RESEARCH ARTICLE

Effect of flippits versus virtual reality on pain, fear, and satisfaction during phlebotomy among children

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Abstract

Objective: To determine the effect of flippits versus virtual reality on pain, fear and satisfaction among children during phlebotomy**.**

Method: The quasi-experiential study was conducted at the Paediatric Medical Department of Kafrelsheikh University Hospital, Egypt, from November 2021 to April 2022, and comprised children of either gender aged 6-12 years. The subjects were randomised into flippits group A, virtual reality group B and control group C in which only traditional care was provided. Data was collected using a structured interview, Wong-Baker Faces Pain Rating Scale, Children's Fear Scale, and Blood Specimen Collection Satisfaction Evaluation Scale. Data was analysed using SPSS 20.

Results: Of the 120 children, 40(33.3%) were in each of the three groups. There were 21(52.5%) boys and 19(47.5%) girls in group A with mean age 8.2±1.6 years, 22(55%) boys and 18(45%) girls in group B with mean age 7.8±1.7 years, and 27(67.5%) boys and 13(32.5%) girls in group C with mean age 7.9±1.9 years ($p>0.05$). Mean pain and fear scores were significantly lower and mean satisfaction score was higher in groups A and B than group C ($p<0.05$). There was no significant difference in the mean pain scores of group A and group B ($p>0.05$).

Conclusion: Flippits and virtual reality interventions had a positive effect on pain, fear and satisfaction levels in children during phlebotomy.

Keywords: Phlebotomy**,** Pain, Fippits, Fear, Children. **DOI: 10.47391/JPMA.EGY-S4-43**

Introduction

According to the International Association for the Study of Pain (IASP), pain is an unpleasant sensory and emotional experience deriving from any part of the body associated with actual or potential tissue damage.[1] Paediatric patients are often undergoing invasive medical procedures that are done by needle punctures, such as phlebotomy, intramuscular (IM) injection and intravenous (IV) catheterisation. These procedures are considered most stressful for children and not only the main source of pain, but also fear, anxiety and stress, and may have a negative impact on the treatment course.[2]

The negative experience may cause long-term problems, such as fear of injections, which can extend from children to adulthood. So, children undergoing these procedures need appropriate intervention to lessen its negative physical and emotional effects.[3]

All health personnel, especially nurses, have the responsibility of enriching their knowledge with up-to-date and age-appropriate methods of managing these painful procedures.[4] An inexpensive, easy-to-use and rapid-action method is recommended for relieving pain-related procedural and patient anxiety in medical settings.[5] Management of pain and fear includes both nonpharmacological and pharmacological methods.[6]

The most commonly used methods for acute pain treatment are pharmacological methods, such as the administration of local anaesthetics like lidocaine 2.5%. Non-pharmacological methods include all techniques used for pain management without medication.[7] An example of non-pharmacological method that is simple and effective during phlebotomy is flippits, or distraction cards (DCs) That have numerous hidden images and patterns that used to divert the attention of children from pain and anxiety. Several studies have reported that DCs caused distraction for children during medical procedures which in turn reduced their perceived pain and anxiety.[8,6]

In addition, virtual reality (VR) glasses have also been considered a simple influencing method of pain-relief during phlebotomy which resulted in better adaptation and treatment compliance.[9] VR glasses are eyewear that function as display devices which create a virtual environment through an artificial interface which provides the users a totally immersed interaction. Through using of VR glasses, multiple senses of the user are integrated, such as visual, auditory and kinesthetic modalities. Besides, it is suitable for different age groups and is used easily in paediatric care units as it can be connected to mobile

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phones.[10] Although some systematic reviews and meta-analyses addressed the efficiency of VR on pain, few have tested its impact on anxiety, therefore, more research is needed to cover the research gap.[11] The current study was planned to fill the gap by assessing the effect of flippits and VR on pain, fear and satisfaction among children during phlebotomy. It was hypothesised the DCs and VR will both be effective.

