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Attitudes and perception of baccalaureate nursing students toward educational simulation

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Abstract: *Background*: Simulation can produce highly qualified professionals, however, it can also be perceived as stressful and frustrating by the nursing students. *Purposes*: This study was to identify the attitudes and perceptions of Jordanian nursing students toward simulation as an educational strategy, to investigate whether certain students' characteristics affect their attitudes and perceptions, to assess for differences in the attitudes and perceptions toward simulation between the different year levels of students, and to identify the important predictors of students' attitudes and perceptions toward educational simulation. *Method*: A descriptive correlational design was used with a convenience sample of 413 Jordanian nursing students. The Arabic translated version of KidSIM ATTITUDES scale was used. *Results*: The total attitude score was encouraging with significant differences between first, second and third year students. Post hoc analyses showed the lowest attitude mean score occurring in the second year nursing students. Using linear regression analysis, prior experience in an ICU or CCU was the only significant predictor of the student's attitudes and perceptions toward simulation. *Conclusions and implication for practice*: Reinforcing the teamwork approach during the students' early phases of their course of study, and incorporating simulation into later phases can promote knowledge development, skill acquisition, and self-confidence.

ABOUT THE AUTHOR

Besher Gharaibeh is an assistant professor in the Faculty of Nursing, Jordan University of Science and Technology (JUST), Jordan. He has a PhD in Nursing from University of Kansas Medical Center (KUMC), United States, and his research interests are adult health nursing. Part of this interest is about using the different strategies of teaching and education. He worked in the simulation lab at KUMC and currently work as the head of the simulation committee at JUST. He worked in both clinical and educational settings and held various administrative positions in the Faculty of Nursing at JUST. He received two research Awards (Ruth O. McKibben Alumni Research Award, and Valmi Delfino De Sousa Award of Excellence).

PUBLIC INTEREST STATEMENT

This article is about the use of simulation to improve education. To improve the student's abilities to provide health care to the patients, nursing students need to learn and practice how to use the knowledge they obtain in class and use it to care for the patients. However, when working with real patients the students may face challenges, risks, and restrictions. So, simulation helps by providing a learning environment that contains no risks. But, in simulation, the students work with manikins instead of real patients. Also, simulation is composed of many stages, so students may see simulation as boring and stressful. So, this article aims at discussing and understanding how the students see simulation and how their experience in simulation changes with time. This would help in building educational programs that maximize the benefit of using simulation in education and decrease simulation disadvantages.

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Subjects: Educational Research; Technology in Education; Nurse Education & Management

Keywords: simulation; education; attitudes; nursing students

1. Introduction

Simulation is a potentially powerful teaching approach that engages students and requires them to use critical thinking and clinical reasoning, and provides an opportunity for reflective learning and integration of the student's knowledge (Peisachovich, Gal, & Johnson, 2016). There are different levels of simulations usually used; high, moderate, and low fidelity simulation (World Health Organization, 2011). High level of fidelity of simulation means closer resemblance to the actual clinical setting (World Health Organization, 2011). Simulation is a technique, not a technology, that is used to create a guided experience to help in acquiring necessary skills and ensure patients' safety and well-being (Lateef, 2010).

Currently there is an increased interest in simulation as an approach to teach important psycho-motor and critical thinking skills to nursing students (Leigh, 2008; Norman, 2012). This increasing interest in simulation is attributed to the idea that educational curricula should adapt to the changing needs of learners and the need to stay updated with the most current educational strategies (Norman, 2012). In 2011, the World Health Organization (WHO) reported that simulation can assist in education because students respond and learn best when the learning environment is safe, supportive, challenging, and engaging. Moreover, simulation was found to have positive influence on various educational outcomes such as self-efficacy, knowledge acquisition, and clinical performance (Kaakinen & Arwood, 2009; Norman, 2012).

Although the literature reported simulation had a positive impact on various aspects of teaching and learning (Cant & Cooper, 2010), some nursing students perceived simulation as not matching the actual clinical practice, stressful environment and uncomfortable way to learn (DeCarlo, Collingridge, Grant, & Ventre, 2008; World Health Organization, 2011). Such negative perceptions may impede the process of learning and influence students engagement and the fidelity of simulation (DeCarlo et al., 2008). Moreover, McCallum (2007) indicated the literature still shows that the conventional laboratory clinical placement is still superior to simulation in terms of teaching clinical skills. In addition, poor planning, organizing, and executing simulation can cause frustration to the students and failure to meet the learning objectives (Peisachovich et al., 2016).

