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The effect of simulation software on learning of psychomotor skills and anxiety level in nursing education

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Abstract

The purpose of experimental study was to develop a simulation software related "Intravenous Therapy and Drug Administration" and determine the effects of simulation software on learning of psychomotor skills and anxiety level in nursing education. Study sample included 69 students who met inclusion criteria of study at İstanbul University Florence Nightingale Nursing School. Data were collected three times as to before practice, after practice and before practice on humans by using an "Information Form", "Intravenous Therapy and Drug Administration Skill Checklist", "State-Trait Anxiety Inventory (STAI)", "Intravenous Therapy and Drug Administration Simulation Software" and "Advanced Injection Arm". Results present that simulation software is an effective method for learning and improving psychomotor skills and decreasing anxiety in nursing education. Generalizing simulation software in nursing education could be suggested.

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Keywords: Simulation, nursing, nursing education, psychomotor skill, anxiety;

1. Introduction

Changes and improvements to healthcare systems, short hospital stays, complex disease processes, cost-effective implementations, patient rights, patient safety and staffing shortages require that nurses -especially new graduates-, quickly master the skills of accurate patient assessment, appropriate and quick decision making, timely and safe intervention and the provision of quality care. To do so, nursing students need to encounter, especially in education, either real-life situations or realistic settings where in they can experience the pressures of patient care situations while employing safe methods (Eaves&Flagg, 2001; DeYoung, 2003; Robertson, 2006). However, increases in the numbers of students and faculty and shortages of practice settings in nursing education lead to ineffective teaching and learning processes for students. Thus, students have difficulty learning professional knowledge and skills. Consequently, simulation has become a valuable and significant educational method in nursing education, as it evokes real-life responses from participants but does not result in real untoward effects; further, simulation facilitates learning and development of psychomotor skills (Eaves&Flagg, 2001; Tsai et al., 2004; Medley&Horne, 2005; Abdo &Ravert, 2006; Schoening et al., 2006; Wilford&Doyle, 2006; Baxter et al., 2009).

Intravenous therapy and drug administration, which are frequently used in nursing implementations, are risky skills because of the frequent occurrence of malpractice (Engum et al., 2003; Tsai et al., 2004). Therefore, students

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should learn these skills accurately and perfectly during their professional education. Anxiety levels are important in the learning process of psychomotor skills, as they are in all learning (Engum et al., 2003; Tsai et al., 2004). Simulation software effectively facilitates learning of psychomotor skills by reducing anxiety levels. Therefore, it is getting more important in nursing education day by day (Eaves&Flagg, 2001; DeYoung, 2003; Medley&Horne, 2005; Schoening et al., 2006). Briefly, the use of simulation in nursing education is essential to ready students for the future.

This study was planned as experimental design to develop a simulation software related "Intravenous Therapy and Drug Administration" and determine the effects of simulation software on learning of psychomotor skills and anxiety level in nursing education.

2. Method

2.1. Setting and sample

Research was realized at Istanbul University Florence Nightingale Nursing School on 2009-2010 academic year spring semester. Target population of the study included 162 freshman at İstanbul University Florence Nightingale Nursing School, and the study sample included 69 students (control group=31, experimental group=38) who met inclusion criteria of study.

2.2. Instruments

"Information Form", "Intravenous Theraphy and Drug Administration Skill Checklist", "State-Trait Anxiety Inventory (STAI)", "Intravenous Theraphy and Drug Administration Simulation Software" and "Advanced Injection Arm" were used in data collection.

2.2.1. *Information Form:* Used to determine students' socio-demographis characteristics.

2.2.2. *Intravenous Therapy and Drug Administration Skill Checklist:* Used to collect data about students' intravenous therapy and drug administration skill.

2.2.3. *State-Trait Anxiety Inventory (STAI):* Used to collect data about students' anxiety levels.

2.2.4. *Intravenous Therapy and Drug Administration Simulation Software:* This simulation software was developed in line with ADDIE instructional design principles and process as analysis, design, develop, implement and evaluate (Akkoyunlu et al., 2008; Fer, 2009).

2.2.5. *Advanced Injection Arm* Advanced arm model used in professional skill laboratory is like real human arm through shoulder to fingers and (Nasco Life Form, 1982).

2.3. Data analysis

Data were analyzed by using SPSS packet programme. Frequency-percentage, mean, standart deviation, independent sample t-test, chi-square test with yates' correction, two factor dependent groups/way analysis of variance, One Way ANOVA, Bonferroni test and paired groups t-test and pearson corelation analysis (Aksakoğlu, 2001).

3. Findings

Control group's mean age was 20,19±1,85. Of the students, 54,8% ranged between the ages of 18-19, 74,2% were female, mean professional courses' grade point average was 2,67±,66 (successful), 64,5% had not self computer, 61,3% had education about computer/computer softwares, 93,5% had knowledge about simulation software. Experimental group's mean age was 19,61±,79. Of the students, 50,0% ranged between the ages of 18-19 and over 20 years, 86,8% were female, mean professional courses' grade point average was 2,96±,66 (successful), 52,6% had self computer, 55,3% had education about computer/computer softwares, 97,4% had knowledge about

simulation software. There was no statistically significant difference (p>,05) between experimental and control groups in terms of "age, gender, mean professional courses' grade point average, having own computer, havinge education about computer/computer softwares, having knowledge about simulation software". Groups were similiar in terms of these characteristics.

Control group's mean intravenous therapy and drug administration skill was 50,46±14,64, experimental group's was 60,34±15,58. The experimental group had significantly higher total score than that of the control group (p<,01).

