

Effect of Video Based Virtual Reality Simulation on Nursing Students Self-Efficacy, Satisfaction and Performance regarding selected procedures

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Abstract

Background: Simulation-based learning is widely used in nursing students' clinical practice, including 3D video virtual reality which has grown remarkably in the last few years. Integrating 3D video virtual reality and mobile phone technology into clinical training of nursing students allows for enhancing learning experiences. **Aim :** The purpose of this study was to evaluate the effect of video based virtual reality simulation on nursing students' self-efficacy, satisfaction and performance regarding selected procedures. **Subjects and Method:** A purposive sample of 200 nursing students from academic first year, who were enrolled in fundamental nursing course in the second semester, Faculty of Nursing, Tanta University. **Tools:** four tools were included. **Tool (I):** Student knowledge questionnaire which composed of two parts: Part (A): Socio- demographic characteristics of students. Part (B): Students knowledge assessment sheet. **Tool (II):** Observational checklist of selected procedures **Tool (III):** Students Self-Efficacy. **Tool (IV):** Nursing student's satisfaction scale. **Results:** The main findings showed that nursing students' performance, knowledge, self-efficacy, and satisfaction had all significantly improved in the study group since p value was ≤ 0.05 post implementing the program. **Conclusion& Recommendations:** The implementation of video based virtual reality simulation had a positive effect on nursing students' knowledge, performance, self-efficacy and satisfaction regarding selected procedures. It was recommended that financial investment on the part of nursing faculty in the creation of suitable laboratories and training instructors who will apply training program

Key words: Video Based Virtual Reality, Simulation, Self-Efficacy, Satisfaction, Performance

Introduction

Great development of information technology necessitate a change in nursing training which is required to better train nursing students for the complex and rapidly changing health care environments (Chen et al.,2020). Applying innovative practices in nursing clinical training is important because nursing is a profession that requires cognitive, psychomotor, and attitudinal behavior. (Bayram& Caliskan, 2020).

Recently, the application of simulation to deliver experiential learning has grown. It is an innovative strategy for clinical training that gives nursing students great chances to acquire and securely apply what they learn in nursing care (Pottle , 2019) Additionally, there is increase need for using simulation to improve quality of training which is the base for developing competent nurses (Koukourikos et al., 2021)

Simulation-based learning is any educational technique that creates new learning conditions intended to closely represent real-world events that may be experienced(Bø,2022). Most nursing programs use in-person clinical simulation, in which students must physically attend in a clinical lab equipped with mannequins and practice clinical skills under the supervision of nursing faculty. (Lei et al., 2022; Tolarba et al., 2021)

Simulation enables nursing students to carry out clinical procedures with environment similar to hospital and helps them to acquire nursing experiences with real situation, even before they start working as professional nurses. It also improves students' competence, clinical performance, knowledge, satisfaction and confidence. (Koukourikos et al., 2021; .Bø, 2022;Lei et al .,2022).

Simulation in nursing clinical training has some drawbacks. The main drawback is the cost, as high-fidelity simulation technology can be expensive to implement and maintain (Kapp, 2023). Additionally, the need for space, as simulation requires dedicated areas with realistic environments and equipment (Tapia & Waseem ,2023).Furthermore, repeated exposure to simulation scenarios can lead to a potential side effect of being overwhelmed, which may impact students' learning experiences. (Erwan& Guillouët. 2023; Carrie et al .,2022).

Utilizing immersive technologies, including virtual reality, provide a more affordable and accessible method of simulation (Bethany, et al., 2023). It refers to a broad range of computer-based applications typically associated with immersive, highly visual, three dimension (3D) features that enables the user to move around within virtual world. (Gagne et al., 2023).

Utilizing virtual reality (VR) simulation in nursing students training instead of other media has benefits which include Immersion, simulating things that are challenging or impossible to test in real life (Christian,et al., 2023). Moreover, the use of VR in simulations allows for enhancing ability to demonstrate a procedure or technique.(Biyik Bayram, et al., 2022).

