Pain was assessed during venipuncture (needle insertion) by an independent blinded assessor using the FLACC scale. All data were recorded on standardized forms and analyzed using SPSS version 26.

## Results

Primary outcome: Pain during venipuncture was measured using the FLACC scale, assessed immediately following the procedure.

**Statistical analysis**

Statistical analysis: Data were analyzed using SPSS version 26. Continuous variables were summarized as mean±standard deviation, and categorical variables were expressed as frequencies and percentages. Between-group comparisons were conducted using appropriate statistical tests based on the type and distribution of the data. Statistical significance was set at $P<0.05$.

**Trial registration and ethics**

Trial registration and ethics: This trial was registered at ClinicalTrials.gov under registration number NCT07417852. Ethical approval was obtained from the University College of Nursing, University of Baghdad (approval number: 73, dated January 29, 2026). Written informed consent was obtained from the parents or legal guardians.

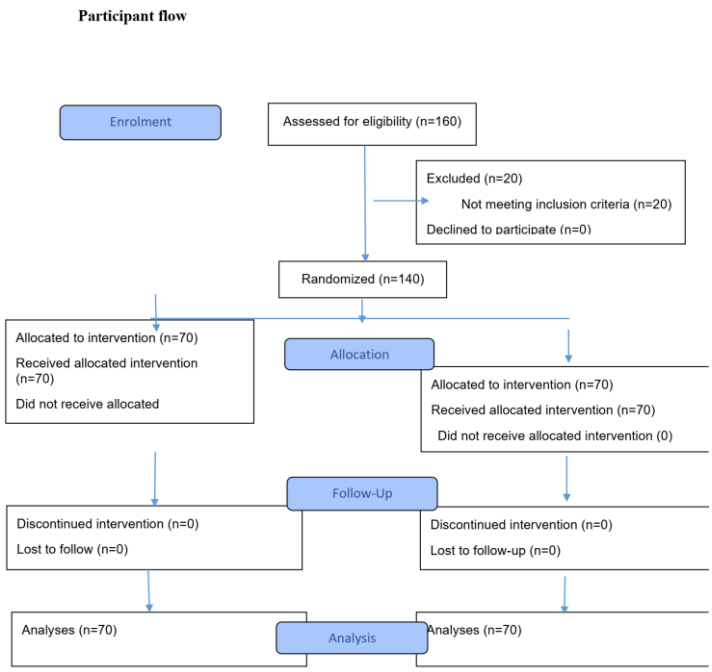



**Figure 1**. (CONSORT Flow Diagram)

**Table 1. Description of children' socio-demographic variables (SDVs) (N=140)**

| List | Group Variables | | Immerse Cartoon Projection (ICP) (n=70) | | Ball Squeezing (BS) (n=70) | |
|---|---|---|---|---|---|---|
| | | | No | % | No | % |
| **1** | Age (year) | 3 | 11 | 15.7 | 24 | 34.3 |
| | | 4 | 15 | 21.4 | 19 | 27.1 |
| | | 5 | 24 | 34.3 | 13 | 18.6 |
| | | 6 | 20 | 28.6 | 14 | 20 |
| | | $\tilde{x}$ ±*IQR* | *5 ±2* | | *4 ±2* | |
| **2** | Sex | Male | 44 | 62.9 | 35 | 50 |
| | | Female | 26 | 37.1 | 35 | 50 |
| **3** | Previous hospitalization | Yes | 51 | 72.9 | 58 | 82.9 |
| | | No | 19 | 27.1 | 12 | 17.1 |
| **4** | Previous IV insertion or venipuncture in last 3 months | Yes | 50 | 71.4 | 55 | 78.6 |
| | | No | 20 | 28.6 | 15 | 21.4 |
| **5** | Residency | Urban area | 43 | 61.4 | 52 | 74.3 |
| | | Rural area | 27 | 38.6 | 18 | 25.7 |
| **6** | Birth order | First | 0 | 0 | 8 | 11.4 |
| | | Second | 28 | 40 | 32 | 45.7 |
| | | Third | 31 | 44.3 | 20 | 28.6 |
| | | Fourth + | 11 | 15.7 | 10 | 14.3 |
| **7** | Weight (Kg) | Underweight | 7 | 10 | 22 | 31.4 |
| | | Normal | 40 | 57.1 | 30 | 42.9 |
| | | Overweight | 23 | 32.9 | 18 | 25.7 |

