The Efficacy of Virtual Reality for Managing Pediatric Pain and Anxiety During Intravenous Starts

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Introduction

Virtual reality (VR) is a state-of-the-art technology with wide-ranging clinical application that has demonstrated increasing utilization and efficacy in addressing perceptions of pain (Malloy & Milling, 2010).

- Pediatric patients often undergo intravenous (IV) placement to administer medications, which can cause pain, distress and development of needle-phobias (Kennedy et al., 2008).
- In the pediatric population, VR has been used for pain management in cancer, neurorehabilitation, burns, and IV insertion (Chirico et al., 2015; Wang & Reid, 2011; Das et al., 2005; Gold et al., 2006).
- While many studies have supported the effectiveness of VR to manage pain, much of this research has been investigated through case studies, or studies with smaller sample sizes.
- The present randomized-controlled trial examines whether virtual reality is an effective tool to reduce pediatric pain and anxiety during IV placement.

Procedures and Measures

Participants in this study were randomly assigned to one of two conditions for their IV start procedure.

1. **Standard of care (SOC)**: SOC procedures consisted of a nurse applying a tourniquet to the arm, selecting a vein, cleaning the skin, and placing the IV
2. **SOC plus VR intervention**: Patients played BearBlast (appliedVR™) on the Samsung Gear VR goggles (ages 13-21) or the Google Merge VR goggles (ages 10-12)

Patients and their caregivers completed standardized self-report measures of pain and anxiety before and after the IV start procedure.

1. Pain: Pain was measured using a Visual Analogue Scale, with a scale ranging from 0-10 (no pain to worst/most pain)
2. Anxiety: Anxiety was measured using a Visual Analogue Scale, with a scale ranging from 0-10 (no anxiety to worst/most anxiety)

Statistical analyses included independent samples T-tests to compare differences between pain and anxiety in SOC and VR as reported by patients and caregivers.

Pre-procedure levels of pain and anxiety were not controlled for because there were no statistically significant differences in reported pain and anxiety between the SOC and VR groups.

Results

Table 1. Participant Demographics

	SOC (N = 41) n (%)	VR (N = 39) n (%)
Age in years, **M** (SD)	**14.15** (2.19)	**14.02** (2.14)
Boys	**24** (58.5%)	**24** (61.5%)
Hispanic/Latino	**16** (39.0%)	**15** (38.5%)
White/Non-Hispanic	**10** (24.4%)	**10** (25.6%)
African American	**4** (9.8%)	**2** (5.1%)
Asian/Pacific Islander	**5** (12.2%)	**1** (2.6%)
Multi-racial	**4** (9.7%)	**6** (15.4%)
Other/Unknown	**2** (4.9%)	**5** (12.8%)

Recruitment Location

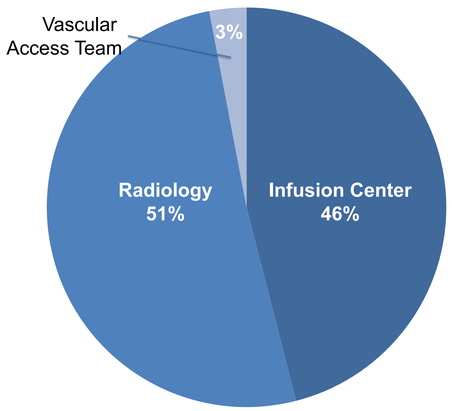

Table 2. Descriptive Statistics

	Standard of Care		Virtual Reality	
	Mean (Standard Deviation)	95% Confidence Interval	**Mean** (Standard Deviation)	95% Confidence Interval
Patient-report pain	**2.56** (2.08)	2.01, 3.36	**1.58** (1.75)	1.07, 2.33
Patient-report anxiety	**3.44** (2.84)	2.39, 4.05	**2.00** (2.26)	1.24, 2.49
Caregiver-report pain	**2.50** (2.79)	1.58, 3.41	**1.19** (1.55)	.70, 1.82
Caregiver-report anxiety	**3.30** (3.27)	2.23, 4.40	**2.55** (2.40)	1.70, 3.40

Table 3. Independent Samples t-tests – SOC versus VR

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Patient-report pain	Equal variances assumed	3.147	.080	2.229	74	.029
	Equal variances not assumed			2.249	73.689	.027
Patient-report anxiety	Equal variances assumed	3.582	.062	2.462	76	.016
	Equal variances not assumed			2.490	74.870	.015
Caregiver-report pain	Equal variances assumed	13.817	.000	2.437	71	.017
	Equal variances not assumed			2.491	58.842	.016
Caregiver-report anxiety	Equal variances assumed	5.721	.019	1.099	71	.275
	Equal variances not assumed			1.132	70.098	.262

Conclusions

Patients who played VR reported significantly lower pain (M = 1.58, 95% CI [1.07, 2.33], p = .029) and anxiety (M = 2.00, 95% CI [1.24, 2.49], p = .016) as compared to those in the SOC group.

Caregivers of patients in the VR group reported statistically lower pain (M = 1.19, 95% CI [0.70, 1.82], p = .017) as compared to caregivers of patients in the SOC group. Caregivers did not report any differences in anxiety based on group participation.

Results demonstrate that VR is an innovative and effective tool to reduce pediatric pain and anxiety during IV placement in multiple clinic settings.

Managing pain and distress in pediatric patients who commonly undergo IV insertion is crucial to improve overall patient experience and health outcomes.

Future research is necessary to explore the efficacy of VR for pain management during a variety of painful and distressing routine procedures.

"My thought[s] are that the VR was very helpful in the procedure"
-Participant

"It was great, would definitely benefit people with anxiety."
-Participant

"Went better than expected"
-Caregiver

"I didn't think it would go as well as it did. It really help[ed]."
-Caregiver

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