Video-based virtual reality has shown promise as a teaching strategy for training nursing students on clinical procedures such as intravenous injection, blood transfusion and oxygen therapy .It involves the use of immersive simulated environments created through video technology to provide realistic training experiences (Pernica, et al.,2023). Additionally, it provide step-by-step guidance and allow students to practice each aspect of

the procedure multiple times. (Foronda et al., 2020). Video-based virtual reality can also improve students' self-efficacy in performing clinical procedures. Overall, VR offers an innovative and effective approach to train nursing students on clinical procedures (Dinda, et al.,2023)

Significance of the study

Alternative teaching strategies must be developed and taken into consideration in light of recent challenges in practice and education. (Samuel,et al.,2023). Virtual reality simulation (VRS) is regarded as an efficient training strategy because it decreases the constraints of clinical training and enhances both learning capacity and satisfaction levels .Moreover, learning process is improved by watching educational videos. As they help in decreasing the amount of study time needed, improving performance, and raising self-efficacy with regard to particular procedures (Chiang,et al.2021; Pirker, & Dengel, 2021) hence, the purpose of this study is to assess the effect of video based virtual reality simulation training on nursing students' self-efficacy, satisfaction and performance regarding selected procedures.

The aim of the Study

Evaluate the effect of video based virtual reality simulation training on nursing students' self-efficacy, satisfaction and performance regarding selected procedures.

Research Hypothesis:

- Post implementation of 3D video based virtual reality simulation, nursing students are expected to exhibit improvement in their performance regarding selected procedures in the clinical labs.

-Post implementation of 3D video based virtual reality simulation, self-efficacy and satisfaction of the nursing students are expected to be improved regarding selected procedures.

Subjects and Method

Research design

Quasi- experimental research design was used in the present study.

Setting

The study was implemented at Medical & Surgical Nursing Department Clinical labs which affiliated to the Faculty of Nursing, Tanta University.

Subjects

A purposive sample of 200 nursing students from academic first year, who were enrolled in fundamental nursing course in the second semester during academic year (2022-2023), Faculty of Nursing, Tanta University. The accepted sample size will be 200 students. The sample size was estimated using the Epi Info 7 Statistical Program, with the following parameters: total target population size = 500 students, confidence level = 99.9%, expected frequency = 50%, accepted error = 5% and confidence coefficient = 95%.

Inclusion criteria

-Age of students ranged between 18<24 years.
-No Previous training with 3D video based virtual reality.

Tools of the study

Four tools were used to gather the required data as follow:

Tool (I): Student knowledge questionnaire:

It consisted of two parts:

Part (A): Socio-demographic characteristics of students: which include the following: age, sex, academic year, residence and previous training about virtual reality eyeglasses in the clinical labs.

Part (B): Students knowledge assessment sheet:

It was developed by the researcher after reviewing of the related literatures (Mahmoud & Abdel-Salam ,2018; Lynn ,2011) to assess studied nursing students (study and control) knowledge pre and post of training.

The total scoring system of students' knowledge was calculated and classified as the following:

- High → > 80% of the total score
- Moderate → 70% - 80% of the total score
- Low → < 70 % of the total score

Tool (II) : Observational checklist of selected procedures; This tool was developed by the researcher after reviewing relevant literatures (Shah & Babcock ,2022; Lynn ,2011) to assess studied nursing students (study and control) practice immediately, follow up after two weeks and after one month of training. The total practices score was calculated and classified as:-

- Satisfactory $\geq 75 - 100$ % of the total score
- Unsatisfactory < 75 % of the total score

Tool (III) : Students Self-Efficacy (SSE)
This tool adopted by Yang and Park (Freeth & Fry, 2005 ; Kennedy ,2013; March,2021; Yang, J. and Park,2004) for the purpose for assessing perception about the ability to cope with a variety of different situations. Students Self-Efficacy consisted of 14 items with a 5-point scale Such as (I feel well prepared to function as a nurse, I feel confident about training (Scoring system each response starts from 1 (strongly disagree) to 5 strongly agree. Total score range from 14 to 70 with 70 indicated, the higher the level of self-efficacy. The total score dichotomized into two levels at the cut of point equivalent to

60%: Total score ranges from 14 to 47 will be categorized as unsatisfactory while total score range from 48 to 70 will be categorized as satisfactory.

