

Effect of Video games on Postoperative Pain among Preschool Children

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Abstract: Background: Playing video games is an interactive form of distraction that is used to divert children focus away from uncomfortable stimuli to lessen pain. **Purpose** of this study was to evaluate the effect of video games on postoperative pain among preschool children. **Design:** a quasi-experimental design was used. **Setting:** it was conducted in the pediatrics surgical unit at Beni-Suef University Hospital. **Sample:** a purposive sample of 88 hospitalized children were included. **Data collection:** three instruments were used to gather the data. A structured interview questionnaire, Toddler-Preschooler Postoperative Pain Scale, and Children's Hospital of Eastern Ontario Pain Scale. **Results:** the results of this study revealed that there were highly statistically significant differences between pain intensity pre-, during and posttest playing video games. As well as there were a highly statistically significant differences between studied children regarding their vital signs (respiratory and heart rate) pre-, during and post playing videogames. **Conclusion:** this study concluded that Implementation of video games had significant effect in alleviation of post-operative pain level among studied preschool children on the posttest compared to the pretest. **Recommendation:** this study recommended that ongoing health education programs based on application of video games distraction technique for parents should be implemented to manage post-operative pain.

Keywords: *Playing Video Games, Postoperative Pain, and Preschool Children.*

Introduction

Tissue injury from surgical incision leads to postoperative discomfort. Immediately A number of cellular breakdown products and inflammatory mediators are quickly exposed to sensory nerve terminals after tissue destruction, which causes acute

nociceptive activity. Acute pain arises after tissue damage related to surgery and should resolve during the healing process, which might take up to 3 months. (Kulshrestha & Bajwa, 2021). Pain is defined as an unpleasant sensory and emotional experience

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associated with actual or potential tissue damage. It is a multidimensional phenomenon with sensory, physiological, cognitive, affective, behavioral and spiritual components (Treede, 2018).

Pediatric surgeries pose a wide variety of surgical disorders occurring in pediatric patients requiring proper surgical intervention to save life and minimize disability. The common abdominal surgeries performed in children including appendectomy, cholecystectomy herniorrhaphy, laparotomy, colostomy, and gastrostomy. It ranges from the very simple to the most highly complex surgery, with life threatening conditions followed by extended recovery (Zaghal & El Rifai, 2021).

A child's quality of life can be significantly impacted by untreated pain since it affects their mood, sleep, hunger, ability to concentrate in class, academic participation in extracurricular activities and performance. The potential for suffering in a child's later life is increased by repeated exposure to pain, which can also lead to altered pain sensitivity, poor social skills, and self-destructive behavior patterns (Dessie et al., 2019).

Pharmacologic and non-pharmacologic therapy are the approaches utilized to treat acute postoperative pain. Respiratory distress is a serious adverse effect of pharmacologic drugs like analgesics, local anesthetic, sedatives, and general anesthesia. Virtual reality, video game distractions, Acupuncture, guided play, digital tablet games, cartoons, hypnosis, and child life therapy are examples of non-pharmacological therapies. Video games are one of the frequently employed distractions. "An approach, whether cognitive or behavioural, that diverts a child's

attention from painful pain cues," is how it is described (Puntillo, Giglio, & Giustino, 2021).

Video games have a potential in modifying affective states of mind and have a positive effect on brain activities, video games may be an effective tool in helping the healing painful procedures by reducing pain and any negative effect, video games distraction are used to lessen the pain and anxiety associated with surgery in children because they are interactive, goal-oriented, and demand executive skills, such as planning, anticipation, and continual active focus on the game (Havenga, 2019).

The nurse's role in pediatric pain management includes every component of nursing care and is crucial to the nursing process. The assessment and management of pain must be done professionally, and nurses must be aware of children's rights to adequate pain care, according to pain management guidelines. Healthcare providers' primary duties include reducing postoperative pain, however a sizable majority of patients report unfavorable levels of postoperative pain (Mahna, Ouda, & Sadek, 2020).

