

<https://doi.org/10.33472/AFJBS.6.11.2024.579-587>



African Journal of Biological Sciences

Journal homepage: <http://www.afjbs.com>



Research Paper

Open Access

## A STUDY TO ASSESS THE EFFECTIVENESS OF WEARING VIRTUAL REALITY DURING IV TREATMENT IN REDUCING ANXIETY AND PAIN PERCEPTION AMONG SCHOOL GOING CHILDREN SELECTED HOSPITAL AT, NADIAD CITY.

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### Article Info

Volume 6, Issue 11, July 2024

Received: 22 May 2024

Accepted: 19 June 2024

Published: 08 July 2024

*doi:* [10.33472/AFJBS.6.11.2024.579-587](https://doi.org/10.33472/AFJBS.6.11.2024.579-587)

### ABSTRACT:

**Background:** The integration of digital therapeutics, such as virtual reality (VR) systems, into pediatric healthcare can indeed have a significant impact on managing pain and anxiety associated with medical procedures. **The Aim:** To determine the effectiveness of VR in reducing anxiety and pain during IV treatment among school going children selected hospital at, Nadiad city **Methods:** This true experimental study was conducted at the selected hospital at, Nadiad city. The computer assisted simple random sampling technique was used to select 60 school going children. The sample of children (n= 60) was case group (n=30) and the control group (n=30). Hamilton anxiety scale was used to assess the anxiety level during IV treatment in school going children. Face pain scale was used to assess the pain level during IV treatment in school going children. **Results:** Anxiety and pain were significantly lower in the case group. In the case group, 30% of children reported mild anxiety, 26.7% moderate, 33.3% severe, and 10% very severe. In the control group, 0% had mild anxiety, 6.7% moderate, 20% severe, and 73.3% very severe. Regarding pain, 66.7% of children in the case group reported mild pain, 33.3% moderate, and none severe. In contrast, the control group had 3.3% with mild pain, 56.7% moderate, and 40% severe. This shows that the case group experienced significantly less moderate and severe pain compared to the control group. **Conclusion:** In this study virtual reality intervention can effectively reduce the anxiety and pain during IV treatment in school going children.

**Keywords:** Anxiety, pain, Virtual reality, IV, School going children.

## 1. INTRODUCTION

Pain is described as a subjective experience, meaning it varies from person to person and can be influenced by multiple factors. This subjectivity implies that individuals may perceive and experience pain differently based on various factors such as physiological, psychological, social, cultural, and even genetic differences. The perception of pain is influenced by a variety of factors including physiological (e.g., nerve sensitivity), psychological (e.g., emotions, cognitive processes), social (e.g., cultural norms, social support), and genetic factors. These factors interact in complex ways to shape an individual's experience of pain. The perception of pain can be heightened when a child is consciously attentive to the environment in which the pain occurs. This implies that factors such as focus, awareness, and cognitive processes play a role in shaping the experience of pain. Negative thoughts and emotions related to pain, anxiety, and fear can amplify the perception of pain, making it a more distressing experience for the individual. <sup>[1]</sup>

Integrating digital therapeutics, such as virtual reality systems, into healthcare can offer significant benefits, especially for young patients undergoing painful medical procedures. Incorporating digital therapeutics like VR into the management of pain and anxiety associated with medical procedures has the potential to revolutionize pediatric healthcare, leading to better adherence to treatment regimens and ultimately improving the long-term health outcomes of young patients. <sup>[2]</sup> Virtual reality (VR) has been increasingly recognized as an effective distraction technique during various painful clinical procedures, particularly those involving needles such as vaccinations, blood draws, or medication administration. <sup>[3]</sup>

VR allows individuals to immerse themselves in a virtual environment, which serves as a distraction from the procedure itself. The passage outlines different tools used for VR implementation, including personal computer screens, mobile devices, and head-mounted visors, which provide immersive experiences. <sup>[4]</sup>