To attain the benefit of simulation, students should understand the ground rules for simulation so that they maintain the motivation and self-direction during the activity (Jeffries, 2005). After reevaluating simulation in nursing, Schiavenato (2009) indicated that nurses narrowed their understanding of simulation as a concept to the degree where simulation was sometimes perceived only as operating the human patient simulation. Thereafter, the examining student's perception toward different scenarios and simulation methods were important (Tosterud, Hedelin, & Hall-Lord, 2013). Addressing students' perceptions and attitudes involves assessing their mental state, beliefs, feelings, values, and emotions toward simulation is important because this assessment helps evaluate their readiness to engage in simulation and helps in preparing effective teaching plans for the nursing students in a clinical setting (Ogilvie, Cragg, & Foulds, 2011). Basically, values, attitudes, and beliefs should be a basis for successful simulation (Kaakinen & Arwood, 2009).

The popularity of simulation as an educational technique has noticeably grown in Jordan (Tawalbeh & Tubaishat, 2014). Various schools of nursing have incorporated simulation into their educational strategies where the majority of nursing faculties have started incorporating simulation into clinical students' training (Akhu-Zaheya, Gharaibeh, & Alostaz, 2012). However, simulation training in Jordan focuses on skills practicing but lacks case study scenarios. This necessitated exploring and identifying nursing students' attitudes and perceptions toward simulation.

The literature has extensive investigation on how simulation lab training impacted the quality of students' outcomes in terms of their clinical competencies. However, in Jordan, studies exploring how students' attitudes toward simulation affect their clinical performance are scarce. Additionally, exploring students' attitudes and perceptions can provide an insight into their readiness to perform simulations because attitudes and perceptions exert a direct and dynamic influence on their responses, define how they see situations, and define how they behave toward simulation (Pickens, 2005).

In summary, Simulation is an educational strategy that can be used to support the process of clinical education. Simulation can help in improving students' self-esteem through provide an opportunity to practice in a risk-free environment. However, simulation, sometimes perceived inferior to clinical practice because the majority of the students during simulation never forget that they are working with a manikin. So, students' attitudes and perceptions toward simulation are important because they affect how the students handle the simulation and affect the level of fidelity of simulation. This study was to address the development of the attitudes toward simulation, and address the factors that can influence the attitudes and its development throughout the nursing program. The purposes of this study were to identify the attitudes and perception of Jordanian nursing students toward simulation as an educational strategy, to investigate whether certain students' characteristics affect their attitudes and perception, to assess for differences in the attitudes and perceptions toward simulation between the different levels of students, to correlate the attitude and perception of the nursing students with demographic variables, and to identify the important predictors of students' attitudes and perceptions toward educational simulation.

2. Literature review

Various studies were conducted to assess different aspects of a student's perception and attitude toward simulation. For example, Leonard, Shuhaibar, and Chen (2010) indicated there was a lack in the studies assessing the benefits and learning opportunities in the intra-professional simulation. They then conducted a qualitative study on a sample of 48 undergraduate students to assess their perceptions toward intra-professional high fidelity simulation. Three themes emerged in the students' responses: role recognition and differentiation, adaptation to team environment, and professional solidarity. The authors indicated there were differences in perceptions within these themes between the different levels of the nursing students. They recommended further investigation of the use of intra-professional high fidelity simulation for students in health professional programs.

While Leonard et al. (2010) focused on the perceived benefit of simulation, the Ogilvie et al. (2011) qualitative study assessed the perception of nursing students on the process and outcomes of the simulation experience. A sample of 10 students was recruited and interviewed to assess their perceptions of the simulation experience and its influence on their clinical learning. The analysis supported two themes of outcomes: knowledge development and skill acquisition, and confidence. However, the perception of the realism of the simulation was recognized as an important factor in simulation prompting concerns that a lack of reality could lead to incomplete care. Also, participants reported being more focused on the physical assessment rather than using the holistic approach during simulation due to a lack of non-verbal cues.