Significance of the study

Ineffective postoperative pain management led to negative clinical outcomes. In pediatric patients may be harmful to a child's physical, mental, and social development. All of this has negative effects on the economy and health, including prolonged hospital stays, readmissions, and patient dissatisfaction with medical care. (Ibitoye et al., 2019). Erikson's theory of psychosocial development states that play is the most common type of self-therapy available to preschoolers and that children utilize it to communicate their troubles. Play can therefore play a variety of roles in

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children's development since it allows them to express their sorrow (Small & Laycock, 2020). At our referral hospital, there were 2575 total admissions of children in their first ten years of life from Egypt. Elective and outpatient cases made up the majority of cases, 1380 (53.5%) of all cases, 580 of them presented with congenital defects, the emergency department saw 1195 cases, which were divided into traumatic and non-traumatic cases. These cases' outcomes were divided into two categories: discharged (92.1%), and died (4%) (Khaled et al.,2021). Interventions that aim to reduce the post-operative pain in children are limited and there is no wide literature about video games and their significance. For these reasons, the purpose of this study was conducted to evaluate the effect of video games on postoperative pain among preschool children.

Purpose

The purpose of the study was to evaluate the effect of video games on postoperative pain among Preschool Children.

Research Hypothesis:

Post-operative pain level will be alleviated among studied preschool children after engaging in video games than before.

Methods

Research Design:

A quasi experimental (one group pretest/posttest) was utilized to fulfill the purpose of the study.

Research Settings:

The study was conducted at Beni-Suef University Hospital's pediatric surgery department.

Subjects:

A purposive sample of 88 hospitalized children were included. Who meet the following sample criteria and consent to participating in the study.

Inclusion Criteria for Children:

- 1) Age was 3-6 years scheduled for surgical procedure.
- 2) Conscious and able to communicate.
- 3) No history of trauma, multiple painful procedures, or frequent encounters with needles.

Exclusion Criteria for Children:

- 1) Hearing, vision impairments and mental retardation that make child unable to use video games.
- 2) Motor disability that would interfere with using the video game equipment.
- 3) Children requires for emergency management.
- 4) Children have attention-deficit disorder, that make child easy distract and unable to focus on video games.

Instruments: -

Three instruments were used to gather the data:

Instrument One:

The researcher created a structured interviewing questionnaire (pre- and posttest). in Arabic language after studying the relevant literature; El-Sharkawoy & Morsy, (2001) and Mokble. (2007). It was applied through interviewing the children with their mothers and consists of three parts:

- **Part One:** Personal characteristics of studied children included age, gender, level of education and residence.
- **Part Two:** A Medical assessment sheet of studied children included medical diagnosis, type of surgery,

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type of anesthesia, duration of surgery and operation complications.

B-Analgesia administration included: Name, dose and time of the last analgesic administered.

C-Vital signs included: pulse and respiration, researcher measured children's vital signs (respiration and pulse) after four hours at first day of surgical operation pre-, during and post applying video games distraction technique.

- **Part Three:** Video games variables for each use including: type of video games (as action, sport and panting games), length of time that child was engaged in video games after surgery during first day of the post-operative period. The researcher was displaying portable multimedia devices, such as smart phones, tablet was readily available at low cost, and age-appropriate video games.

Instrument Two: Observational Scale for Assessing Post-Operative Pain, The Toddler-Preschooler Postoperative Pain Scale, (TPPPS)

It was adopted by Tarbell, Cohen, & Marsh (1992).

consists of seven elements split into three areas of pain behaviour: (1) vocal pain expression as verbal pain complaint, cry, moan (2) facial behavior like open mouth, squint, close eyes, brow, and furrow forehead (3) body behavior as restlessness motor behavior/stroking or touching painful area. Researcher was observing child's pain behavior pre- and post-applying video games intervention as distraction technique over 5-minutes observation period.

Scoring System:

The scale has a range of 0 to 7. The seven pain behaviour items were rated

as "1" if they appeared during the 5-minute observation period and as "0" if they did not. The highest score possible is 7, which denotes intense pain Mild pain (0–2), moderate pain (3–4), and severe pain were among the scoring items (5- 7) (Tarbell, Cohen & Marsh., 1992).

Instrument Three: The Behavior Scale for Assessing Post-Operative Pain in Young Children, Children's Hospital of Eastern Ontario Pain Scale (CHEOPS):

It was adopted by McGrath et al., (2003).

It can be used to monitor the effectiveness of interventions for reducing the pain and discomfort, it included 6 categories of behavior: cry, facial, verbal, torso, touch, and leg. Child's pain behavior during displaying video games was observed by researcher.

Scoring System:

It includes 6 categories of behavior. Each is a separate category and between 0 and 2 or 1-3. Moreover, a pain score ranging from minimum to maximum score (4- 13) (McGrath et al., 2003).

Scoring items included three levels of pain: mild (0–4), moderate (5–8), and severe (>8) (9-13).