Integrating VR into IV medication procedures for pediatric patients can enhance the patient experience, improve pain management, reduce anxiety, and promote better overall outcomes. It offers a safe, non-invasive, and effective adjunctive therapy that complements traditional approaches to pediatric pain management and enhances the quality of care provided to young patients. <sup>[5]</sup> By examining the effectiveness of VR distraction in reducing pain perception and fear during IV medication procedures in children with hospitalization, this study could provide valuable insights into the potential benefits of integrating VR technology into pediatric care to improve patient experiences and outcomes. <sup>[6]</sup>

## 2. METHODS

This true experimental study was conducted after institutional ethical committee approval. Hamilton anxiety scale was used to assess the anxiety level during IV treatment in school going children and Face pain scale was used to assess the pain level during IV treatment in school going children. by computer assisted simple random sampling technique. Written inform consent from all participant. For Hamilton anxiety scale regarding assess anxiety level during iv treatment, the total minimum score is 0 and total maximum score is 56. The score and category were calculated as 0-17 indicate mild anxiety, 18-24 indicate moderate anxiety, 25-30 indicated sever anxiety and 31-56 very sever anxiety indicate. For Wong bakers face pain scale regarding assess pain level during IV treatment, the total minimum score is 0 and total maximum score is 10. The score and category were calculated as 0 indicate no pain and 1-3 indicate mild pain, 4-5 indicated moderate pain,7-9 indicated sever pain and 10 indicated worst pain. The school going children were included 6-12 year from Dr. N.D desai hospital, Nadiad. Data of pain and anxiety were distributed in percentage based on age, gender, family

monthly income, place of residence, religion, program of study, having previous history of organ donation in family. The association between anxiety and pain perceived by school-going children during IV treatment in the control group and their selected demographic variables.

### Ethical consideration:

Ethical approval for the present study was obtained from institution Ethics committee for Human Research of Maganbhai Adenwala Mahagujarat University, Nadiad.

(Approval No: MAM Uni / IECHR/320 / 2023) (Ref. No: IEC-MAM Uni /2023-24)

### 3. RESULT

**Table 1: Frequency and percentage distribution of demographic variables of school going children in control group and case group**  
N=60

S.N.	Demographic variable	Case Group	Control Group
		Frequency (Percentage)	Frequency (Percentage)
1.	Age of the child		
	a) 6 to 8 year	9 (30%)	9 (30%)
	b) 8 to 10 year	11 (36.7%)	12 (40%)
	c) 10 to 12 year	10 (33.3%)	9 (30%)
2.	Gender		
	a) Male	15 (50%)	13 (43.3%)
	b) Female	15 (50%)	17 (56.7%)
3.	Number of siblings		
	a) One	12 (40%)	11 (36.7%)
	b) Two	12 (40%)	13 (43.3%)
	c) Three or more	6 (20%)	6 (20%)
4.	Types of family		
	a) Nuclear	17 (56.7%)	14 (46.7%)
	b) Joint	13 (43.3%)	16 (53.3%)
5.	Religion		
	a) Hindu	12 (40%)	12 (40%)
	b) Muslim	11 (36.7%)	13 (43.3%)
	c) Christian	7 (23.3%)	5 (16.7%)
6.	Education of father		
	a) Illiterate	8 (26.7%)	5 (16.7%)
	b) Primary	12 (40%)	14 (46.7%)
	c) Secondary	7 (23.3%)	9 (30%)
	d) Graduation	3 (10%)	2 (6.7%)
7.	Education of mother		
	a) Illiterate	12 (40%)	12 (40%)
	b) Primary	13 (43.3%)	14 (46.7%)
	c) Secondary	5 (16.7%)	4 (13.3%)
8	Previous experience of IV		
	a) No	2 (6.7%)	5 (16.7%)
	b) Within a week	12 (40%)	13 (43.3%)
	c) Two week back	11 (36.7%)	11 (36.7%)
	d) More than two week	5 (16.7%)	1 (3.3%)