Tool (IV): Nursing student's satisfaction scale: (National League for Nursing(NLN),2018 ; Ahmed et al.,2022)

Nursing students' satisfaction was assessed using a scale developed by the National League for nursing. It composed of five items such as (the teaching methods used were effective) and created to assess the satisfaction of nursing student. A 5- point Likert scale was used to grade each item, strongly disagree received a score of 1, disagree received a score of 2, undecided received a score of 3, agree received a score of 4 and strongly agree received a score of 5. The score ranges from 5 to 25, with the greater the score, the higher the level of satisfaction.

Method:**Ethical consideration**

The official permission for gathering data was acquired from the dean of the nursing faculty. ,Tanta University for permission to carry out the study. The subjects as a whole suffered no harm from the study's design. Confidentiality and privacy were taken into account regarding data collection. The purpose of the study was explained to students before they provided their written, informed consent to participate. Every participant received information on the study's objectives, information confidentiality, benefits, and their ability to withdraw from the study if at any time.

Methods of data collection

1-Every tool was examined for questionnaire clarity and content validity by professors of medical surgical nursing and accordingly needed modifications were done .it was calculated and found to be = (98%)

2-The reliability for the study tools was calculated by Cronbach's Alpha; it was in tool I: that measuring student knowledge questionnaire is 0.781 for 39 items, tool II Observational checklist of selected procedures is 0.878 for 78 items, tool III is 0.906 for 14 items ,tool IV is 0.881 for 5 items and the sheet in total is 0.922 for 135 items.

3- A pilot study was carried out on (10) % of the study population prior to the study to evaluate the tools' applicability, clarity, relevance, and organization and to spot any potential problems that might arise during the data collection phase. The pilot study subjects were excluded from the original study subjects.

4-Data collection took about 4Months and conducted in the period from the beginning of March to the end of June 2023.

5- The current study was conducted over the course of four phases: assessment, planning, implementation, and evaluation. Students were also followed up with after two weeks and one month.

Assessment phase; the studied nursing students' knowledge and practice were assessed by using Tool I and Tool II. Tool III and Tool IV were used to assess students nurse self-Efficacy and satisfaction.

Planning phase; preparing a PowerPoint which includes knowledge about selected procedures (Intravenous injection, Blood transfusion and oxygen therapy (nasal cannula) .The content was created to meet the above mentioned objectives. An illustrative colorful booklet about uses of 3D virtual reality and application of selected procedures on mannequin prepared as a guide for the study group. The booklets were distributed to students who participated in the study at the end of sessions. the 3D

video based Virtual Reality Simulation was prepared by the researcher according to selected procedure (blood transfusion, intravenous injection and oxygen therapy (nasal cannula).It was prepared and designed by using computer program. The researcher checked the working of virtual reality eye glasses, smart phone and 3d video and solve any technical problems.

-Implementation phase; for group 1 (study group) : the group received virtual reality simulation training program about selected procedures through four sessions and the length of each session was one and half hour in 5 weeks. The manner of teaching is through 3 D video based virtual reality simulation .for group 2 (control group): the group received the same program with the same sequence as study group but the manner of teaching is through traditional face to face method.

On the first session included three parts

First part: knowledge about blood transfusion

It included knowledge about blood transfusion: definition, indications, contraindications, types, infection control measures and complications.

Second part: knowledge about Intravenous injection

It included knowledge about Intravenous injection Definition, purpose, infection control measures, complications, common sites, equipment of Intravenous injection.

Third part: knowledge about Oxygen therapy (nasal cannula)

It included knowledge about Oxygen therapy (nasal cannula): Definition, Indications, and principles of oxygen therapy, complications and advantages of nasal cannula, methods and sources of oxygen therapy.

II- The second session included practice regarding application of 3D video based virtual reality simulation about intravenous injection procedure which included equipment of the procedure, assessment before procedure, and preparation of intravenous technique, assess IV site for presence of inflammation, site of injections, types of syringe and cannula, Intravenous injection procedure, care during and post procedure, management of complications.

Researcher connect mobile phone to virtual reality eye glasses and apply virtual reality eye glasses for each student of the study group and turn on the 3 D video through a button on the top of virtual reality eye glasses Then, the researcher observe each student while sitting on chair.