**Table 2. Comparison between immerse cartoon projection (ICP) and ball squeezing (BS) intervention techniques**

| Pain | Intervention | N | Mean rank | Mann-whitney U | z | Sig. | $r_{rb}$ |
|---|---|---|---|---|---|---|---|
| **Overall Score** | ICP | 70 | 87.77 | 1241.000 | -5.109 | .000 | .49 |
| | BS | 70 | 53.23 | | | | |

**Table 3. Evaluation of overall pain score among children during venipuncture post intervention techniques N (140)**

| Groups | | Immerse Cartoon Projection (ICP) (n=70) | | | Ball Squeezing (BS) (n=70) | | |
|---|---|---|---|---|---|---|---|
| **Pain** | **Score** | | | | | | |
| | | **No** | **%** | **x̃ (IQR)** | **No** | **%** | **x̃ (IQR)** |
| **Overall Score** | **No pain** | 1 | 1.4 | 6.00 (2) | 4 | 5.7 | 3.00 (3) |
| | **Mild** | 10 | 14.3 | | 41 | 58.6 | |
| | **Moderate** | 48 | 68.6 | | 21 | 30 | |
| | **Severe** | 11 | 15.7 | | 4 | 5.7 | |

**Table 4. Relationship between children's sociodemographic variables and effect of immerse cartoon projection technique in reducing pain (n=70)**

| Variables | | Immerse cartoon projection | | | |
|---|---|---|---|---|---|
| | | **Median** | **IQR** | ***Correlation*** | ***P*** |
| **Age (year)** | 3 | 6.00 | 3 | .106 [a] | .381 |
| | 4 | 6.00 | 3 | | |
| | 5 | 5.50 | 9 | | |
| | 6 | 5.00 | 7 | | |
| **Sex** | Male | 6.00 | 8 | .064 [b] | .598 |
| | Female | 6.00 | 8 | | |
| **Previous hospitalization** | Yes | 5.00 | 9 | .226 [b] | .060 |
| | No | 6.00 | 3 | | |
| **Previous IV insertion or venipuncture in last 3 months** | Yes | 5.00 | 9 | .240 [b] | **.046** |
| | No | 6.00 | 3 | | |
| **Residency** | Urban area | 6.00 | 9 | .137 [b] | .258 |
| | Rural area | 5.00 | 7 | | |
| **Birth order** | First | 5.50 | 7 | -.057 [a] | .641 |
| | Second | 6.00 | 8 | | |
| | Third | 4.00 | 5 | | |
| | Fourth + | 6.00 | 9 | | |
| **Weight (Kg)** | Underweight | 5.00 | 3 | -.262 [a] | .028 |
| | Normal | 6.00 | 6 | | |
| | Overweight | 4.00 | 7 | | |

**Table 5. Relationship between children's sociodemographic variables and effect of ball squeezing technique in reducing pain (n=70)**

| Variables | | Ball squeezing | | | |
|---|---|---|---|---|---|
| | | **Median** | **IQR** | ***Correlation*** | ***P*** |
| **Age (year)** | 3 | 4.00 | 5 | -.431 [a] | < 0.001 |
| | 4 | 3.00 | 7 | | |
| | 5 | 3.00 | 4 | | |
| | 6 | 2.00 | 6 | | |
| **Sex** | Male | 3.00 | 7 | .102 [b] | .402 |
| | Female | 3.00 | 6 | | |
| **Previous hospitalization** | Yes | 3.00 | 7 | .055 [b] | .648 |
| | No | 3.00 | 5 | | |
| **Previous IV insertion or venipuncture in last 3 months** | Yes | 3.00 | 7 | .083 [b] | .492 |
| | No | 3.00 | 5 | | |
| **Residency** | Urban area | 3.00 | 7 | .129 [b] | .288 |
| | Rural area | 3.00 | 6 | | |
| **Birth order** | First | 5.00 | 4 | -.302 [a] | .011 |
| | Second | 3.00 | 6 | | |
| | Third | 2.50 | 6 | | |
| | Fourth + | 3.00 | 5 | | |
| **Weight (Kg)** | Underweight | 4.00 | 5 | -.342 [a] | .004 |
| | Normal | 3.00 | 7 | | |
| | Overweight | 2.00 | 6 | | |