Wotton, Davis, Button, and Kelton (2010) also addressed the importance of a simulation's fidelity by conducting a cross-sectional quantitative study to assess nursing students' perceptions toward implementing high fidelity simulation into an existing clinical course. The authors indicated that retention and reinforcing a student's knowledge can be affected by perception of fidelity and enjoyment of simulation. The participating students were asked to complete an evaluation form after the end of the simulation which included 11 Likert-type questions and three open-ended questions. The authors found that maintaining a high degree of fidelity to actual clinical situation in simulation enhanced students' cognitive and associative conditions, and improved their skills. However, the majority of the students in this study reported feeling confused and lost at some point during the simulation.

The previous studies demonstrated that perception toward simulation can be affected by the type of simulation, the year level of the students, the degree of fidelity, and the enjoyment in simulation. Tosterud et al. (2013) conducted a study to assess for other factors that may influence perception toward simulation. The authors assessed the influence of the method of scenarios played during simulation on nursing students' perceptions. They also examined whether the educational level of the students (i.e. first, second, third, or fourth year) affected their perceptions. A sample of 86 participants of the different levels was used and students were randomly divided into three groups. Each group worked with a high fidelity patient simulator, a static mannequin or a paper/pencil case study adapted to their level. The authors found that the method of simulation affected the degree of satisfaction where low fidelity simulation groups had a higher level of satisfaction but the educational level did not influence their perceptions. The authors attributed the high satisfaction in paper/pencil simulation to the students' familiarity with this method; i.e. the complexity of simulation affected the perception. The authors denoted that the way the students perceived the simulation method ultimately improved their progression in the program.

Sigalet, Donnon, and Grant (2012) indicated that using a standardized tool to assess attitudes and perceptions can provide guidance for the delivery of a team training curriculum, however, assessing perception toward simulation as a learning modality is usually missing. Their study created the KidSIM Attitude Towards Teamwork in Training Undergoing Designed Educational Simulation (ATTITUDES) scale that assesses students' attitudes and perceptions toward team training and the use of simulation. A quasi-experimental study and a sample of 196 of both medical and nursing students were used to test the psychometric properties and to assess the construct validity of the scale.

Although simulation was generally considered to have a positive impact on various aspects of education, DeCarlo et al. (2008) indicated nurses had concerns about the value of simulation-based education. Thus, they surveyed 523 nurses to address their perceptions regarding simulation and assess the relationship of these perceptions with three demographics: prior experience with simulation, years of clinical experience, and area of employment. The authors found that nurses perceived the presence of many difficulties which differed based on demographics, e.g. being in a stressful environment, using new equipment, and training with non-nurses. Some nurses even described simulation as a waste of time.

Perception toward simulation was not the only area of debate regarding the effectiveness of simulation. For example, Akhu-Zaheya et al. (2012) in their quasi-experimental study found that high fidelity simulation and traditional teaching methods had the same effect on knowledge retention and acquisition of knowledge in a BLS class. These findings were congruent with those of Blum and Parcells (2012) in their comprehensive literature review. Blum and Parcells stated that the literature does not yet support simulation over other approaches to teaching in nursing.

In summary, the assessment of a student's attitude and perception toward simulation is necessary as they influence the outcome of simulation. The complexity of the relationships between attitude and perception, the simulation, and the outcome of simulation is evident and influenced by various factors such as fidelity of simulation, type of students, and type of scenario. Even though simulation is known to positively impact various learning outcomes, simulation, as an educational technique, has its difficulties and barriers, and can be perceived as a confusing and stressful learning event.

3. Methods

A descriptive correlational design was used to identify baccalaureate students' perceptions and attitudes toward simulation among students' with different year levels. Statistical Package for the Social Science (SPSS) Version 20 was used to analyze the data. Descriptive statistics including mean (M), standard deviation (SD), and percentages (%) were used to describe the sample characteristics and to assess the level of the student's attitudes and perceptions toward educational simulation.

ANOVA and *t*-test were used to assess if there were any statistically significant differences in student's attitudes between the different year-levels among these students. Finally, regression analysis was done to explore the significant predictors of nursing student's attitudes toward educational simulation.