Validity:

The three instruments were sent to a jury of five professionals from nursing faculties and pediatric specialists (Two professors and another assistant professor in pediatric nursing, in addition one professor and another assistant professor in pediatrics medicine were also included). who assessed the tool and provided their feedback in order to ensure its validity.

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Reliability:

Reliability for the tools was applied for testing internal consistency of the tool by giving the same tool to the same participants under identical circumstances, the results from repeated testing were compared (test-retest reliability), and it was determined that all tools were highly dependable. The internal consistency of the tools was measured using the cronbach's alpha to determine their dependability. It was found that, the reliability for the structured questionnaire sheet was 0.84, reliability for TPPPS was 0.88 and reliability of CHEOPS was 0.87.

Ethical Consideration:

- A written approval was obtained from the Ethical and Research Committee of the Faculty of Nursing, Menoufia University.
- Mothers of the children provided oral consent regarding their willingness to take part in the study.
- Each child's mother participated in an initial interview to discuss the goals, potential advantages, and voluntariness of participation in the study (participants can withdraw from the study at any time without penalty).
- Confidentiality and anonymity of children and their mothers were ensured by the coding of every data and the storage of all paper in a locked cabinet.
- During personal interviews, participants obtained confirmation that the surveys were filled out by the researcher or by them. They were also told that the nature of the questionnaire did not affect participants physically or psychologically.

Pilot study

Nine children (10% of the sample) participated in pilot research to test the validity, applicability, consistency, clarity, and practicability of the study instruments and to estimate the time needed to complete them. No adjustments were necessary. As a result, the sample from the pilot research constituted part of the overall sample.

Procedure

1. Written permission:

After submitting a formal letter from the dean of the nursing faculty detailing the purpose of the study and the method for data collecting, the director of the hospital granted authorization for the study to be carried out. First, a meeting was held with the setting's director to ask for permission to conduct the research and to describe its objective and expected results.

2. Assessment phase:

- From March 2021 to August's 2021, six months of data collection took place.
- Before the application began, the researcher introduced herself to the kids and their parents. The researcher was interviewing each child with her mother individually face to face at pediatric surgical post-operative care unit to explain the aim of study, all mothers were provided informed consent before enrollment, it took 5-10 minutes.
- The observation was carried out two days per week during the afternoon shift. The observation time lasted for three hours.
- The researcher informed all mothers about video games distraction as a non-pharmacological pain management technique. It took 5-10 minutes.

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- The researcher fulfilled the questionnaire sheet and collected personal data, which took 15 minutes.
- Complete child pain and vital signs assessment took from 10-15 minutes.
- A pretest was conducted in order to measure pain and vital signs of children before the intervention.

3.Planning phase:

- Based on baseline data that are acquired from the assessment phase and significant literature, the researcher designed a plan to conduct the current study.
- The researcher was selecting portable multimedia devices, such as smart phones, tablets which are readily available at low cost, and age-appropriate video games, after four hours at first day of surgical operation.
- The researcher selected child's age-appropriate video games application.
- The researcher encouraged mother to support the child to focus his attention on the distractor (video games).

4.Implementation Phase:

- The researcher fulfilled the questionnaire sheet and collected personal data, which took 10 to 15 minutes.
- Once finishing from collecting personal data, the researcher started to measure vital signs as respiration and heart rate for studied children before displaying of video games after the surgery by four hours at pediatric post-operative, it took 5 minutes, (Pretest).
- Researcher assessed child's pain intensity before displaying video games after the surgery by four hours at pediatric post-operative care unit by using instrument II

The Toddler-Preschooler Postoperative Pain Scale, it took 5 minutes. (Pretest).

- Time consumed for complete child pain and vital signs assessment was from 10-15minutes.
- The researcher started displaying video games to child.
- The researcher assessed child's pain intensity during playing video games by instrument three (CHEOPS).
- The researcher assessed child's vital signs during playing video games.
- Child played video games continuously for more than 40 minutes.
- Time spent by researcher with each child was more than 40 minutes.

Evaluation Phase:

- Researcher reassessed intensity of pain during applying video games distraction technique at 25 minutes from beginning of playing video games by using Children's Hospital of Eastern Ontario Pain Scale, instrument III, this step took 5 minutes for each child.
- Researcher reassessed intensity of pain during applying video games distraction technique at 30 minutes from beginning of playing video games.
- Immediately after playing of video games, the researcher reassessed children's pain at 45 minutes from beginning of video games distraction technique by using The Toddler Preschooler Postoperative Pain Scale, instrument II. This step took 5 minutes for each child, (posttest).
- Immediately after displaying of video games distraction technique, the researcher reassessed children's vital signs at 47 minutes from the beginning of video games

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distraction technique, this step took 5 minutes for each child, (posttest).