9	Site of IV treatment		
	a) a) Dorsum of hand	15 (50%)	13 (43.3%)
	b) b) Wrist ( radial)	13 (43.3%)	16 (53.3%)
	c) c) Ankle	2 (6.7%)	1 (3.3%)
10	Any pain relief measure before IV treatment?		
	a) Yes	6 (20%)	4 (13.3%)
	b) No	24 (80%)	26 (86.7%)
11	Child receiving IV treatment during procedure of VR		
	a) IV infusion with push of normal saline	12 (40%)	13 (43.3%)
	b) IV injection in priorly insert IV cannula	18 (60%)	17 (56.7%)
12	Pulse of the child		
	a) 90-100	14 (47%)	5 (17%)
	b) 101-110	5 (17%)	2 (7%)
	c) 111-120	7 (23%)	2 (7%)
	d) 121-130	4 (13%)	14 (47%)
	e) 131-140	0 (0%)	7 (23%)
13	Weight of the child		
	a) a) 23-25	2 (7%)	0 (0%)
	b) 26-28	6 (20%)	11 (37%)
	b) c) 29-31	16 (53%)	17 (57%)
	c) d) 32-34	7 (23%)	2 (7%)
14	Respiration of the child		
	a) a) 16	15 (50%)	10 (33.3%)
	b) b) 18	12 (40%)	13 (43.3%)
	c) c) 22	3 (10%)	7 (23.3%)

**Table no.2 Comparison between control group and case group regarding anxiety and pain on wearing of virtual reality during IV treatment of school going children in selected hospital at, Nadiad City**

Comparison between Case and Control group		Mean Score	Independent Samples Test			
			Mean Difference	t- Value	df	Sig.
Level of Anxiety	Case group	23.50	8.93	<b>6.51</b>	58	<b>.000 S</b>
	Control Group	32.43				
Level of Pain	Case group	3.0	2.23	<b>10.77</b>	58	<b>.000 S</b>
	Control Group	5.23				

The mean difference between the case and control groups for anxiety is 8.93. The independent samples t-test yields a t-value of 6.51 with 58 degrees of freedom, indicating a statistically significant difference ( $p < .001$ ) in anxiety levels between the case and control groups. The mean difference between the case and control groups for pain is 2.23. The independent samples t-test yields a t-value of 10.77 with 58 degrees of freedom, indicating a statistically significant difference ( $p < .001$ ) in pain levels between the case and control groups. These

findings suggest that the use of virtual reality during IV treatment is associated with lower levels of anxiety and pain among school-going children, as evidenced by significantly lower mean scores in the case group compared to the control group.

**Table no.3 Association of level of anxiety perceived by the school going children during IV treatment in the control group with their selected demographic variables.**

Demographic variable	Level of Anxiety			$\chi^2$ Value	P-Value
	Moderate	Severe	Very Severe		
Age of the child					
a) 6 to 8 year	1	3	5	<b>3.131</b>	P>0.05
b) 8 to 10 year	1	1	10	df= 4	
c) 10 to 12 year	0	2	7	NS	
Gender					
a) Male	1	3	9	<b>0.197</b>	P>0.05
b) Female	1	3	13	df= 2	
c) Transgender	0	0	0	NS	
Number of siblings					
a) Nil	2	0	0	<b>7.116</b>	P>0.05
b) One	0	0	9	df= 4	
c) Two	0	4	9	NS	
d) Three or more	2	2	4		
Types of family					
a) Nuclear	1	2	11	<b>0.536</b>	P>0.05
b) Joint	1	4	11	df= 2	
c) Extended	0	0	0	NS	
Religion					
a) Hindu	2	1	9	<b>5.027</b>	P>0.05
b) Muslim	0	3	10	df= 4	
c) Christian	0	2	3	NS	
d) Others	0	0	0		
Education of father					
a) Illiterate	0	1	4	<b>3.646</b>	P>0.05
b) Primary	2	2	10	df= 4	
c) Secondary	0	2	7	NS	
d) Graduation	0	1	1		
e) Other	0	0	0		
Education of mother					
a) Illiterate	1	2	9	<b>0.465</b>	P>0.05
b) Primary	1	3	10	df= 4	
c) Secondary	0	1	3	NS	
d) Graduation	0	0	0		
e) Other	0	0	0		
Previous experience of IV					
a) No	0	0	5	<b>8.493</b>	P>0.05
b) Within a week	2	2	9	df= 6	
c) Two week back	0	3	8	NS	
d) More than two week	0	1	0		