3.1. Study sample

A convenience non-probability sampling technique was used. This sampling technique was used because the students followed the predefined simulation schedule and because of the unfeasibility to alter the schedule for the sake of the study. The eligibility criteria to participate in this study included students actively enrolled in the undergraduate nursing program, 18 years old or older, able to read and understand Arabic, students from the four year levels (i.e. 1st, 2nd, 3rd, and 4th year students) were included in the study. The program curriculum dictates that the first exposure to simulation is in the second year of the program, and students continue to attend simulation for the next years. Students attend one simulation per semester. Students were asked if they have previous simulation experience or not to account for the effect of previous engagement in educational simulation, that may have occurred elsewhere, on the level of the attitudes and perceptions. Because students attend one simulation per semester, which meant higher year's level indicated more number of simulations attended. Enrolled International nursing students were excluded from the study to prevent bias due to language differences.

The total sample size of the nursing students was (*N* = 413) participated in this study. The mean age of the students was about 21.5 years (SD = 3.4) with approximately 37% male (*N* = 154). The number of students in each cluster was about even. The first year student cluster composed about 22% (*N* = 93) of the whole sample, the second year student cluster composed about 23% (*N* = 97), the third year student cluster composed about 24% (*N* = 101), and the fourth year student cluster was the biggest cluster composing about 29% (*N* = 122) of the sample. The majority of the students in the sample (*N* = 344) had no prior work experience and were enrolled in the baccalaureate nursing program (*N* = 408), whereas only five participants were enrolled in the bridging program. Sixty-seven participants (16.2%) had an average of 1.6 weeks of experience in an ICU or CCU. Only two participants of those who had work experience did not have any experience in a critical or intensive care unit. Moreover, those who had prior simulation experience composed a small fraction of about 9% (*N* = 28) of the whole sample. However, a fair percentage of about 25% (*N* = 103) of the participants reported previous team-based learning. In most of the cases (*N* = 47), this team-based experience was reportedly acquired in workshops (See Table 1).

3.2. Setting

This study was conducted in a Faculty of Nursing in the North of Jordan during September 2014 to January 2015. Currently, the total number of students enrolled in the different programs offered in the Faculty of Nursing is about 2,300 graduate and undergraduate nursing students from 11 nationalities. The majority of the students enrolled in the program are Jordanians with a small portion of non-Arabic speaking natives. The simulation curriculum requires the students to attend two high fidelity simulation sessions per semester based on pre identified schedule and time table. Each session is composed of a case scenario that takes about 1 h. These scenarios are basically medical-surgical in nature. The simulation outline (i.e. briefing, case, and debriefing) is the same for the different levels of students, with various cases depend on the course requirements. The simulation schedule insured that the students discussed the case in the corresponding theory course before working with it in the simulation lab.

3.3. Research tool

A self-administered questionnaire was used for data collection to achieve the purposes of the study. The questionnaire was completed in approximately 15 min. It was composed of two parts: the KidSIM ATTITUDES questionnaire and the socio-demographic sheet. These two parts were bundled into one study package for the convenience of the participants. The KidSIM ATTITUDES questionnaire was developed by Sigalet et al. (2012). The KidSIM questionnaire was a 30-item questionnaire

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Table 1. Sample characteristics; mean (M); standard deviation (SD); and percent (%) (N = 413)				
Variables	**Range**	**M (SD)**	**N**	**%**
Age (Years)	18–52	21.5 (3.4)		
Gender				
Male			154	37.3
Female			259	62.7
Student year level				
First year			93	22.5
Second year			97	23.5
Third year			101	24.5
Forth year			122	29.5
Nursing experience	0–18	.74 (2.33)		
Program type				
Bridging			5	1.2
BSN			408	98.8
Prior simulation experience				
Yes			38	9.2
No			375	90.8
Length of simulation experience (in months)	0–36	.34 (2.09)		
Length of critical care unit experience				
None			346	83.8
1 week			4	1.0
2 weeks			6	1.5
3 weeks			5	1.2
1 month			23	5.6
>1 month			29	7.0
Grade point average	50.3–94.8	73.7 (8.0)		
Prior experience in teamwork				
Yes			103	24.9
No			310	75.1
Type of teamwork experience				
Workshop			47	11.4
Lecture			22	5.3
Else			34	8.2

developed as a standardized measure to assess a student's perceptions of and attitudes toward educational simulation and the use of simulation as a learning modality. The KidSIM ATTITUDES scale was developed using a compilation of concepts taken from the literature and preexisting scales. Factor analysis, using principal components analysis with varimax rotation, was conducted to examine the psychometric properties and to assess the construct validity of the scale. The factor analysis of the instrument carried out by the authors supported the presence of five factors: communication, opportunities of IPE, relevance of simulation, roles and responsibilities, and situation awareness.