Statistical analysis:

The collected data were organized, analyzed using appropriate statistical significance tests. The data were collected and coded using the Computer Version 23 of the Statistical Package for Social Science (SPSS). Excel was utilised to make the graphics. The standard deviation (SD) and mean (X) of the quantitative data were shown (SD). The analysis of variance test (ANOVA) was employed. The frequency distribution tables used to convey qualitative data (number and percentage).

Results

Table 1: illustrated the distributions of studied children according to their personal characteristics. It was discovered that over half (52.27%) of the children under study were male, and that the children's average age under study was between 5 and 6 years old, and around two thirds (65.91%) of the children in the study were boys. About their education, it was found that, more than half (63.64%) were at nursery education. In relation to residence, this table reflects that, the vast majority (81.82%) of the children in the study lived in rural areas.

Table 2: represented the distribution of the children under study based on their most recent medical history. It clarified found a considerable percentage (47.73%) of the investigated children were hospitalized for urological surgery, and that more than half (59.09%) had hospital stays of 1 day. In relation to anesthesia type this table indicated the vast majority (88.63%) of the studied children were under general anesthesia. Additionally, more than half (61.36%) of the studied children were lasting from 1 to 2 hours at surgical duration. Also, about half

(47.73%) of them were received dolphin suppository as analgesic after surgery and the most of them (93.18%) did not have complications after surgery.

Table 3: showed the impact of videogame distraction on the studied children's vital signs. It was obvious among the children that were evaluated, there was highly statistically significant difference in their vital signs (respiratory and heart rate) pre-, during and post playing videogames ($p < 0.01$).

Table 4: illustrated distributions of the studied children according to CHEOPS pain scale during playing video games. It demonstrated that more than two thirds (72.73%) of the children that were studied did not cry and the most (95.45 %) of them was smiling during playing video games. Also, the most of them (97.73%) were not touching their wound during playing video games. In relation to leg position, this table showed that all of the studied children (100%) have natural position of the leg.

Figure 1 clarified pain intensity of studied children during playing video games. It revealed that the significant number of 59.09% of the examined children had mild pain during playing video games.

Figure 2: represented pain intensity of studied children pre- and post-playing video games. It clarified that three quadrants of studied children (75.00%) suffered from severe pain before playing video games, while the most (90.91%) of children had mild pain post video games intervention.

Table 5: represented total distribution of studied children in relation to TPPPS pain scale pre- and post-playing video games. It showed that three quadrants of studied children (75.00%) suffering from severe pain before playing video games, while

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after playing video games the most (90.91%) of them had mild pain. There were highly statistical significances differences between TPPPS pain scale pre- and posttest playing video games ($P < 0.001$).

Table 6: presented total distribution of the children who were evaluated in regard to the overall mean score for pain intensity according to Toddler-Preschooler Postoperative Pain Scale (TPPPS) and 'Children's Hospital of Eastern Ontario pain scale (CHEOPS) before, during and after playing video games among children under the study. It was obvious from this table that total

mean scores of pains in studied children were (5.39 ± 1.12 , $2.64 \pm 0.47a$ and 1.32 ± 0.88) pre-, during and post playing video games respectively. There were highly statistically significant differences between TPPPS pain scale pre-, CHEOPS during and post playing video games ($P < 0.001$).

Table 7 displayed the correlation between vital signs and pain intensity pre- and post-playing video games among studied children. As indicated in the table, there were statistically significant correlation between studied children's vital signs and pain intensity pre- and post-playing video games.

Table (1) Distribution of the studied children according to their personal characteristics, (n=88).

