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The Effect of Simulation-Based Learning on the Clinical Competency of 2nd Year Perpetual Help College of Manila Nursing Students in Intramuscular Injection: A Quantitative Study

Vargas, Ruby D.
rdovperps@yahoo.com

Edrada, Florenz Nicole M.
roshirmaedumo@gmail.com

Tan, Darwin.
darwintan03@gmail.com

Elas, Rhea Valerie I.
felijah003@gmail.com

Guimbongan, Zoe Leigh L.
lucasguimbonganzoeleigh@gmail.com

Fernandez, Elijah A.
luisjanssen13@gmail.com

Dela Torre, Francy Shane Trixie S.
elasrheavalerie@gmail.com

Tee Sy, Luis Janssen B.
fst14.delatorre@gmail.com

Dumo, Roshir Mae T.
nicsedrada@gmail.com

1 – University of Perpetual Help System Manila, Philippines

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Abstract

Simulation-Based Learning (SBL) has been recognized as an effective strategy for bridging the gap between theoretical knowledge and clinical skill in nursing education, particularly for procedures such as intramuscular (IM) injections. This quantitative correlational study examined the effect of SBL on the competency, confidence, and clinical performance of 164 second-year nursing students at Perpetual Help College of Manila. Data were collected using skills assessment checklists and questionnaires, with primary endpoints focused on competency and confidence, and secondary endpoints on clinical internship performance. Results showed a significant improvement in IM injection competency, with mean scores increasing from 70.55 pre-simulation to 85.30 post-simulation ($p < .001$), and students reported strong agreement that SBL enhanced their confidence, competency, and preparedness for clinical practice. Age influenced perceived clinical performance ($p = .003$), while performance scores were consistent across gender and section. Students also noted reduced error rates and improved accuracy due to SBL. These findings demonstrate that SBL is an effective educational intervention that promotes safe, accurate, and confident

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performance of IM injections and supports its continued integration into the nursing curriculum to develop practice-ready, competent nurses.

Keywords: *Simulation-Based Learning, Intramuscular Injection, Nursing Education, Clinical Competency, Student Confidence*

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1. Introduction

Simulation-based learning (SBL) has emerged as one of the most popular approaches in nursing education as a methodology to fill the gap between theory and practice. The available literature shows that SBL is a safe and controlled setting where students will be able to perform all procedures without risking patient safety. Unal and Alkan (2019) note that SBL is efficient in bridging the gap between classroom and real-world clinical competencies, whereas El-deen et al. (2020) point out that SBL contributes to increasing student confidence, retaining skills, and mastering the technical aspect. Such implications are especially applicable to the procedures that involve intramuscular (IM) injections since they need to be precise, follow the five rights of medication administration, and make good clinical decisions to avoid complications.

IM injections are also extensively utilized in delivering drugs because they are absorbed quickly and can be released in a sustained manner (Kozier and Erb, 2019; Frandsen et al., 2021). They require the correct location determination, examination of the patient, and severe adherence to safety measures, including the Five Rights of Medication Administration (Patel et al., 2022). Moreover, it cannot be done in one step since it includes several steps, such as preparing medications, choosing the right needles, and locating anatomical landmarks to implement such methods as the Z-track technique to avoid nerve damage, pain, or tissue destruction (Francis et al., 2022). The US Centers for Disease Control and Prevention (2024) guidelines also include age-related recommendations regarding the needle size, injection sites, and the procedure method, which further confirm the complexity of the IM injection safety.

Although IM injection is procedurally significant, the traditional clinical internship is not always a good venue in terms of providing practical experience. The problem of limited patient access, safety issues, and inconsistent clinical exposure can potentially hamper the process of student building of confidence, mastery, and competence. These limitations make it questionable that nursing students are well equipped to combine theoretical concepts and psychomotor skills, especially in those procedures that have a high level of patient safety consequences. Despite numerous SBL applications used in most nursing schools, there is a lack of knowledge regarding its exact impact on the clinical competence of second-year nursing majors to conduct IM injections in the Perpetual Help College of Manila environment.

This gap highlights the importance of investigating the level of SBL development of the knowledge, technical skills, and confidence, and compliance with safety procedures needed to become a competent IM injection administrator. The gap needs to be addressed owing to the fact that IM injections are core nursing competencies and insufficient training may result in medication errors, poor patient outcomes, and low student preparedness to clinical practice.

Therefore, this quantitative study aims to determine the effect of simulation-based learning on the clinical competency of second-year Perpetual Help College of Manila nursing students in performing intramuscular injections. Specifically, it evaluates how SBL influences students' knowledge, procedural accuracy, confidence, and compliance with the Five Rights of Medication Administration. Findings from this study are expected to inform instructional strategies, enhance the quality of nursing education, and reinforce patient safety through improved competency development.