## Discussion

### Discussion of socio-demographic characteristics for mothers

The data presented in Table 1 describe the sociodemographic characteristics of the study participants across the two intervention groups. In terms of age, children aged 4 years represented the highest proportion (26.7%), with a mean age of 4±2 years across both groups. This finding aligns with a study evaluating mothers' knowledge regarding non-pharmacological pain management methods for children with sickle cell anemia in the Basra center, which reported that 33.3% of the children were aged 3-5 years (mean=7±3) (21). Conversely, a previous clinical trial conducted in Iraq showed inconsistent findings, reporting that the majority of participants in both the intervention and control groups were within the age range of 6-8 years (22).

n terms of sex distribution, males predominated across groups (57.1% overall), with a majority representation in each condition, though the difference was not statistically significant ($\chi^2$=2.450, *P*=.294). A previous clinical trial concerning the Music Medicine Intervention on children's pain levels during bone marrow aspiration and lumbar puncture procedures reported that 50% of the children were male (23). Similarly, a study using a shot-blocker device to alleviate pain associated with peripheral intravenous cannulation found that the proportion of males was higher than that of females in all three groups (10,24). Our findings differ from those of a study assessing the effects of educational animation in virtual reality on preoperative fear and postoperative pain, which found that the larger percentage of children had no history of previous hospitalization (25). As shown in the demographic table, residency varied significantly. These findings contrast with prior research reporting a predominance of rural residents (66.7%) compared to urban residents (33.3%) (26).

Birth order showed second-borns dominant normal weight prevailed (ICP 57.1%, BS 42.9%) with significant variance ($\chi^2$=10.914, *P*=.028), These findings align with a study xhibited a higher prevalence of second-order children in all group (70%, n=48) (13). Besides, 43.3% of them ranked as the second child (26).

### Discussion evaluation of overall pain score among children during venipuncture post intervention techniques N (140).

Tables 2 and 3 present the overall evaluation of pain scores across all study groups during venipuncture procedures. Findings for the immersive cartoon projection (ICP) group indicated a moderate level of pain, evidenced by a median score of 6.00 (IQR 2) and a high proportion (68.6%) of children reporting moderate pain. In the ball-squeezing (BS) group, more than half (58.6%) of the children experienced mild pain, and 30% experienced moderate pain, with a median score of 3.00 (IQR 3).

The overall findings indicate that lower pain levels were associated with the application of these intervention techniques, shifting pain levels from severe to moderate or mild. Research indicates that three different interventions using audiovisual distraction—virtual reality, animated cartoons, and music videos—can assist in minimizing pain and distracting children during invasive procedures (27).

The findings of the current study may correlate with previous research investigating the effect of the Helfer skin tap technique on reducing pain in infants undergoing immunization. That study revealed that intense pain was experienced by all infants in the control group, with an average FLACC pain scale score of 7.71±0.824, in contrast to those who underwent the Helfer skin tap technique (22).

Moreover, these findings align with research on soothing venipuncture using bubble blowing and ball squeezing, which found that pain ratings in all groups were statistically equal at baseline; however, participants in the bubble-blowing and ball-squeezing groups demonstrated less anxiety, fear, and pain during the procedure (28).

However, these results agree with a previous study which reported that the ShotBlocker group showed significantly lower pain scores than the control group (mean difference -3.17188, P<.001). Conversely, those in the control group showed significantly higher pain scores than those in the ShotBlocker group (mean difference 3.17188, *P*<.001) (29).

### Discussion relationship between children's sociodemographic variables and effect of immerse cartoon projection technique in reducing pain (n=70)

Table 4 demonstrates the relationship between children's sociodemographic variables and the efficacy of Immersive Cartoon Projection (ICP) in reducing venipuncture pain among 70 children. This section examines statistical differences in pain intensity across sex, residency, educational level, and previous admission groups. A noteworthy correlation was discovered between prior venipuncture experience and the effect of

ICP (*P*=.046), indicating that children with prior exposure to venipuncture may respond differently to distraction interventions than those without such experience. A significant negative correlation was also observed between body weight and the effect of ICP (r=-.262, *P*=.028), suggesting that lower body weight may be associated with a more pronounced pain-reducing response to the technique.