The scale was reported to have a high level of internal consistency reliability (Cronbach's alpha = .95). The scale is a Likert-type scale with options that range from 1 = strongly disagree, 2 = agree, 3 = neutral, 4 = agree, and 5 = strongly agree; producing a range score between 30 and 150. No items on the scale required reverse coding (Sigalet et al., 2012).

For the purpose of this study, The KidSIM ATTITUDES questionnaire was translated and back translated by a panel of four doctoral prepared nurses and four laypersons who are competent in both Arabic and English languages. This panel described the translated version as a valid scale. Back translation is a standard procedure for translating a research questionnaire from English to other languages (Kim, Schwartz-Barcott, Holter, & Lorensen, 1995). The principal investigator introduced the questionnaire to 20 baccalaureate nursing students to evaluate its clarity. Rewording and amendments were made based on the panel's and students' suggestions.

The internal consistency reliability estimate for the translated scale was determined using Cronbach's alpha. A coefficient of .70 or higher was considered evidence of internal consistency (Tavakol & Dennick, 2011). The reliability testing indicated that the translated scale had a strong internal consistency (Cronbach's alpha = .93). The correlational matrix showed moderate to strong correlations between the total score of the scale and each of the five subscales; where the correlation between the subscales was lower than the correlation of each subscale with the total scale score.

The participant demographic characteristics measured in this study were self-reported gender, age in years, monthly income, number of years of formal education completed, work status, marital status, grade point average, previous exposure to simulation, and other demographics.

3.4. Data collection procedure

Research assistants (RAs) were trained in data collection procedures. They were instructed to approach the students toward the end of their classes. The RAs approached students from different year levels. The RAs provided a brief description of the study and invited eligible students to participate. The students who agreed to participate received a questionnaire package which included a cover letter containing a summary of the study, the participant's rights, and the researcher's contact information. In the cover letter, potential participants were requested to complete the questionnaire and return it to the RAs.

3.5. Ethical issues

The study received approval from the Faculty of Nursing Research Committee for Protection of Human Subjects and from the Institutional Review Board at JUST. The confidentiality of the participants was protected. Participation in the study was completely voluntary. No benefits were given to the students for participation. No physical, psychological, social or economical harm or risk affected the participants, since the data collection process primarily relied on a descriptive noninvasive questionnaire.

4. Results

4.1. Students' attitudes and perceptions toward simulation and its correlates

The level of the student's attitude and perceptions toward educational simulation was encouraging with a total attitude score mean of 131.2 (SD = 14.4) on the KidSIM scale which has a possible range of 30–150. Out of the whole sample, only two cases reported an attitude that fell under the scale's average. These two cases reported total scores of 30 and 68 forming a total percent of .2% of the whole sample. The means of the five subscales that composed the KidSIM were well above the possible mean scores of each of those subscales indicating encouraging performance on all those subscales (See Table 2).

Pearson *r* and Spearman *rho* correlation tests were done to assess for significant correlations between students' attitudes and perceptions and their demographic factors. Results showed that significant positive correlation existed between attitude and a student's year level ($r = .102$; $p < .05$), prior simulation experience ($r = .106$; $p < .05$), experience in critical care units ($r = .155$; $p < .05$), prior teamwork experience ($r = .097$; $p < .05$), and type of teamwork experience ($r = .097$; $p < .05$).

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Table 2. Students' performance on the five subscales of the KidSIM questionnaire							
Subscale	Number of items	Subscale potential range	Subscale potential mean	Actual minimum score	Actual maximum score	Mean (SD)	Median
Opportunities of IPE	7	7–35	21	7.00	35.00	30.82 (3.85)	31
Relevance of Simulation	6	6–30	18	6.00	30.00	25.76 (3.43)	26
Communication	8	8–40	24	8.00	40.00	35.19 (4.57)	36
Roles and Responsibilities	6	6–30	18	6.00	30.00	26.58 (3.14)	27
Situational Awareness	3	3–15	9	3.00	15.00	12.93 (2.02)	13

4.2. Student's characteristics that influenced the attitudes and perceptions toward simulation

ANOVA and t-test were used to assess the differences in the students' attitudes and perceptions toward educational simulation with regard to the sample's demographics. ANOVA analyses showed that student's attitudes and perceptions differed significantly between the different student's year levels ($F = 5.03$; $p < .05$). Post hoc analyses using LSD comparison revealed that the mean attitude score of the second year students was significantly lower than the first, third, and fourth year students (See Figure 1 for the mean scores). However, there was no significant difference in the other comparisons of students' year levels (See Table 3).