Subjects and Methods

The quasi-experiential study was conducted at the Paediatric Medical Department of Kafrelsheikh University Hospital, Egypt, from November 2021 to April 2022. After approval from the institutional ethics review committee, the sample size was calculated on the basis of earlier data, [(6)] taking into account a threshold of 5% significance and 80% power, and using the equation.[12]

$$n = \frac{(Z\alpha/2 + Z\beta)^2 \times 2(SD)^2}{(d^2)}$$

In the equation, SD was the standard deviation, $Z_{\alpha/2}$ value was 1.96 for 5%m Z_{β} was 0.84 for 80%, and d was the expected mean difference. Hence,

$$n = \frac{(1.96 + 0.84)^2 \times 2(2.0)^2}{(1.26)^2} = 39.5$$

The sample was raised using purposive sampling technique. Those included were children of either gender aged 6-12 years with no delays in cognitive development and who were due to undergo blood testing during hospitalisation. Those excluded were children who had earlier experienced flippits or VR interventions, or were medically unstable, or had any congenital anomaly, hearing or vision impairment, or had taken an analgesic in the preceding 6 hours.

After taking informed verbal consent from the mothers of all the participants, the subjects were randomised into flippits group A, VR group B and control group C in which only traditional care was provided.

Data was collected using a structured interview, Wong-Baker Faces Pain Rating Scale (WBFPS), Children's Fear Scale (CFS), and Blood Specimen Collection Satisfaction Evaluation Scale (BSCSES).

The interview questionnaire was self-developed to gather sociodemographic data for children in the light of literature,[13] covering gender, age, height, weight, diagnosis and information regarding prior vein puncture. Cronbach's alpha coefficient of the tool was 0.83.

The WBFPS assesses the pain level among children.[14] The children were instructed to describe their level of pain by drawing a circle around the represented face on the scale, after which it was numerically expressed (Figure 1). Cronbach's alpha reliability value was 0.96.

The CFS[15] was utilised to assess the children's varying degrees of fear. It consists of 5 animated faces, indicating varying levels of fear from Face 0 = not scared at all to Face 4 = the most scared. Children were instructed to circle the face that would represent how scared they felt before and during the phlebotomy, which was afterward quantified. Cronbach's alpha reliability value was 0.87.

The BSCSES was used to measure the satisfaction level of children and their mothers during the procedure.[13] It was scored from unsatisfactory = 0 to very satisfactory =2. Five experts in the paediatric nursing field evaluated the content validity of the tool, and the needed corrections were incorporated. A pilot study on 12 randomly selected children who were not part of the main study was conducted to assess the clarity, feasibility and applicability of the tool. Any necessary modifications were done accordingly.

During the preparatory phase of the study, the researchers prepared the VR device and three-dimensional (3D) MP4 audio-visual files for different cartoon series such as 'Tom and Jerry' and 'Snowwhite'. Also prepared were 9-inch-wide and 12-inch-long visual cards with the cartoon characters. Medical records of children were used to make a list of those who were undergoing a blood sample procedure, and face-to-face structured interviews lasting 5 minutes were conducted with the children. After the randomisation of the subjects, two volunteer nurses were trained for the purpose; 1 served as an observer, and 1 took the blood samples between 9am and 10am on the first try at the antecubital site using a 22G needle and 5ml injector.

In the flippits group A, DCs were shown before and during the procedure. While flipping the cards during phlebotomy, communication was ensured with the children who were encouraged to share stories about that cartoon character.

In the VR group B, the tell-show-do technique was adopted. Explanations on how to use a headset in VR according to the child's level of understanding (tell) were given while simultaneously showing them the way of selecting and displaying the cartoon movie (show), and then the children were allowed to apply it (do) themselves.

Once the VR device headset was adapted to the child's

head size and adjusted to his eyes, the selected cartoon movie was played before and throughout the procedure. After ensuring that the child was fully immersed in the cartoon movie, a needle blood sample was injected after a brief explanation. After each child, the used VR glasses were properly cleaned with 70% isopropyl alcohol.

In control group C, the children got traditional interventions, such as verbal diversion, an explanation of the procedure, and psychological support.

The children's pain, fear, and satisfaction levels were evaluated using reports from the mothers, the children, the researchers, and the observers nurse (Figure 2).

Data was analysed using SPSS 20. Continuous data was normally distributed and was expressed as mean ± standard deviation (SD). Categorical data was expressed as frequencies and percentages. One-way analysis of variance (ANOVA) test was used for comparison among more than two continuous variables, while independent sample t-test was used for comparison between two continuous variables. Chi-square test was used for the comparison of categorical variables. P<0.05 was considered statistically significant.