III- On third session included practice regarding application of 3D video based virtual reality simulation about blood transfusion. ; equipment of the procedure, assessment before procedure, preparation of blood transfusion, site of injections, blood transfusion procedure, care during and post procedure, management of complications.

On fourth session includes practice regarding application of 3D video based virtual reality simulation about intravenous injection such as equipment of the procedure, assessment before procedure, connect nasal cannula to oxygen set up with humidification, oxygen therapy by nasal cannula procedure and management of complications.

Evaluation phase: The nursing students were evaluated by using Student knowledge questionnaire. (Tool I) at pre and post student education. Students' practice observational checklist (Tool II) will be used immediately, follow up after two weeks and after one month. Self-Efficacy Scale (Tool III) will be used immediately, follow up after two

weeks and after one month and Nursing student's satisfaction scale (Tool IV) will be used post implementation of student education.

Methods of data analysis

SPSS software, or statistical computer package version 26, was used to arrange, tabulate, and statistically analyze the data that had been gathered. Calculations were made to determine the range, mean, and standard deviation for quantitative data. The Chi-square test (χ^2) was utilized to compare qualitative data. . T-test for independent samples was used to compare the means of the variables for the two groups. Pre- and post-intervention variable means for each group were compared using the paired samples T-test. When comparing means for variables over three intervention periods in a group or for more than two variables, the analysis of variance (ANOVA) F-value was calculated. The correlation between the variables was evaluated using the Pearson and Spearman's correlation coefficients, which are both abbreviated as r. A $P < 0.05$ significance level was applied.

Results:

Table (1): Distribution of the studied students according to their socio-demographic characteristics. It represented that the majority of the study group (99.0%) were in the age group between (18-<20). while all the control group (100.0 %) were in the age group between (18-<20). **Additionally**, more than half (54.0%) of the study group are male. meanwhile more than half of the control group (57.0 %) were female .also, more than two third of the studied group (study and control) (64 %, 67.0 %) were living in rural areas respectively. furthermore ,all studied group (100%.100%) had no previous training about virtual reality eye glasses respectively.

Table (2) illustrated Distribution of the studied students regarding their knowledge

level among the studied groups pre and post training.

It was found that as pre implementation of the educational program the majority of studied students (study and control) (98.0%,94.0%) had low level of knowledge respectively. Moreover, the minority of studied groups (6.0%, 2.0%) had moderate level of knowledge respectively But, Post implementation of the educational program the majority of studied students (83.0 %, 82.0%) had high level of knowledge respectively. moreover, less than one quarter (16.0%) of study group had moderate level of knowledge and the minority of control group (7.0%) had moderate level of knowledge post implementation of the educational program.

Table (3) illustrated the distribution of the studied students regarding their practice level throughout periods of implementation

.It was found that about two third of the study group had satisfactory level of practice (63.0%) while more than half of the control group (58%) had satisfactory level of practice immediately post implementation of the procedure. Additionally, all of the study group (100%) had satisfactory level of practice post two weeks of implementation of the educational program meanwhile ,the majority of the control group (85%) had satisfactory level of practice Also. the majority of study group and control group (96.0%,80.0%,) had satisfactory level of practice respectively post one month of implementation of the educational program.

Figure (1): Distribution of the studied students regarding their self-efficacy (SSE) level throughout periods of implementation

It showed that the majority of the study group had satisfactory level of self-efficacy (92%) compared to the majority of the

control group (95%) had unsatisfactory level of self-efficacy immediately post implementation of the procedure study, additionally, the majority of the study group (95%) had satisfactory level of practice. Meanwhile, more than half of the control group (57%) had satisfactory level of self-efficacy post two weeks of implementation of the educational program.

Also, the majority of the study group (96%) had satisfactory level of self-efficacy while, the majority of the control group (87%) had unsatisfactory level of self-efficacy respectively post one month of implementation of the educational program

Figure (2) illustrated the distribution of the studied students regarding their satisfaction level among the studied groups post implementation of education. It showed that the majority of the study group (84%) were satisfied meanwhile, more than one third of the control group (38.0%) were satisfied. moreover, it was about less than one quarter (16.0%)of the study group had average level of satisfaction but, it was about half of the control group (51.0%) had average level of satisfaction.