The t-test showed that students with prior simulation experience had significantly ($t = 2.7$; $p < .05$) higher mean attitude score ($m = 135.7$) compared to those who did not have prior simulation experience ($m = 130.8$). Moreover, the mean score for students with prior engagement in teamwork ($m = 134.1$) was significantly higher ($t = 2.8$; $p < .05$) compared to those without prior engagement ($m = 130.3$). However, there was no significant difference in the level of attitude based on the type of teamwork experience.

4.3. Predictors of students' attitudes and perception toward simulation

Multiple linear regression analysis was done to identify the significant predictors of the students' attitudes and perceptions. Regression model was significant ($F = 3.09$; $p < .05$; $r^2 = .037$). Controlling

Table 3. Post hoc analysis table to assess for significant differences in mean attitude and perception scores between the students' year levels			
Year level (i)	Mean score	Year level (j)	*p*-value
First year	131.2	Second year	.030*
		Third year	.170
		Fourth year	.414
Second year	126.7	First year	.030*
		Third year	.000*
		Fourth year	.002*
Third year	133.9	First year	.170
		Second year	.000*
		Fourth year	.528
Fourth year	132.7	First year	.414
		Second year	.002*
		Third year	.528

*$p < .05$ level.

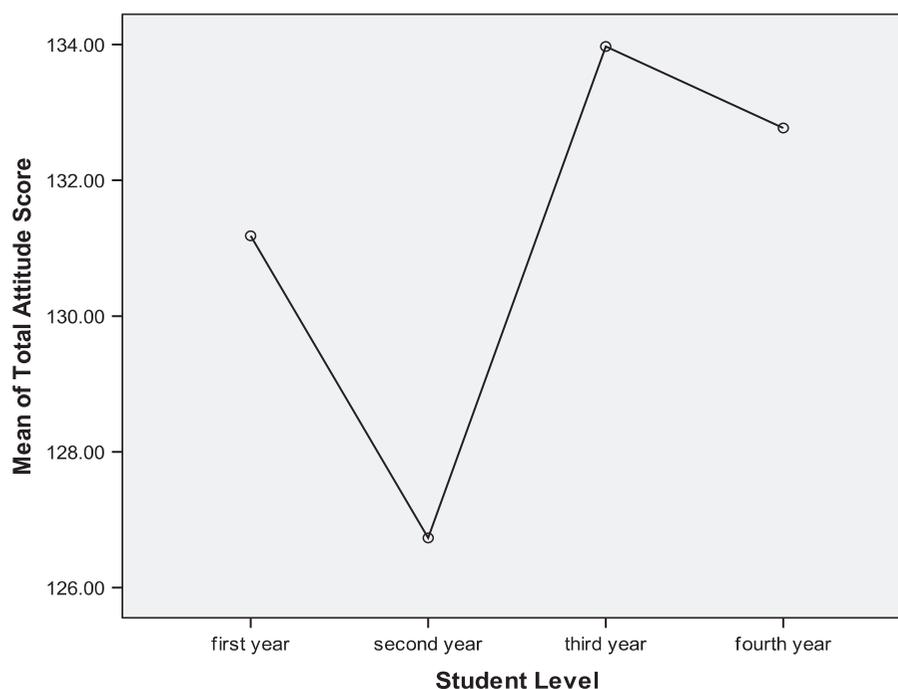**Figure 1. Perceptions and attitudes toward educational simulation mean scores in the four student levels.**

Table 4. Standardized multiple regression analysis to assess predictors of student's attitudes

Factor	B	F
Student's year level	.499	.761
Prior sim. experience	−2.689	−1.069
Experience in CCU	1.129	2.258*
Prior teamwork experience	−.371	−.106
Type of teamwork experience	.901	.562

Dependent variable: Total attitude score.