Results

Of the 120 children, 40(33.3%) were in each of the three groups (Figure 3). There were 21(52.5%) boys and 19(47.5%) girls in group A with mean age 8.2±1.6 years, 22(55%) boys and 18(45%) girls in group B with mean age 7.8±1.7 years, and 27(67.5%) boys and 13(32.5%) girls in group C with mean age 7.9±1.9 years). Age, weight, gender and height were not significantly different among the groups (Table 1). There was highly significant differences among the groups regarding the children's mean pain scores (Table 2; Figure 4).

As for the fear among the children, there was highly significant differences in the 3 groups, as noted by the subjects, their mothers, researchers and the observing nurse (Table 3).

Children and their mothers in groups A and B were more satisfied than those in the control group (Table 4; Figures 5-6).

Table-1: Clinical and demographic characteristics.

	Control n (%)	Virtual Reality n (%)	Flippits n (%)	Chi-Square X^2	*p-value*
Age (Years)					
6 to less than 8	19 (47.5)	19 (47.5)	16 (40.0)		
8 to less than 10	13 (32.5)	14 (35.0)	15 (37.5)		
10 or More	8 (20.0)	7 (17.5)	9 (22.5)	1.179	0.881
Mean ±SD	7.9 ±1.9	7.8 ±1.7	8.2 ±1.6	0.667	0.515
Gender					
Male	27 (67.5)	22 (55.0)	21 (52.5)		
Female	13 (32.5)	18 (45.0)	19 (47.5)	2.126	0.345
Weight (kg)					
15 to less than 20	16 (40.0)	9 (22.5)	12 (30.0)		
20 to less than 25	11 (27.5)	12 (30.0)	11 (27.5)		
25 to less than 30	8 (20.0)	11 (27.5)	10 (25.0)		
30 or More	5 (12.5)	8 (20.0)	7 (17.5)	3.242	0.778
Height (cm)					
110 to less than 120	19 (47.5)	13 (32.5)	17 (42.5)		
120 to less than 130	16 (40.0)	13 (32.5)	11 (27.5)		
130 or More	5 (12.5)	14 (35.0)	12 (30.0)	6.415	0.170
Diagnosis					
Gastroenteritis	5 (12.5)	11 (27.5)	12 (30.0)		
Pneumonia	12 (30.0)	13 (32.5)	15 (37.5)		
Asthma	9 (22.5)	10 (25.0)	6 (15.0)		
Bronchitis	7 (17.5)	3 (7.5)	3 (7.5)		
Favism	7 (17.5)	3 (7.5)	4 (10.0)	8.780	0.361
Previous vein puncture					
Yes	31 (77.5)	35 (87.5)	33 (82.5)	1.385	
No	9 (22.5)	5 (12.5)	7 (17.5)		0.500

SD: Standard deviation.

Table-2: Mean pain scores.

	Control	Virtual Reality	Flippits	ANOVA Test		Student's T-Test		
	Mean ±SD	Mean ±SD	Mean ±SD	F	P	Control vs VR	Control vs Flippits	VR vs Flippits
Child's reports	7.0 ±2.1	0.8 ±0.3	0.8 ±0.4	329.957	<0.001**	T=18.347, P<0.001**	T=18.272, P<0.001**	T=0.118, P=0.905
Mother's reports	7.1 ±1.9	0.7 ±0.2	0.7 ±0.1	447.650	<0.001**	T=20.879, P<0.001**	T=21.053, P<0.001**	T=0.523, P=0.602
Researchers' reports	7.3 ±2.2	0.6 ±0.2	0.7 ±0.3	355.975	<0.001**	T=18.542, P<0.001**	T=18.986, P<0.001**	T=1.886, P=0.062
Nurses' reports	7.1 ±2.1	0.6 ±0.3	0.6 ±0.2	372.246	<0.001**	T=19.040, P<0.001**	T=19.109, P<0.001**	T=0.166, P=0.868

VR: Virtual reality, SD: Standard deviation, ANOVA: Analysis of variance.

Table-3: Mean fear scores.