Children characteristics	No = (n=88)	% 100
Age		
a) 3 to ≤ 4 years	42	47.73
b) 5 to ≤ 6 years	46	52.27
Mean ± SD	4.55±1.01	
Gender		
a) Male	58	65.91
b) Female	30	34.09
Education		
a) Nursery School	56	63.64
b) First Grade - Primary School	10	11.36
c) Second Grade - Primary School	22	25.00
Residence		
d) Rural	72	81.82
e) Urban	16	18.18

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Table (2): Distribution of the studied children according to their current medical history, (n=88).

current medical history	Items	No (n=88)	%100
Hospital Stay	a) One day	52	59.09
	b) 1 to 4 days	28	33.82
	c) 5 days or more	8	9.09
	Mean ± SD	2.89±4.90	
Surgery Type	d) General surgery	34	38.64
	e) Neurosurgery	2	2.27
	f) Urology surgery	42	47.73
	g) Orthopedic surgery	4	4.55
	h) ENT	6	6.82
Anesthesia Type	a) Local anesthesia	10	11.36
	b) General anesthesia	7	8.863
Surgery Duration	a) From 30 minutes to 1 hour	22	25.00
	b) From 1 to 2 hours	54	61.36
	c) From 2 to 3 hours	12	13.64
Analgesia after Surgery	a) No	6	6.82
	b) Catafly	2	2.27
	c) Cetal	4	4.55
	d) Declophen	10	11.36
	e) Dolphin suppository	42	47.73
	f) Perfalgan	24	27.27
If yes, time?	a) No analgesic	8	9.09
	b) From half an hour to an hour	36	40.91
	c) From 1-2 hours	40	45.45
	d) From 2-3 hours	2	2.27
	e) From 4-5 hours	2	2.27
Surgery Complications	a) No	82	93.18
	b) Fever & Vomiting	4	4.55
	c) Intestinal Obstruction	2	2.27

Table (3): Distribution of the effect of videogame on studied children's respiration and heart rate, (n=88)

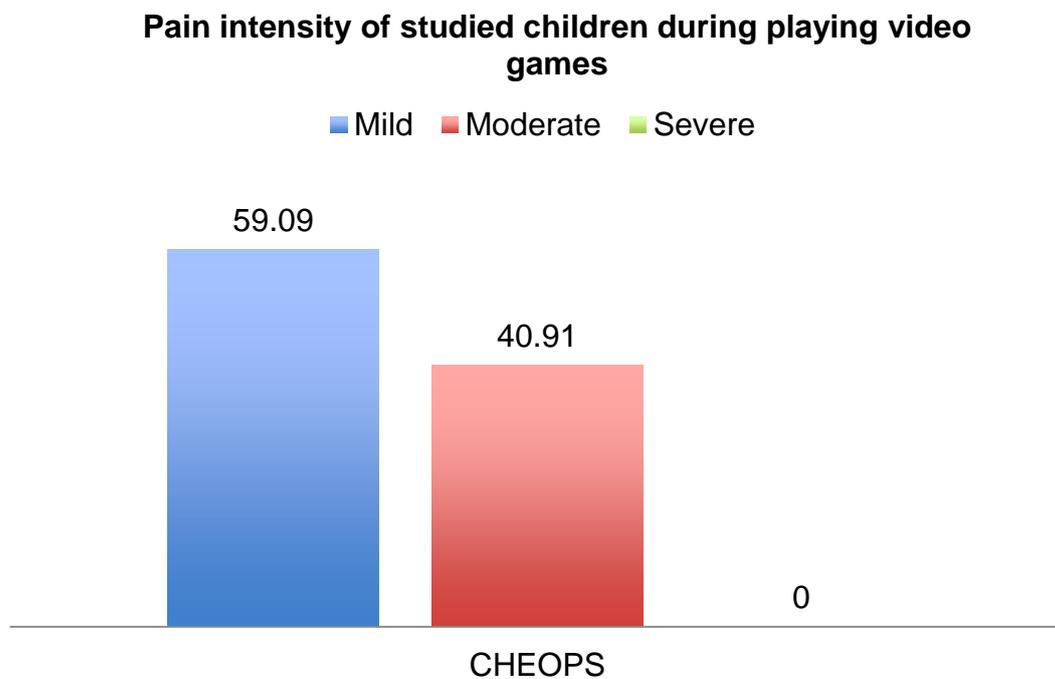
Vital signs	Mean	SD	F	Sig.
Respiration				
Before	31.64	3.75	65.380	0.000**
During	25.32	3.82		
After	26.98	3.84		
Pulse and Heart Rate				
Before	103.34	19.27	21.769	0.000**
During	91.25	7.04		
After	94.84	6.82		

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Table (4): Distribution of studied children in relation to CHEOPS pain scale during playing video games, (n=88).