*$p \le .05$ level.

for the student's year level, prior simulation experience, prior teamwork experience, and type of teamwork experience; the only significant predictor of attitude and perception ($B = 1.12$; $p < .05$) was prior experience in an ICU or CCU. This accounted for about 4% of the variability of the attitudes scores (See Table 4 for the regression analysis).

5. Discussion

Searching the literature yielded very few studies that focused on assessing perception and attitudes toward simulation. The majority of the studies cited in the literature assessed the effect of simulation on various psychological outcomes (Akhu-Zaheya et al., 2012; Gordon & Buckley, 2009; Tawalbeh & Tubaishat, 2014).

5.1. Students' attitudes and perceptions toward simulation

In this study, the Jordanian nursing students' attitudes and perceptions were generally in favor of simulation. In addition, the majority of students showed a high level of understanding and optimistic attitude toward simulation, where their scores were encouraging on all five factors that composed the attitude. There were no previous studies in Jordan that assessed the view of the nursing students of simulation. The scarcity of studies about simulation in general and simulation specifically in Jordan could be attributed to the fact that simulation is not implemented in most, if not all, of the nursing schools in Jordan. Currently, the interest in simulation and integration of simulation into

nursing curricula is growing (Sanford, 2010). However, in Jordan, the implementation of simulation is limited since few nursing schools have dedicated space to serve as simulation labs and even fewer schools have simulation-trained staff. Searching the literature produced very few studies in Jordan that addressed simulation. For example, Akhu-Zaheya et al. (2012) and Tawalbeh and Tubaishat (2014) used experimental design to study the effect of simulation on BLS and ACLS training, respectively. They found that simulation was more effective than the traditional use of Power Point presentations in improving a student's knowledge and confidence. These two studies support our notion that simulation is not nationally used as an educational strategy in that their intervention focused on only one nursing psychomotor skill (Table 4).

5.2. Student's characteristics that influenced the attitudes and perceptions toward simulation

In this study, attitudes and perceptions toward simulation were better among the senior nursing students, those who had previous simulation experience, and those who engaged in teamwork. The findings of this study were similar to the findings of Sigalet et al. (2012) who found that the use of team-based learning improved perceptions of and attitudes toward simulation-based curriculum. Our findings can be attributed to the fact that the nursing students start their educational simulation experience as early as the first semester of their second year. Not only do their simulation experiences increase with time, but also their involvement in teamwork activities increases. Moreover, other studies concluded that senior students showed a positive perception and attitude toward high fidelity simulation because simulation improved skill acquisition and knowledge development which ultimately increased the student's self-confidence (Ogilvie et al., 2011; Wotton et al., 2010).

This study demonstrated that first, third, and fourth year students' attitudes were not significantly different, but their attitudes were significantly higher than those in the second year. The difference between first and second year students' attitudes can be primarily due to the fact that first year students do not participate in simulation while the second year is considered the simulation entry phase. This notion is consistent with other findings in the literature, such as the World Health Organization (2011) report indicating simulation might be confrontational for students and not always a comfortable learning approach. Moreover, DeCarlo et al. (2008) showed that simulation was considered a stressful environment, and training with people from other professions was a barrier to participate in simulation. Tentatively, second year students anticipated simulation as an enjoyable and pleasant new experience, but once they entered simulation as a course requirement, they started feeling stressed and frustrated, and perceived simulation experience as a confrontational learning approach (DeCarlo et al., 2008; World Health Organization, 2011).

Results showed there were significant differences between the attitudes of the second year students versus third and fourth year students. These findings are congruent with Leonard et al. (2010) and Ogilvie et al. (2011) who postulated that simulation enhanced students' confidence especially for third and fourth year nursing students. In addition, our result was compatible with a study that used a staggered timing model which reported that simulation achieved a fast effect then maintained its effect (plateau effect) (Meyer, Connors, Hou, & Gajewski, 2011). A similar pattern was seen in our study where attitudes and perceptions toward simulation significantly increased then plateaued. These findings should raise a question about the variables that correlate with the sustainability of the effectiveness of simulation. Further research might be useful in this regard.