	Control	Virtual Reality	Flippits	ANOVA Test				Student's T-Test
	Mean ±SD	Mean ±SD	Mean ±SD	F	P	Control vs VR	Control vs Flippits	VR vs Flippits
Before Procedure								
Child's reports	2.80 ±1.04	2.88 ±0.97	2.98 ±0.95	0.317	0.729	T=0.355, P=0.723	T=0.808, P=0.421	T=0.465, P=0.642
Mother's reports	3.03 ±0.66	2.83 ±0.87	2.78 ±0.86	1.082	0.342	T=1.158, P=0.250	T=1.458, P=0.148	T=0.258, P=0.796
Researchers' reports	3.05 ±0.93	2.83 ±0.87	2.85 ±0.83	0.784	0.459	T=1.092, P=0.278	T=1.014, P=0.313	T=0.105, P=0.916
Nurses' reports	3.08 ±0.94	2.70 ±0.82	2.72 ±0.83	2.505	0.086	T=1.926, P=0.057	T=1.815, P=0.073	T=0.108, P=0.914
During Procedure								
Child's reports	3.38 ±0.81	0.78 ±0.33	0.85 ±0.30	307.971	<0.001**	T=18.799, P<0.001**	T=18.524, P<0.001**	T=0.992, P=0.324
Mother's reports	3.45 ±0.68	0.75 ±0.31	0.81 ±0.31	435.783	<0.001**	T=22.851, P<0.001**	T=22.343, P<0.001**	T=0.865, P=0.389
Researchers' reports	3.55 ±0.68	0.63 ±0.20	0.80 ±0.29	549.626	<0.001**	T=26.054, P<0.001**	T=23.528, P<0.001**	T=3.052, P=0.003*
Nurses' reports	3.53 ±0.68	0.73 ±0.22	0.78 ±0.22	550.965	<0.001**	T=24.776, P<0.001**	T=24.333, P<0.001**	T=1.016, P=0.312

VR: Virtual reality, SD: Standard deviation, ANOVA: Analysis of variance.

Table-4: Satisfaction scores.

	Control	Virtual Reality	Flippits	Chi-Square	
	n (%)	n (%)	n (%)	X^2	*p-value*
Children Satisfaction					
Dissatisfied	20	50.0	0	0.0	1
2.5					
Little satisfied	20	50.0	7	17.5	9
22.5					
Very satisfied	0	0.0	33	82.5	30
75.0	76.167	<0.001**			
Mothers Satisfaction					
Dissatisfied	14	35.0	0	0.0	1
2.5					
Little satisfied	22	55.0	9	22.5	11
27.5					
Very satisfied	4	10.0	31	77.5	28
70.0	52.257	<0.001**			

VR: Virtual reality.

Figure 1: Wong-Baker Faces Pain Rating Scale.[15]

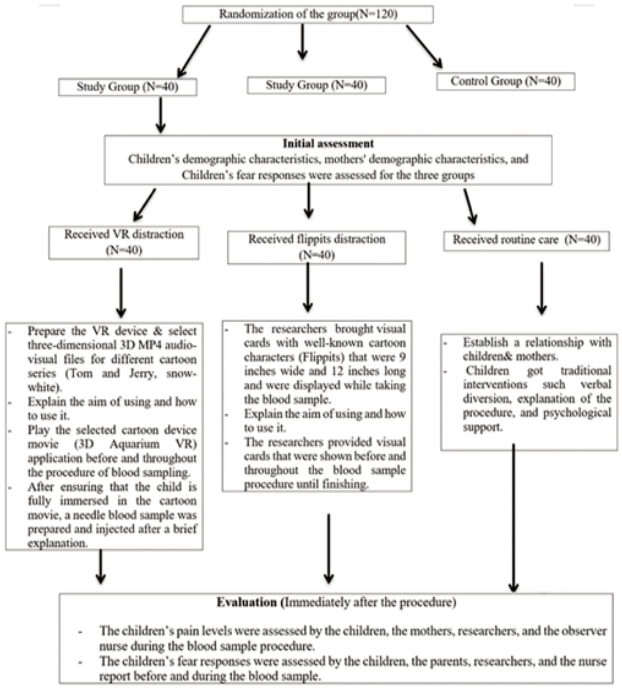

Figure 2: Flow chart of the study's implementation phase.