Table 1. Comparison of Control and Experimental Group Students' State and Trait Anxiety Level According to Time and Group

Time	Group	Control Group (n=31)	Experimental Group (n=38)	t*	P (sd: 67)
State Anxiety	Before Practice[bp]	35,10±9,30	34,61±9,03	*,222*	*,825*
	After Practice[ap]	37,65±12,10	31,05±7,07	*2,682*	***,010******
	Before Practice on Humans[bph]	40,90±12,79	35,47±8,72	*2,089*	***,040*****
	*F***	*3,584*	*5,337*		
	P	***,041***** *bp›bph*	***,009****** *ap‹bp,bph*		
Trait Anxiety	Before Practice[bp]	41,71±7,39	44,03±7,08	*1,304*	*,197*
	After Practice[ap]	39,87±6,98	43,11±7,25	*1,874*	*,065*
	Before Practice on Humans[bph]	39,81±8,24	43,16±7,39	*1,779*	*,080*
	*F***	*5,753*	*3,345*		
	P	***,008******** *bp›ap,bph*	***,047***** *bp›ap*		

** Independent sample t-test, ** One Way ANOVA*
**** p<,05, **** p<,01*

Before practice students in both the control and experimental groups had low level state anxiety and middle level trait anxiety. Between group differences were not statistically significant (p>,05). Groups were similiar in terms of anxiety level. After practice students in the control group had low levels of both state and trait anxiety; those in the experimental group had low level state anxiety and middle level trait anxiety. The experimental group had significantly lower state anxiety level than the control group but trait anxiety levels did not significatly differ between groups. Before practice on humans students in the control group had middle level state anxiety and low level trait anxiety; whereas those in the experimental group had low level state anxiety and middle level trait anxiety. The experimental group had significantly lower state anxiety level than the control group, but trait anxiety levels did not significanlty differ between groups (Table 1).

Both the control and experimental groups' mean state and trait anxiety scores significanlty chaned over time (Table 1).

4. Discussion and conclusion

The present study found that the experimental group's mean total score on the intravenous therapy and drug administration skill checklist was higher than that of the control group. This result is congruent with the findings of many previous studies (Mazıcıoğlu, 2002, Tsai et al., 2004, Alinier et al., 2004, Di Giulio et al., 2004, Jamison et al., 2006) that showed that students who study skills such as blood pressure measurement, intravenous therapy and drug administration, ECG measurement, defibrillator use, airway opening, fitting infusion pump and endoscopy with simulation software are more successful, need less help and perform better than students who study using only traditional educational methods. These results indicated that simulators or simulation software is effective for learning and performing psychomotor skills accurately for the purposes of nursing education.

The current results showed that students in the experimental and control groups have similar state and trait anxiety levels before practice. After practice, state anxiety levels were higher in the control group than the experimental group while trait anxiety levels did not significantly differ between groups. This finding is consistent with those of other studies (Baxter et al.,2009; Alinier et al., 2004; DeCarlo et al., 2008; Schoening et al., 2006;

Abdo&Ravert, 2006; Tsai et al., 2004) that showed that simulation experience increases students' confidence, decreases their anxiety levels and eliminates their stress. This results supports literature indicating that simulations make risky practices risk-free, do not impose real patient responsibility on students, offer the opportunity to learn by doing, enable learning, embody abstract concepts, and increase self-confidence (Eaves & Flagg, 2001; DeYoung, 2003; Feingold et al., 2004; Medley&Horne, 2005; McCaughey&Traynor, 2010). The results of this study indicated that simulation is an effective method to decrease anxiety levels. Before practice on humans, state anxiety levels were higher in the control group than the experimental group. Further, trait anxiety levels before practice on humans did not significantly differ between groups. This finding is consistent with those of other studies (Abdo&Ravert, 2006; Bremner et al., 2006; Feingold et al., 2004; McCaughey&Traynor, 2010; Robertson, 2006; Schoening et al., 2006) that showed that simulation software or simulators prepare students for real practices. This result showed that simulation software or simulators are more beneficial than models for preparing students' real-life implementations and decreasing their anxiety levels.

Students in the control group had higher state anxiety levels before practice on humans than before practice. This finding confirms those of earlier studies (Kleehammer et al., 1990; Sabuncu, 1994; Sabuncu et al., 2008) that revealed that students feel more stress before practicing skills such as intramuscular and subcutaneous injection on humans. This result showed that models -which are frequently used in nursing education- can not prepare students for real practice, thus students feel anxiety because of the chance of harming patients or making a mistake. The state anxiety levels of students in the experimental group after practice on the simulator are lower than those before practice on the simulator and on humans. This result confirms the literature that concludes that simulation software decreases anxiety levels by providing an effective and productive learning experience and enabling active participation in the teaching-learning process (Alinier et al., 2004; Tsai et al., 2004; Abdo&Ravert, 2006; DeCarlo et al., 2008; Baxter et al., 2009; McCaughey&Traynor, 2010). Because of using simulation software only once in experimental group was thought state anxiety levels before practice on humans are higher than before and after practice on the simulator.

The results indicated that students in the control group had lower trait anxiety level before practice on humans than before and after practice; whereas those in the experimental group had lower trait anxiety level than after practice and before practice on humans. Before practice in both the control and experimental groups had higher trait anxiety level than after practice and before practice on humans. Erol et al. (1998) revealed in Turkish Mental Health Profile report that teens who were at 18-19 age had middle trait anxiety level (55,3±6,7). When examined both group's trait anxiety levels in current study, it could be said that this result is expected in terms of reflecting anxiety level of young population in community.

Results present that simulation software is an effective method for learning and improving psychomotor skills and decreasing anxiety in nursing education. According to the results, support intravenous therapy and drug administration simulation software with video and more original pictures and generalize simulation software in nursing education could be suggested.

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