Table (4): Illustrates the correlation between the studied tools among the studied groups throughout periods of implementation of the educational program

.Regarding self-efficacy score , the study's findings demonstrated a substantial correlation between the study group's self-efficacy score and overall practice right after the educational training program as $P=0.011$.

Table (1): Distribution of the studied students according to their socio-demographic characteristics.

Characteristics	The studied students (n=200)				χ^2 P
	Control group (n=100)		Study group (n=100)		
	N	%	N	%	
Age (in years)					
(18-<20)	100	100.0	99	99.0	FE
(20-24)	0	0.0	1	1.0	1.00
Gender					
Male	43	43.0	54	54.0	FE
Female	57	57.0	46	46.0	0.157
Residence					
Rural	67	67.0	64	64.0	FE
Urban	33	33.0	36	36.0	0.766
Previous training					
No	100	100.0	100	100.0	-

FE: Fisher' Exact test

Table (2): Distribution of the studied students regarding their total level of knowledge among the studied groups and post training.

Total Knowledge level	The studied students (n=200)									χ^2 P
	Control group (n=100)				χ^2 P	Study group (n=100)				
	Pre		Post			Pre		Post		
	N	%	N	%		N	%	N	%	
▪ Low	94	94.0	2	2.0	174.712 0.000*	98	98.0	10	10.0	157.481 0.000*
▪ Moderate	6	6.0	16	16.0		2	2.0	7	7.0	
▪ High	0	0.0	82	82.0		0	0.0	83	83.0	
Range	(7-52)		(42-69)		t=26.233	(19-51)		(23-70)		t=22.019
Mean ± SD	36.54±8.06		61.21±4.84		P=0.000*	34.04±7.36		60.16±9.33		P=0.000*

Low (<70%) Moderate (70-80)% High (>80%)

* Significant at level P<0.05

Table (3): Distribution of the studied students regarding their practice level throughout periods of implementation.

Total practice level	The studied students (n=200)														χ^2 P
	Control group (n=100)						χ^2 P	Study group (n=100)							
	Immediate		Post 2 weeks		Post a month			Immediate		Post 2 weeks		Post a month			
	N	%	N	%	N	%		N	%	N	%	N	%		
Unsatisfactory	42	42.0	15	15.0	20	20.0	127.63	37	37.0	0	0.0	4	4.0	143.47	
Satisfactory	58	58.0	85	85.0	80	80.0	0.000*	63	63.0	100	100.0	96	96.0	0.000*	
Range			(95-141)		(81-131)		F=228.9	(88-134)		(117-150)		(112-142)		F=264.07	
Mean \pm SD	(74-117)		118.22 \pm 10.48		98.27 \pm 8.57		2 P=0.000*	114.75 \pm 6.78		135.26 \pm 6.39		127.02 \pm 5.83		P=0.000*	