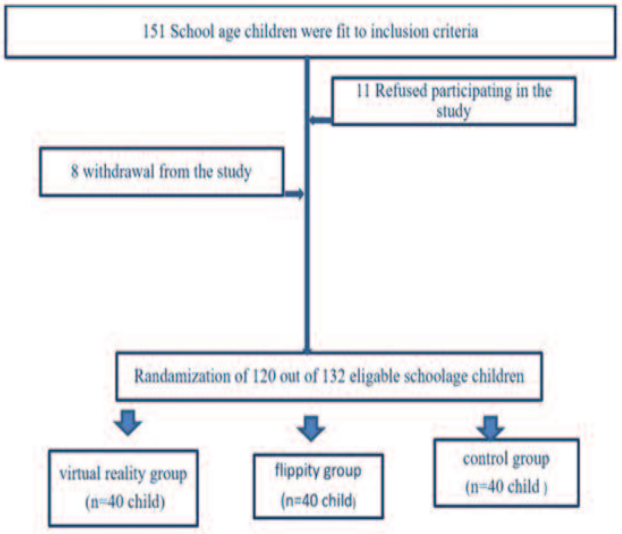

Figure 3: The recruitment process.

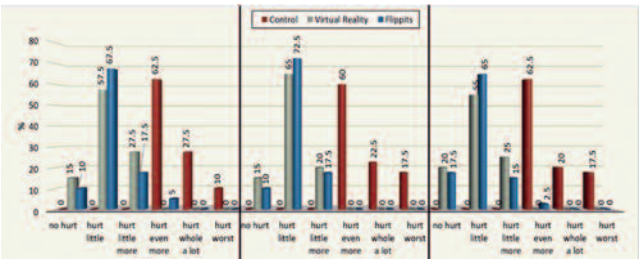

Figure 4: Level of pain in the study groups.

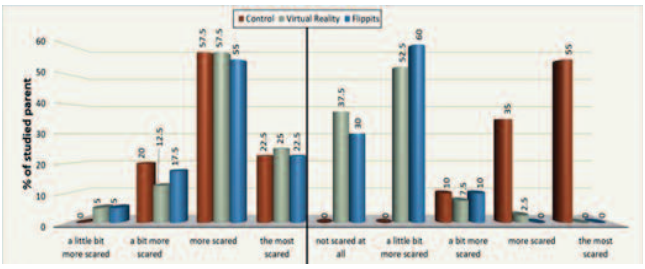

Figure 5: Level of fear among children as reported by mothers.

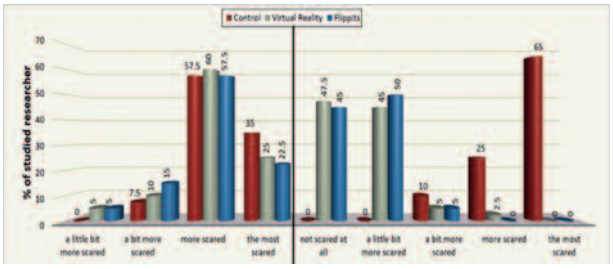

Figure 5: Level of fear among children as reported by the researchers.

Discussion

Flippits, or DCs, are effective in phlebotomy pain, anxiety and fear management.[8] The current study showed that children in the flippits group had considerably lower pain and fear levels than children in the control group. The first research hypothesis, as such, was supported by the findings. From the researchers' point of view, using DCs with visual stimuli distracted children from medical procedures and helped them feel less pain, anxiety, and fear. This finding was consistent with literature.[16,17]

VR simultaneously stimulates the visual, auditory and cognitive systems.[18] The current study showed that children in the VR group scored much lower mean scores on pain and fear levels than children in the control group. This finding supports the second study hypothesis. It may be rationalised that utilizing distraction reduces the brain's ability to focus attention on the painful stimulus while diverting attention to other attractive stimuli. This finding is consistent with literature.[4,19]

Children's phlebotomy pain and anxiety can be safely reduced using VT and flippits techniques as they are affordable, reusable and accessible.[20] Regarding the current findings, there were no statistically significant differences between the mean pain and fear scores of children in the VR group and those in the flippits group according to the child's reports. From the researchers' point of view, the healthcare provider can gain advantages from these findings as they can use one of the methods. Similar findings have been reported earlier.[6]

The current results showed that children and their mothers in the VR and flippits groups had higher levels of satisfaction than children and their mothers in the control group. This finding is in accordance with literature.[21]

The current study has limitations in terms of a small sample size, which means the findings may not be generalised.

It is proposed that educational training programmes should be given for improving nurses' performance regarding flippits and VR distraction to alleviate children's pain and fear. Also, hospitals should make available distraction devices.

Conclusion

Flippits and VR groups experienced less procedural pain and anxiety than the control group, demonstrating the efficacy of these techniques in lowering procedural pain and fear.

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Conflict of Interest: None.

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