CHEOPS Category	Finding	Score	No (n=88)	%100
Cry	c) No cry	1	64	72.73
	d) Moaning/Crying	2	24	27.27
Facial expressions	e) Smiling	0	84	95.45
	f) Composed	1	0	0.00
	g) Grimace	2	4	4.55
Child Verbal	h) Positive	0	44	50.00
	i) None/Complaints other than pain	1	44	50.00
Torso	j) Neutral	1	84	95.45
	k) Shifting/Tense/Shivering/Upright/Restrained	2	4	4.55
Wound touch	l) Not touching	1	86	97.73
	m) Reach/Touch/Grab/Restrained	2	2	2.27
Leg	n) Neutral	1	88	100.00

Figure (1): Pain intensity of studied children during playing video games, (n=88).



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Figure (2): Pain intensity of studied children pre and post playing video games, (n=88).

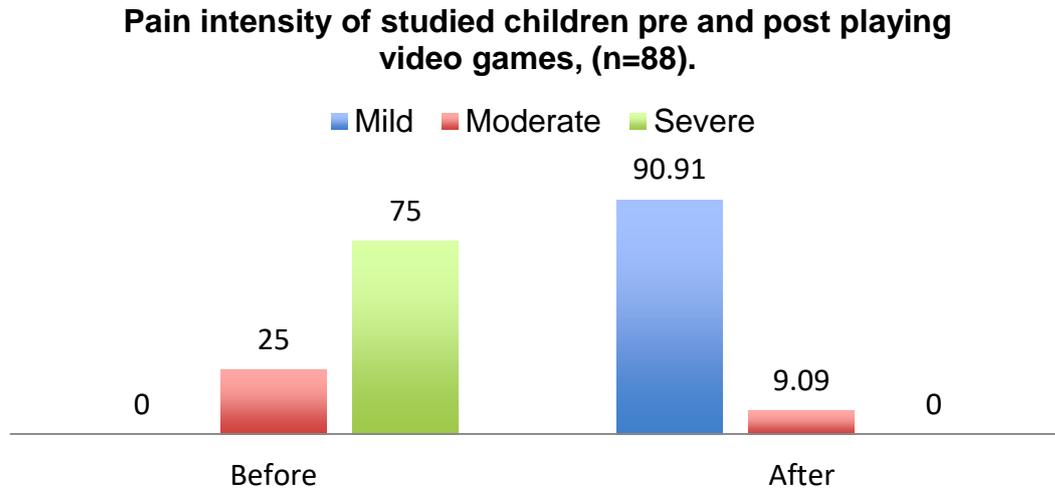


Table (5): Total distribution of studied children in relation to TPPPS pain scale pre and post playing video games, (n=88).

(TPPPS) Category	TPPPS				t	Sig.
	pre playing video games		post playing video games			
	No (n=88)	%100	No (n=88)	%100		
Mild	0	0.00	80	90.91	39.408	0.000**
Moderate	22	25.00	8	9.09		
Severe	66	75.00	0	0.00		
Mean ± SD	5.39±1.12		1.32±0.88			

Table (6): Total mean score of pain intensity according to toddler-preschooler postoperative pain scale (TPPPS) and Children's Hospital of Eastern Ontario Pain Scale (CHEOPS) before, during and after playing video games among studied children, (n=88).

Tool	Mild		Moderate		Severe		Mean ± SD	F	Sig.
	No (n=88)	% 100	No (n=88)	% 100	No (n=88)	% 100			
TPPPS – pre playing video games	0	0.00	22	25.00	66	75.00	5.39±1.12	505.723	0.000**
CHEOPS – During playing video games	36	40.91	52	59.09	0	0.00	2.64±0.47a		
TPPPS – post playing video games	80	90.91	8	9.09	0	0.00	1.32±0.88		

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Table 7: Correlation between vital Signs and pain intensity pre and post playing video games among Studied children, (n=88).

Items	TPPPS – before		TPPPS – after	
	R	Sig.	R	Sig.
Respiration	0.427	0.000**	0.146	0.174
Pulse	0.049	0.649	0.214	0.046*

Discussion:

Postoperative pain is a common clinical issue that poses a serious therapeutic challenge for surgical pediatric patients. Physically and psychologically, it is a painful experience related to real or probable tissue damage from the surgery itself. Postoperative discomfort increases the risk of respiratory and cardiovascular problems and delays recovery and discharge. Hence, ability to effectively manage postoperative pain is crucial. (Kulshrestha & Bajwa, 2021).