Site of IV treatment d) a) Dorsum of hand e) b) Wrist ( radial) f) c) Ankle	1 1 0	2 4 0	10 11 1	<b>0.795</b> df= 4 <b>NS</b>	P>0.05
Any pain relief measure before IV treatment? a) Yes b) No	0 2	1 5	3 19	<b>0.367</b> df= 2 <b>NS</b>	P>0.05
Child receiving IV treatment during procedure of VR a) IV infusion with push of normal saline b) IV injection in priorly insert IV cannula	1 1	1 5	11 11	<b>2.172</b> df= 2 <b>NS</b>	P>0.05
Pulse of the child a) a) 90-100 b) b) 101-110 c) c) 111-120 d) d) 121-130 e) e) 131-140	0 0 0 2 0	2 0 0 3 1	3 1 1 9 6	<b>6.859</b> df= 8 <b>NS</b>	P>0.05
Weight of the child d) a) 23-25 e) b) 26-28 f) c) 29-31 g) d) 32-34	0 2 0 0	0 3 3 0	0 6 14 2	<b>14.03</b> df= 4 <b>S</b>	<b>P&lt;0.05</b>
Respiration of the child d) a) 16 e) b) 18 f) c) 22	0 2 0	2 2 2	8 9 5	<b>6.859</b> df= 4 <b>NS</b>	P>0.05

**Table no.4 Association of level of Pain perceived by the school going children during IV treatment in the control group with their selected demographic variables.**

Demographic variable	Level of Pain			$\chi^2$ Value	P-Value
	Mild	Moderate	Severe		
Age of the child a) 6 to 8 year b) 8 to 10 year c) 10 to 12 year	1 0 0	5 6 6	3 6 3	<b>3.088</b> df= 4 <b>NS</b>	P>0.05
Gender a) Male b) Female c) Transgender	1 0 0	6 11 0	6 6 0	<b>1.972</b> df= 2 <b>NS</b>	P>0.05
Number of siblings a) Nil b) One c) Two d) Three or more	0 1 0 0	0 5 8 4	0 5 5 2	<b>2.288</b> df= 4 <b>NS</b>	P>0.05

Types of family						
a) Nuclear	1	7	6	<b>1.402</b>	P>0.05	
b) Joint	0	10	6	df= 2		
c) Extended	0	0	0	<b>NS</b>		
Religion						
a) Hindu	1	5	6	<b>6.075</b>	P>0.05	
b) Muslim	0	7	6	df= 4		
c) Christian	0	5	0	<b>NS</b>		
d) Others	0	0	0			
Education of father						
a) Illiterate	0	3	2	<b>3.458</b>	P>0.05	
b) Primary	1	6	7			df= 6
c) Secondary	0	7	7			<b>NS</b>
d) Graduation	0	1	2			
e) Other	0	0	1			
Education of mother						
a) Illiterate	1	5	6	<b>3.403</b>	P>0.05	
b) Primary	0	10	4			df= 4
c) Secondary	0	2	2			<b>NS</b>
d) Graduation	0	0	0			
e) Other	0	0	0			
Previous experience of IV						
a) No	0	0	5	<b>10.796</b>	P>0.05	
b) Within a week	1	9	3			df= 6
c) Two week back	0	7	4			<b>NS</b>
d) More than two week	0	1	0			
Site of IV treatment						
g) a) Dorsum of hand	1	7	5	<b>2.122</b>	P>0.05	
h) b) Wrist ( radial)	0	9	7			df= 4
i) c) Ankle	0	1	0			<b>NS</b>
Any pain relief measure before IV treatment?						
a) Yes	0	2	2	<b>1.305</b>	P>0.05	
b) No	1	15	10			<b>NS</b>
Child receiving IV treatment during procedure of VR						
a) IV infusion with push of normal saline	1	7	5	<b>1.353</b>	P>0.05	
b) IV injection in priorly insert IV cannula	0	10	7			<b>NS</b>
Pulse of the child						
f) a) 90-100	0	5	0	<b>13.93</b>	P>0.05	
g) b) 101-110	0	1	1			df= 8
h) c) 111-120	0	2	0			<b>NS</b>
i) d) 121-130	1	6	7			
j) e) 131-140	0	1	6			