In contrast, no significant relationship was found between the effect of ICP and age, sex, residency, or birth order. This lack of association suggests that the analgesic benefit of ICP was relatively consistent across these demographic categories within the present sample. This finding is in line with recent evidence showing that, in terms of previous admission, study results have displayed a statistically significant difference in pain intensity among groups in the control cohort. This suggests that a child's history of admission, regardless of exposure to injection or cannula insertion procedures, can influence pain intensity in either positive or negative ways (30).

This pattern is consistent with literature that indicating the study result show that significant difference between body max index (BMI) and pain intensity in the lidocaine spray group (â=0.113; *P*= .028), also the shot-blocker group , show that significant difference between BMI and pain intensity â= -0.674; *P*= .005 and control group , outcomes illustrate that significant difference between pain intensity and body max index (BMI) (â= -0.374; *P*= .016) (31).

**Discussion relationship between children's sociodemographic variables and effect of ball squeezing technique in reducing pain (n=70)**

Table 5 indicates that the effectiveness of Ball Squeezing (BS) in reducing pain was inversely associated with age, birth order, and weight. The significant negative correlation with age suggests that younger children responded more positively to this tactile distraction technique than older children, a finding potentially explained by developmental differences in attention span, coping mechanisms, and cognitive awareness of the venipuncture procedure. Furthermore, the negative association with birth order may suggest that a child's prior family and social experiences influence their emotional and behavioral responses to invasive procedures.

This finding is consistent with previous evidence suggesting that younger children tend to benefit more from simple distraction methods during painful procedures (15). However, this result differs from findings in a study that reported no statistically significant difference between the groups' median ages ($\chi2$=0.556, *P*=0.968). Similarly, no significant difference in age was observed between groups ($\chi2$=0.022) (32).

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## References

1. Suleman SK, Yahya NB, Nilsson S, Enskär K. Distraction techniques during venipuncture in children. Eur J Pediatr 2024;183:113-22.
2. Corneanu LE, Petriș OR, Lionte C, Sîngeap MS, Coșovanu EO, Grigolo S. Peripheral venipuncture in pediatric patients: A mini-review. J Clin Med 2025;14:6397.
3. Akar A, Şener DK. The Effect of Play Dough Activities Before the Venipuncture Procedure on Pain and Anxiety Level in Children. Balıkesir Sağlık Bilim Derg. 2025;14:164-71.
4. Wong CL, Choi KC. Virtual reality intervention on pediatric pain. JAMA Netw Open 2023;6:e230001.
5. Toros University. The Effect of Virtual Reality Goggles and Stress Ball Used During Intravenous Catheterization on Pain and Fear in Children; 2024.
6. Shawq AH. Effectiveness of Deep Breathing Technique on Pain in Children. Med J Babylon 2024;21:S120-5.
7. Pop-Jordanova N. Children also suffer and feel pain as adults. Contributions 2025;46.
8. Oluc N, Tas Arslan F. Reducing pain and fear during phlebotomy in children. Int Emerg Nurs 2024;72:101386.
9. Ugucu G, Uysal DA, Polat OG, Artuvan Z, Kulcu DP, Aksu D, et al. Cartoon watching and bubble-blowing effects on pain in children. J Pediatr Nurs 2022;65:e107-14.
10. Naser SA, Al-Fayyadh S. Impact of Shot Blocker on Pain in Children. Malaysian J Nurs 2024;16:74-86.
11. Vincenot M, Poisbeau P, Morel-Ferland N, Dumas G, Léonard G. A 5000-year overview of the history of pain through ancient civilizations to modern pain theories. Pain Rep 2025;10:e1241.
12. Ahmed MA, Al-Musawi KM. Effects of buzzy device and distraction cards on pain relief during intravenous cannulation in children: A Randomized Controlled Trial. J Res 2025;22:20.
13. Kareem HJ, Ajil ZW. Z-Track Technique as Pain Management Strategy for Neonates. Malaysian J Nurs 2025;17:113-23.
14. Atefeh S. Barriers and facilitators of pain management in