<75% Unsatisfactory \geq 75% Satisfactory

* Significant at level P<0.05

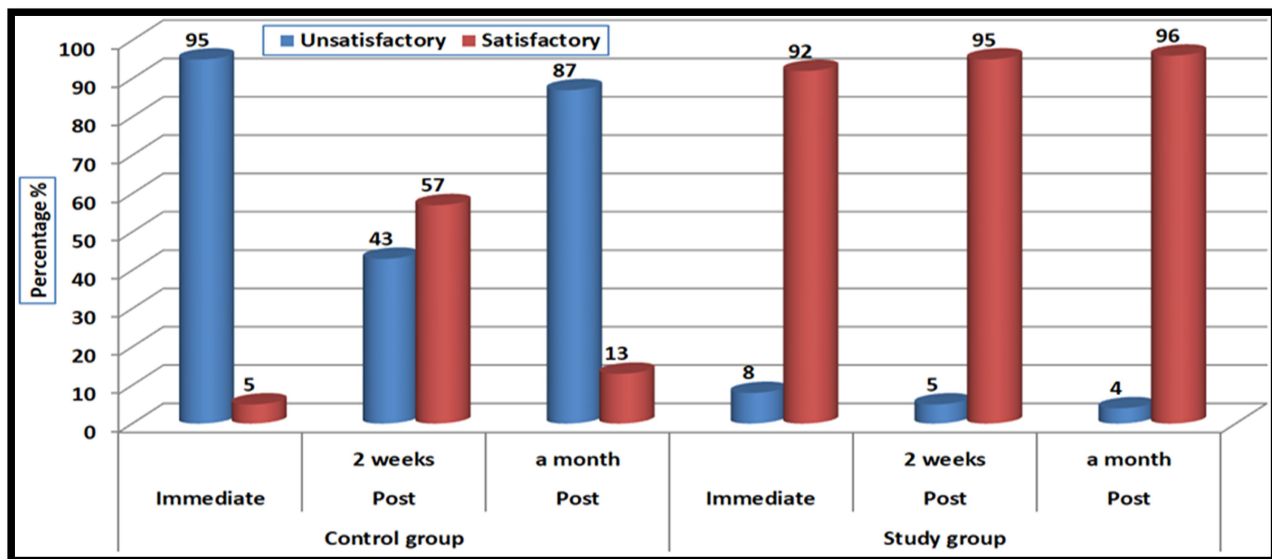


Figure (1): Distribution of the studied students regarding their self-efficacy (SSE) level throughout periods of implementation

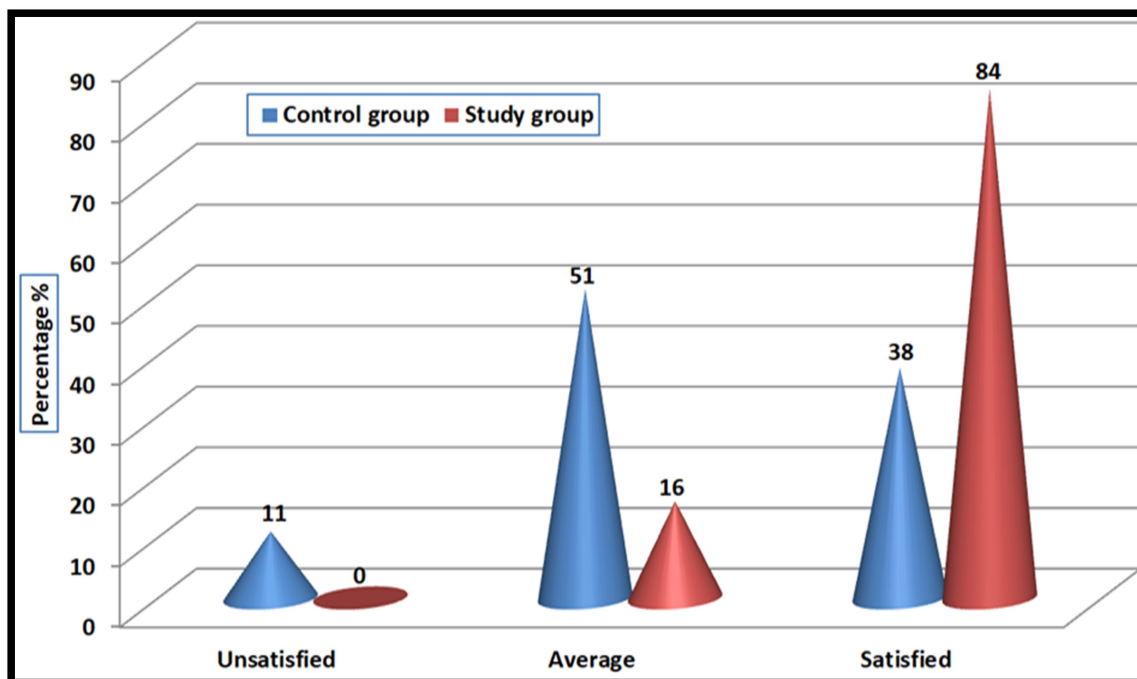


Figure (2): Distribution of the studied students regarding their satisfaction level among the studied groups post implementation of education.

Table (4): Correlation between the studied tools between the studied groups along periods of implementation.