Weight of the child					
h) a) 23-25	0	0	0	<b>9.711</b> <b>df= 4</b> <b>S</b>	<b>P&lt;0.05</b>
i) b) 26-28	1	1	3		
j) c) 29-31	0	9	8		
k) d) 32-34	0	1	1		
Respiration of the child					
b) a) 16	0	7	3	<b>4.906</b> <b>df= 4</b> <b>NS</b>	<b>P&gt;0.05</b>
c) b) 18	1	8	4		
d) c) 22	0	2	5		

#### 4. DISCUSSION

Barbara Atzori, Laura Vagnoli, and their colleagues' study on the effectiveness of virtual reality (VR) analgesia for children and adolescents undergoing venipuncture with your own study. It's promising to see similar results between the two studies, particularly regarding the effectiveness of VR in reducing both pain intensity and pain unpleasantness during medical procedures. This consistency in findings across studies can lend more credibility to the effectiveness of VR as a tool for managing pain in pediatric patients undergoing medical procedures [7]. It's interesting to note that the systematic review conducted by Kevin M. Malloy and Leonard S. Milling found that virtual reality (VR) distraction was effective for reducing experimental pain and discomfort associated with burn injury care, which aligns with the findings of your study on VR analgesia for children and adolescents undergoing venipuncture. However, they also found that studies of needle-related pain provided less consistent findings. This discrepancy could be due to various factors such as differences in study methodologies, patient populations, or the specific VR interventions used. This study suggested that aligns with the current finding of our study [8]. Cho Lee Wong, Miranda Mei Wa Lui, and their colleagues is aiming to investigate the effects of immersive virtual reality (IVR) intervention on pain and anxiety among pediatric patients undergoing venipuncture, which aligns closely with the focus of your study. Conducting a randomized controlled trial with repeated assessments provides a robust method for evaluating the effectiveness of the IVR intervention compared to standard care. Recruiting 200 pediatric patients aged 4–12 years and randomly assigning them to either the intervention or control group allows for a sufficient sample size to draw meaningful conclusions. Additionally, assessing outcomes at multiple time points, including before, during, and after the procedure, provides a comprehensive understanding of the intervention's effects over time. The inclusion of intention-to-treat analysis and generalized estimating equation models for data analysis enhances the rigor of the study and helps account for potential confounding variables and the longitudinal nature of the data [9]. Overall, this study protocol seems well-designed and has the potential to contribute valuable insights into the effectiveness and cost-effectiveness of IVR intervention for managing pain and anxiety in pediatric patients undergoing venipuncture, further supporting the findings of your own study.

#### 5. CONCLUSION

According to findings of this study, showing virtual reality during iv treatment, has a positive effect on reducing anxiety and pain for school going children. This conclusion was made based on the 't' test value which was found to be highly significant.

**Limitaion:** Since the study focuses only on 60 school going children from selected hospital of Nadiad city Findings from a study conducted in a specific geographic location like Nadiad city may not generalize to other regions with different healthcare practices, cultural norms, or



socio-economic factors. The study may primarily focus on short-term outcomes (e.g., immediate reductions in anxiety and pain perception during IV treatment) and may not capture the longer-term effects or implications of using VR in this context.

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