Management of the postoperative pain can be achieved by using appropriate pharmacologic and non-pharmacologic interventions, Regular pain evaluation is made possible by the ongoing technological advancements in video games, which act as a non-pharmacological form of pain alleviation. It is an interactive diversion strategy that encourages the kids to use more deliberate resources than passive ones. It might be a secure, ground-breaking tool for reducing pain and medicine use. (Math eve & Tim Merman's., 2020).

The current study hypothesized that post-operative pain level will be alleviated for studied preschool children after engaging in video games than before.

The current study found that regarding the characteristic of the investigated children, more than half of them aged

5 ≤ 6 years. This finding is congruent with a study by Olsen et al., (2020). about "Effects of non-Pharmacologic Distraction Methods on Children's Postoperative Pain". Who found that, most children under surgery aged between 5 ≤ 6 years old.

Concerning the studied children gender, according to the present study, around two thirds of the children were male. This result was in accordance with Canbulat, (2014) whose study is about "The Efficacy of Distraction Methods on Procedural Pain and Anxiety by Applying Distraction Cards and Kaleidoscope in Children" it revealed that high percentage of children were males. This could be attributed to the fact that male children like playing and participating in video games more than female children.

Regarding the educational level of the children were studied, the present study observed that, more than half of the studied children were at nursery education. This finding was gone in line with, Mokble (2007) in a study entitled "Effect of Distraction on Preschool Children's Postoperative Pain" and found that high percentage of children were at nursery education.

The current study found that the vast majority of the investigated children reside in rural areas. This finding is in accordance with Mohammed, (2020) in his study "Using Video Games for

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Reducing Pain among Children during Invasive Procedures" found that higher than three quarter of the studied children were rural residents.

Concerning hospital stay period, the present study found that for the children that were being studied children stayed at the hospital for 1 day. This finding was congruent with Mohammed (2020) who found that high percentage of studied children stayed at hospital from 1 to 7 days. This finding could be attributed to the high percentage of studied children were undergoing hernia and appendectomy, these types of surgical operations are a day surgery.

According to the results of the current study in relation to anesthetic type, the majority of the children who were evaluated were under general anaesthetic. This finding in accordance with Olsen et al., (2020) They found that the majority of studied children were undergoing general anesthesia. Also, this finding agreed with Sama et al., (2014) and discovered that the vast majority of the youngsters who were undergoing general anesthesia. This finding, in the opinion of the researcher, might be the child needs to have a surgical operation, the surgeon can perform the operation safely, so children need to be in a state where they do not move, and their muscles are relaxed.

Concerning the surgical duration, the current study made clear that more than half of surgeries take longer than expected. lasting from 1 to 2 hours. This finding was congruent with Mahran et al., (2016) they found that average time of surgical duration among studied children was about two hours.

With relation to the postoperative complications, the current study found that, the most of children had not any complications after surgery, only four

children suffered from nausea and vomiting. This result was consistent with Sama et al., (2014).s finding that only 12.3% of kids experienced post-operative nausea and vomiting.

Concerning the vital signs for the studied children, the results of the current study showed that there was a highly statistically significant difference between the children who were the subjects of the study in terms of their respiratory and heart rate pre-, during and post-playing videogames. This finding was consistent with, Gezginci et al., (2021" They discovered that there were statistically significant differences among the youngsters that were being researched. regarding vital signs before, during, and post-playing videogames.

In the same line Mohammed, (2020) supported this finding in a similar study about "Using Video Games for Reducing Pain among Children during Invasive Procedures" who discovered a significant difference between the study and control groups regarding vital signs pre- and post-playing video games. Additionally, these findings were in line with Mokble (2007) who found that there was significant difference between the study and control group regarding decreasing body temperature, heart rates and respiratory rate after using distraction technique. Also, this finding was supported by Moosavi et al., (2019) in study about "The Effect of Medical Directed Play on the Severity of Pediatric Pain" and found that, there was significant difference between the average heart rate of the experimental group and the control group.

Concerning pain intensity for the studied children, the current study presented that, there were highly statistically significant differences between pain intensity pre-, during and post-playing video games intervention

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among studied children. This finding was supported by Atak & Ozyazıcioglu (2021) who conducted a study named "The Effect of Different Audio Distraction Methods on Children's Postoperative Pain and Anxiety". Their study revealed that there was a significant difference between the groups in terms of posttest pain scores. The finding went in the same line with Olbrecht et al., (2020) they found that there was a significant difference between distraction-based games group and group of guided relaxation.