	The studied students (n=200) Total practice score											
	Control group (n=100)						Study group (n=100)					
	Immediate		Post 2 weeks		Post a month		Immediate		Post 2 weeks		Post a month	
	r	P	r	P	r	P	r	P	r	P	r	P
Total knowledge score	0.128	0.205	-	-	-0.072	0.479	-0.034	0.734	-	-	0.051	0.617
Self-efficacy score	0.161	0.109	0.028	0.785	0.028	0.782	0.252	0.011*	0.001	0.993	0.085	0.402
Satisfaction score	-0.027	0.790	-	-	-	-	0.051	0.612	-	-	-	-

r: Pearson/Spearman' correlation coefficient

* Significant at level $P < 0.05$

Discussion:

Clinical training of nursing students is an essential component of nursing training. However, traditional training of nursing students does not always adequately prepare nursing students to meet the quick developments in technology, healthcare, and medical research, resulting in “weak” practical skills of nursing students, or a theory-practice-gap (Christian *et al.*, 2023). Hence, several training method , including video based virtual reality simulation have been proposed in recent years to cope with the current circumstances. (Angela *et al.*, 2023)

Virtual reality (VR) is defined as a video technology that gives the nursing students an environment that resembles reality. It is intended to replace mannequin-based simulation training. Additionally, it has a positive impact on nursing students' knowledge, self-efficacy, communication abilities, and clinical performance. (Lee JS., 2022). So, the purpose of study was to evaluate effect of video based virtual reality simulation on nursing student's self-Efficacy, satisfaction and performance regarding selected procedures.

Concerning to Socio demographic characteristics of the studied groups, it revealed that majority of the study group were in the age group between (18-<20).This finding may be related to the sample of the study from academic first year, who enrolled in fundamental nursing course in the second semester. **As regard to sex, residence, previous training,** it was found that more than two third of nursing students were living in rural areas. This results may be

attributed to nursing profession has a great interest of people living in rural areas more than urban because most of people who are living in rural areas suffering from poverty. This result was in agreement with Gaur, R (2020) who mentioned that more than two third of the nursing students were living in rural areas.

Regarding to previous training through virtual reality, the current study revealed that all studied students have no previous training through virtual reality eye glasses .This results may be attributed to virtual reality is anew emerging technology so, most nursing student have no previous experience of using VR eye glasses. This result was in agreement with Mahmoud& Abdel-Salam , (2018) and Bai, & Manomozhi (2022) who found that all studied students have no previous training through virtual reality eye glasses.

As regard to Students knowledge assessment sheet which measures student knowledge regarding selected procedures ,The result of study revealed that the majority of the studied students were having low level of knowledge in study and control group regarding selected procedures pre implementation of the training program, while immediately post implementation of the training program .It was found that the majority of the studied students have high level of knowledge according to Students knowledge assessment sheet. Additionally, both traditional and virtual methods have increased nursing students' knowledge and it indicated no significant

difference in the level of knowledge in the pre-intervention stage.

Pre implementing the program, it's reasonable to say that before to intervention, nursing students knew very little about clinical procedures. Additionally, the fact that there was no difference between the two groups suggested that the two groups in the current study (virtual and traditional education) were similar.

On the other hand, the improvement in both groups might be related to the use of multiple instructional methods such as the traditional colored educational booklet. In addition to the effect of using new technology in nursing education such as video based virtual reality simulation for the study group. The improvement showing how both approaches participate in increasing the students' knowledge.

The finding was in agreement with **Lee, (2022)** who explained that student knowledge regarding IV injection procedure in traditional simulation and virtual reality group was improved post implementation of the educational program. Also, **Chang et al., (2024)** who explained that students' knowledge of intravenous injection was significantly improved post virtual reality simulation .

Additionally, Habibzadeh et al., (2019) who reported that Although both traditional and virtual teaching approaches have improved students' knowledge, the effects of virtual learning have been more pronounced. **Also,** both groups had no significant difference in the level of knowledge in the pre-implementation of the program.

The finding was not in the same line with Cobbett & Snelgrove-Clarke (2016) who stated that simulation did not affect nursing students' knowledge regardless of technique and there were no significant differences between participants in either of the simulation groups.