children: a scoping review. BMC Anesthesiol. 2025;25:148.
15. Yurdakul Z, Esenay FI. Ball squeezing and pain during venipuncture in children. J Pediatr Nurs 2023;72:e201-9.
16. Campbell-Yeo M, MacNeil M, McCord H. Pain in Neonates: Perceptions and current practices. Crit Care Nurs Clin 2024;36:193-210.
17. Melzack R, Wall PD. Pain Mechanisms: A New Theory. Science. 1965;150:971-9.
18. Remi R V, Anantharaj A, Praveen P, Prathibha RS, Sudhir R. Advances in pediatric dentistry: new approaches to pain control and anxiety reduction in children: a narrative review. J Dent Anesth Pain Med 2023;23:303.
19. Rokhtabnak F, Sayad S, Izadi M, Motlagh SD, Rahimzadeh P. Pain control after mastectomy in transgender patients: ultrasound-guided pectoral nerve block II versus conventional intercostal nerve block: a randomized clinical trial. Anesthesiol Pain Med 2021;11:e119440.
20. Martí L, Garriga-Cazorla H, Roman-Juan J, Miró J. Family-Related Factors in Children and Adolescents With Chronic Pain: A Systematic Review. Eur J Pain 2025;29:e70038.
21. Atiyah MA, Hattab WA. Effectiveness of an Educational Program on Nurses' Knowledge and Practice Regarding Standard Precautions for Hemorrhagic Fever. Int J Body Cult 2025;12:120-31.
22. Shakir AW, Al-Mosawi KM. Effect of Helfer skin tap technique on reducing pain in infants undergoing immunization. Adolesc Saude 2025;20:19-33.
23. Khalel M, Shawq AH. Effect of Music Medicine Intervention on Children's Pain Level During Bone Marrow Aspiration and Lumbar Puncture Procedures. Iraqi Natl J Nurs Spec 2024;37:103-11.
24. Neamah A, Ashour QKAK, Karim EAA, Matsher AMK. Self-Esteem, Social Anxiety, and Affective Lability as Predictors of Academic Achievement in Pediatric Nursing Students: A Mediation Analysis. Iran J Psychiatry 2026;21:282-90.
25. Yaz ŞB, Yilmaz HB. The effects of designing an educational animation movie in virtual reality on preoperative fear and postoperative pain in pediatric patients: A randomized controlled trial. J Perianesth Nurs 2022;37:357-64.
26. Sayed YM, Mohamed SA, Abolwafa NF. Assessment of Pain Intensity among Preschool-age Children during Venipuncture. Minia Sci Nurs J 2020;8:56-64.
27. Ramdhanie GG, Nurrohmah A, Mulya AP, Mediani HS, Sumarni N, Mulyana AM, et al. A scoping review of audiovisual distraction techniques among children in reducing invasive procedure pain. J Multidiscip Healthc 2024;17:4363-72.
28. Sarman A, Tuncay S. Soothing venipuncture: Bubble blowing and ball squeezing in reducing anxiety, fear, and pain in children. J Child Adolesc Psychiatr Nurs 2024;37:e12478.
29. Al-Shammary SE, Sadeq AF. The effectiveness of non-pharmacological interventions on reducing intramuscular injection-related pain in adult patients: A randomized controlled trial. Iraqi Natl J Nurs Spec 2024;37:36-49.
30. Hashem HM, Mahmood FM. Effect of Lidocaine Spray on Pain during Intramuscular Injection. Kufa J Nurs Sci 2024;14:148–56.
31. Birnie KA, Noel M, Parker JA, Chambers CT, Uman LS, Kisely SR, et al. Systematic review and meta-analysis of distraction and hypnosis for needle-related pain and distress in children and adolescents. J Pediatr Psychol 2014;39:783-808.
32. Naser SA, Al-Fayyadh SA. Efficacy of Shot-Blocker in Alleviating Peripheral Intravenous Cannulation Associated Pain among Hospitalized School-Aged Children. Iraqi Natl J Nurs Spec 2025;38:38-51.