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2. Methodology

2.1. Study Design

The research design that was used in this study was a quantitative correlational research design, which was aimed at determining and analyzing the correlation between the performance of nursing students in intramuscular (IM) injections during simulation-based learning and the final outcomes in the clinical internship. The independent variable was how simulation-based learning influenced the intramuscular injection skills and the dependent variables were competency, confidence and clinical performance of students. This design enabled the researchers to quantify associations without the need to control variables but rather the researcher would be interested in the existing correlations among the study subjects.

2.2. Participant Criterion and Population of the Study.

Students of Perpetual Help College of Manila were taken as the population of this study, comprising 164 students of the second year level who were pursuing a nursing course. Inclusion criteria involved active students in the second year of nursing enrolled in a program that involved mandatory foundational nursing classes and participants who were to have clinical rotations that involved intramuscular injections. Students with prior professional experience of administering IM injections or not willing to give informed consent were not included in the study. The proper sample size was calculated by means of the Slovin formula, and random sampling was used to choose the participants thus representing the population in an unbiased way.

2.3. Sources of Data

The data were collected through observations of the participating nursing students (primarily).

- Checklists of skills assessment, which considered the performance in intramuscular injection, which included preparation, technique, interaction with patients, and post-procedure.
- Questionnaires, which collected feedback of the students on their experiences with simulation-based learning, in terms of confidence, perceived effectiveness, and self-efficacy.

The secondary data were collected using research published data, academic journals and clinical guidelines to facilitate the context and methodology of the study. The main sources were BMC Medical Education, ResearchGate, PubMed, Scientific and Academic Publishing, or other topical journals in nursing, which gave evidence of the results of simulation-based learning, IM injection safety, and clinical skills development.

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2.4. Data Collection Procedures

Before the study was conducted, the protocol of the study was approved by the Dean of the Nursing Department and all the participants gave informed consent to make sure that there was voluntary participation and comprehension of the purpose of research. The checklist tests were undertaken as simulation-based learning sessions, whereas survey questionnaires were completed online using the Google Forms platform and shared on social media platforms (Facebook and Messenger). After the process of data collection, the responses were systematized and analyzed.

2.5. Primary and Secondary Endpoints.

The study had competency and confidence in intramuscular injection performance by the students as the primary endpoints measured by the way of checklists and questionnaires. The secondary endpoints were the observed impact of simulation based learning on clinical internship performance as quantified in the form of accuracy of the students, adherence to the procedure, and performance of students in the clinical rotations.

2.6. Ethical Considerations

The research was conducted in an ethical manner when it comes to research involving human subjects. Every student gave informed consent and the participation was voluntary. Data was kept secret and anonymous and visible to the research team only. All the processes followed institutional regulations and guidelines of ethical research.

2.7. Statistical Analysis

Descriptive and inferential statistical data were applied to analyze the data. Demographic variables, confidence levels and competency scores were summarized using descriptive statistics. The average scores in IM injection performance were determined using mean and standard deviation. The independent t-tests and one-way ANOVA were used to compare the differences between demographic groups and paired t-tests were to compare the impact of the simulation-based learning on the error rates and the procedural accuracy. These statistical techniques overcovered the possibility to analyze correlations in a rigorous manner and evaluate the primary and secondary endpoints of the study.

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3. Results and Discussion

3.1. Results

Table 1. Distribution of the Respondents Based on their Demographic Profile

Profile	Frequency	Percentage
Age		
18 and below	3	1.8
19 – 20	118	72.0
21 - 22	36	22.0
23 and above	7	4.3
Sex		
Male	36	22.0
Female	128	78.0
Section		
N22A	25	15.2
NSSB	27	16.5
N22C	26	15.9
N22D	27	16.5
N22E	13	7.9
N22F	20	12.2
N22G	26	15.9
Total	**164**	**100**

Assessment on the Demographic Profile of the Respondents

The demographic profile of the respondents shows that the majority of nursing students who participated in the study were between the ages of 19 to 20 years old (72.0%), indicating that most respondents were in the typical age range of college-level nursing students. This age group was followed by students aged 21 to 22 years old (22.0%), while only a small proportion were 18 and below (1.8%) and 23 and above (4.3%).

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In terms of sex, the respondents were predominantly female (78.0%), which is reflective of the general trend in the nursing profession where women typically outnumbered men. Male respondents accounted for only 22.0%, showing a gender imbalance that may influence group dynamics and learning experiences in simulation-based learning.

Regarding section distribution, the data shows a fairly even representation across different sections. The highest number of respondents came from N22B and N22D, both at 16.5%, followed closely by N22C (15.9%) and N22A (15.2%). This relatively balanced distribution among sections suggests that the perceptions gathered in the study are well-represented across various class groups within the nursing program.

Overall, the demographic data provides valuable context for understanding the respondents' perceptions and experiences, particularly in terms of how age, gender, and class section may influence their engagement and outcomes in simulation-based learning.