Regarding to nursing students performance, all of the study group and the majority of the control group had satisfactory level of practice post two weeks of implementation of clinical training program. This improvement may be related to the effect of using new clinical training method in nursing student training including video based virtual reality which helped to attract student attention and concentration more than traditional face to face training through simulation. **Moreover,** it allowed for repetition of the clinical procedures without feeling of nursing students from being overwhelmed and not having lack interest in boring teaching and learning.

The present study was in agreement with Mahmoud et al., (2018) and Beijing, (2016) who clarified that nearly all of the study group who received their training through video based virtual reality and the majority of the control group had improved their performance regarding selected procedures of oxygen therapy, intramuscular injection and drug administration. **Moreover, Ji et al., (2022)** who described that VRS for IV injection showed significantly higher clinical performance compared to students who received their training through IV arm simulator.

Meanwhile, in the control group the result was in agreement with **Salwa et al., (2019) and Ju et al., (2023)** who found that nursing students showed significant improvement of clinical performance scores after simulation-based training.

The result was not in agreement with Chao et al., (2021) who clarified that there were no significant differences in nursing students skill between nursing students who trained through 3d video based virtual reality simulation and students who trained through traditional method on simulator.

Regarding self-efficacy level, the result of the current study revealed that the majority of the study group and the minority of the control group, respectively, exhibited a good degree of self-efficacy right after the educational training program.

This improvement may be because of using new emerging technology as video based virtual reality provide a realistic and effective learning environment that enhances students' confidence and competence in clinical practice which leading to improvement of nursing students self-efficacy

The result was in consistence with Rosalind et al., (2022) who mentioned that the majority of nursing students who had been trained through virtual reality indicated above efficacy than control group. **Moreover, Mi et al., (2022), Apriliani et al., (2023) ,Francis et al., (2020)** who clarified that when compared to the control group, the experimental group's self-efficacy significantly improved.

However, the results in wasn't in consistent with Lee, et al., (2023) who mentioned that there was no statistically significant increase in the students' self-efficacy between the control and intervention groups. **Moreover, Padilha et al., (2019)** who reported that stated that there were no statistically significant variations in self-efficacy perceptions.

Concerning to nursing students satisfaction, the majority of the study group was found to be satisfied, while over one-third of the control group expressed satisfaction right away following the training program.

This improvement may be attributed to using new emerging technology as video based virtual reality which grasp nursing student's attention. Moreover, it allowed for repetition of the clinical procedures without feeling of nursing students from being overwhelmed and not having lack interest in boring teaching and learning.

Additionally, nursing students were easily distracted during face to face method. Also, Knowledge acquired through traditional methods is more likely to be lost, but because VR-based training encourages interaction and involvement with the real world, it may help students retain long-term memory and form deeper impressions. . In addition, using colored booklet with clear, attractive and simple written steps of the clinical procedures and the colored educational photos which was given to the studied group.

The results of the present study was in consistent with Bai & Manomozhi (2022) who clarified that the majority of virtual reality students were satisfied post

implementation of the training program and Mi *et al.*, (2022) who illustrated that nursing students post VR simulation program received higher scores of satisfaction than control group. Furthermore, Samar *et al.*, (2021); Shuangping, (2023) who clarified that Virtual reality simulation increases nursing students satisfaction post implementation of the training program.

Meanwhile the result wasn't in consistent with Young *et al.*, (2022) who cleared that there was no significant difference satisfaction between VR and traditional nursing skills practice groups.

Regarding relation between clinical performance and nursing students self-efficacy, the study's findings demonstrated a substantial correlation between the study group's self-efficacy score and overall practice right after the educational training program. Lachine, *et al.*, who stated that Self-efficacy is essential predictor of nursing students' performance in clinical practice.

Conclusion and recommendations

According to the results of the present study, it is possible to conclude that training nursing students through video based virtual reality was effective in improving nursing students' knowledge, performance, self-efficacy and satisfaction regarding selected procedures than who received traditional training on mannequins. It was recommended that financial investment on the part of nursing faculty in the creation of suitable laboratories and training instructors who will apply training program.

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