In the same line, Helgadottir & Wilson., (2014) supported this finding in a study about "A Randomized Controlled Trial of the Effectiveness of Educating Parents about Distraction to Decrease Postoperative Pain in Children at Home after Tonsillectomy". Their study revealed that there was a difference in pain intensity when child play videogames as distraction technique.

These findings also agreed with Gates et al., (2020) he found that, important reduction in pain mean score in the group used digital technology such as video games or virtual reality than the control group. Also, Bilimliri, (2020) supported this finding in a study entitled "The Effect of Playing Games with Tablet on Pain and Anxiety during Circumcision in Children: a Randomized Controlled Study" and found that there were significant decreased pain intensity in the group that played the game with tablet during the whole circumcision than non-tablet group/control group.

The findings in the same line with Donnelly (2016) he was found that, there were significant differences between pain intensity before and after videogames distraction, where total pain level means decreased following video game distraction technique. Also, Moosavi et al., (2019) supported

this finding and found that there were significant reductions in pain for those wearing the head-mounted displays and also for those playing by the mobile device.

Meanwhile, Hassannia et al., (2021) supported this finding in a similar study entitled and found that the virtual reality as a distraction technique significantly reduced pain at the onset of circumcision, during anesthesia and at the end of the circumcision.

Also, the finding went in line with the finding of Sengkeh, & Chayati, (2021) in their study They found that, the audiovisual distraction had a positive influence on the decreased pain and anxiety of the post-operative children by lowering their psychological stress.

The explanation of this finding is that playing video games is a key to every child's well-being as it gave them a healthy outlet for their pain by conveying their attention away from the source of pain to playing games. Also, this finding could attribute to playing video games the capability of inducing positive psychological effects as relaxation and changing children's mood to a better state that led to pain relieve and capable of capturing the child's attention away from his pain and gave endless hours of pleasure.

This finding was incongruent with Rantala et al., (2020) in a study about "The Effectiveness of Web-Based Mobile Health Interventions in Pediatric Outpatient Surgery: A Systematic Review and Meta-Analysis of Randomized Controlled Trials", They discovered that web-based mobile health interventions can lower kids' pre-operative anxiety and boost parental satisfaction. They also said that health interventions could be thought of as non-pharmacological distraction tools for kids in nursing, but there isn't enough data to know whether or not using similar

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interventions can lower kids' post-operative pain. Regarding correlation between vital signs and pain intensity pre- and post-playing video games among studied children, the current study indicated that there was statistically significant correlation between studied children's vital signs and pain intensity pre- and post-playing video games. This finding agreed with Huang et al., (2021). Their study finding revealed that correlation between vital signs and pain intensity pre- and post-playing music video therapy among studied children. After the intervention, there were statistical differences of pain intensity, heart rate and respiratory rate among music video therapy, music therapy and control groups on the first day after surgery.

This finding was attributed to the heart rate and respiratory rate increases by increasing sympathetic activity when experiencing acute pain. So, alleviating of pain lead to decreased pulse and respiratory rate. From researcher point of view, playing video games cause distraction effect that led to feel a relaxation away from pain source and child become quieter so that, sympathetic activity decreased which followed a decrease in heart rate and respiratory rate. The Autonomic Nervous System's "fight-or-flight" reaction is triggered by acute postoperative pain, which is characterized by the following symptoms: tachycardia, quick, shallow breathing, elevated blood pressure sweating, pallor, and dilated pupils. From the perspective of the researcher, video games attract child's attention away from pain, which decrease effect of pain on vital signs.

Conclusion

The current study was concluded that: The hypothesis of this study was accepted, and the implementation of video games had significant effect in alleviation of postoperative pain level among studied preschool children compared to the pretest on the posttest.

Recommendations

The following suggestions can be made based on the findings of the present study:

1- Recommendations for Clinical Setting:

- a) Application of video games as distraction technique to minimize post-operative pain intensity over the first postoperative day in children must be implemented.
- b) Ongoing health education programs based on the application of video games distraction technique for parents should be implemented to manage postoperative pain.
- c) Provision of training program for nurses about the video games as distraction technique to alleviate children post operative pain is essential.

2- Recommendations for Education:

- d) New modalities for pediatric pain management as video game distraction should be a part of continuous nursing education program.
- e) A variety of electronic resources, including papers, journals, computers, and the internet, should be available in the units so that staff members may further their education and skill sets.

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3-Recommendations for Future Nursing Research:

- f) A larger sample size was used in the replication of this study in a different paediatric department, allowing for more general conclusions.

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