In this study, the attitudes and the perceptions were higher among senior students, those who had previous simulation experience, and those who engaged in teamwork. As Sigalet et al. (2012) indicated, an assessment of a student's perceptions of and attitudes toward their needs is essential to prepare the educational curriculum and set its objectives based on their learning needs to achieve the required learning outcomes. Our findings indicate that students' learning needs can be best met

by integrating simulation and teamwork-based education into nursing curricula immediately during the course of study and introducing simulation into later stages of the curriculum. Implementing simulation at the time when the students' perceptions and attitudes are well-established can help in improving the outcomes of this educational strategy.

5.3. Predictors of students' attitudes and perception toward simulation

Using the regression analyses, prior experience in an ICU or CCU was the only significant predictor of a student's perception of and attitude toward simulation. This finding is congruent with Sigalet et al. (2012) and Leigh (2008) who reported that nursing students had a lower attitude score compared to medical and respiratory therapy students. The authors justified that by noting nursing students had less experience in an ICU or CCU. In addition, lack of simulation experience was associated with higher levels of incompetence and unconfidence. There were no studies that explained the effect of ICU or CCU experience on attitudes toward simulation, however, we hypothesize this effect was caused by exposure and work with advanced medical technology in these units which may promote the readiness to simulation. Further research on this topic is recommended.

The regression model in this study accounted for a small portion of the variance in the attitudes scores. We hypothesize this result is due to excluding other variables that may have influenced the attitudes and the perceptions. DeCarlo et al. (2008) indicated in their study that not only were the attitudes toward simulation influenced by numerous factors, but the perception of these factors was not consistent. Also, an interaction effect between the studied factors may have existed and influenced the study findings. The descriptive statistics showed that the variance for some of the study variables, such as prior nursing experience and the length of the simulation experience, was low. Kutner, Nachtsheim, and Neter (2004) indicated that low variance can result in omitting important explanatory variables from the regression model.

6. Limitation

Certain limitations in this study were identified. The KidSIM ATTITUDES scale is used in western cultures and may lack the sensitivity to measure the same construct in Jordanian culture. Future studies should be carried out to investigate the validity of the translated version of the scale. In addition, the study was conducted in one educational setting and did not include nursing students from other sectors. Also, using a convenience sampling technique may limit the generalizability of the findings to the population investigated. Variables that might have influenced the results of this study, such as familiarity with the simulation, simulation environment, and level of stress, were not included in this study. Even though prior simulation experience was a significant predictor, only 38 participants reported that they had prior simulation experience in the study which may limit the generalizability of the result.

7. Conclusion and implications

This study showed that first year students' had high perception toward simulation, indicating that they possess readiness to simulation, which can assist and simplify the implementation of educational simulation. This assists in shifting from using a conventional educational approach to the use of simulation approach, reinforcing the teamwork approach during the early phases of their course of study, and incorporate simulation into later phases. Second year students had lower level of attitudes and perceptions because at this level the students attend their first simulation. This first time experience could be a source of stress. The attitudes of the third year students showed improvement as their experience increased. However, the fourth year students showed similar level of attitudes compared to the third year students, which indicate the plateau effect of simulation.

This study shed light on factors that affect students' perceptions and attitudes toward simulation. Recognizing these factors can help in implementing a student-centered approach in their teaching–learning process where students' readiness to learn can be assessed to determine their educational needs. Adopting a student-centered approach in simulation can promote knowledge development, skill acquisition, and self-confidence.

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8. Recommendations for research

In education, usually various levels of scenarios and fidelity in simulation are conducted. Studies usually assess the relationships between a certain type of simulation on the outcomes of interest such as self-efficacy, knowledge, perceptions, and attitudes. However, little is known about how combining two or more levels of simulation will affect these outcomes. Further research is needed to explore for the presence of interactions when applying multiple levels of simulation, and how the processes of influence work when implementing more than one level of simulation to the students. Also, further research is needed to compare between the attitudes the students reported and the actual practices they performed during simulation.

Authors' contributions

This paper has been approved by all authors, and all authors agree to submit of the manuscript solely to your Journal.

Besher Gharaibeh, Issa Hweidi, and Ahmed Al-Smadi were involved in this manuscript including: study conception/design, data collection/analysis, writing up manuscript, critical revisions for important findings, discussion and intellectual contents.

This study is an empirical research study consists of an article on original research that has not been previously published in its current format.

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