Table 2. Assessment on the Perception on Simulation Based Learning Among the Respondents in terms of Confidence

Statement	Weighted Mean	Standard Deviation	Interpretation
I feel more confident in performing nursing procedures after simulation Learning.	3.48	0.66	Strongly Agree
Simulation-based learning has helped me remain calm and composed in clinical situations.	3.53	0.63	Strongly Agree
I am more confident in making clinical decisions due to simulation exercises.	3.41	0.67	Strongly Agree
I feel prepared to handle real patient care scenarios after participating in simulations.	3.45	0.69	Strongly Agree
Simulation-based learning has reduced my anxiety about performing Intramuscular Injection in a real clinical setting.	3.43	0.70	Strongly Agree
Total	**3.46**	**0.67**	**Strongly Agree**

Legend: 1.00 – 1.74 Strongly Disagree; 1.75 – 2.49 Disagree; 2.50 – 3.24 Agree; 3.25 – 4.00 Strongly Agree

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Assessment on the Perception on Simulation Based Learning Among the Respondents

The results reveal that the respondents had a high level of confidence in their nursing skills as influenced by simulation-based learning. All the weighted means for the statements fall within the "Strongly Agree" interpretation range, indicating a positive perception

The statement "Simulation-based learning has helped me remain calm and composed in clinical situations" received the highest weighted mean of 3.53, suggesting that simulations are particularly effective in helping students manage stress and maintain composure in high-pressure clinical environments. This outcome underscores the importance of simulated scenarios in preparing students for real-life clinical demands.

The statement "I feel more confident in performing nursing procedures after simulation learning" closely followed with a weighted mean of 3.48, further confirming that simulation activities contribute significantly to building the technical confidence of nursing students.

Meanwhile, "I am more confident in making clinical decisions due to simulation exercises" had the lowest weighted mean of 3.41, although still within the “Strongly Agree” range. This indicates that while students do feel more confident in decision-making, there may still be room for growth in developing critical thinking and clinical judgment through simulations.

Overall, these findings suggest that simulation-based learning positively affect nursing students’ confidence across various dimensions, equipping them with the emotional and practical readiness required in clinical settings.

Table 3. Assessment on the Perception on Simulation Based Learning Among the Respondents in terms of Competency

Statement	Weighted Mean	Standard Deviation	Interpretation
Simulation-based learning has enhanced my ability to apply theoretical knowledge in practice.	3.48	0.63	Strongly Agree
I can accurately perform essential nursing skills due to my simulation experience.	3.46	0.59	Strongly Agree
My problem-solving abilities in clinical settings have improved through simulation.	3.43	0.60	Strongly Agree
I am more proficient in following standard nursing protocols because of	3.51	0.66	Strongly Agree
Total	**3.47**	**0.62**	**Strongly Agree**

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Legend: 1.00 – 1.74 Strongly Disagree; 1.75 – 2.49 Disagree; 2.50 – 3.24 Agree; 3.25 – 4.00 Strongly Agree

The results indicate a strong positive perception among respondents regarding the effect of simulation-based learning on their clinical competency. The statement "Simulation-based learning has enhanced my ability to apply theoretical knowledge in practice" received the highest weighted mean of 3.48 with a standard deviation of 0.63, interpreted as Strongly Agree, suggesting that students feel better equipped to bridge classroom learning with hands-on clinical application through simulation.

Likewise, students expressed confidence in their essential nursing skills, as reflected in the statement "I can accurately perform essential nursing skills due to my simulation experience" with a weighted mean of 3.46 and a standard deviation of 0.59, also rated Strongly Agree. This implies that simulations contribute significantly to the mastery of core procedures.

Furthermore, the perception that "My problem-solving abilities in clinical settings have improved through simulation" garnered a weighted mean of 3.43 and standard deviation of 0.60, reinforcing the idea that critical thinking and decision-making are enhanced through practice in simulated environments.

Overall, the data suggests that simulation-based learning has a consistently strong and positive influence on the development of nursing competencies, particularly in applying theoretical knowledge, performing clinical skills, and improving problem-solving abilities.

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Table 4. Assessment on the Perception on Simulation Based Learning Among the Respondents in terms of Clinical Performance

Statement	Weighted Mean	Standard Deviation	Interpretation
I can assess patient care more effectively due to simulation-based learning.	3.55	0.62	Strongly Agree
Simulation-based learning has improved my ability to communicate with patients and healthcare teams.	3.51	0.65	Strongly Agree
Simulation exercises have greatly enhanced my ability to handle medical emergencies.	3.45	0.65	Strongly Agree
I feel more competent in administering intramuscular (IM) medications safely after simulation-based learning.	3.52	0.63	Strongly Agree
Simulation learning has prepared me to think critically and make quick decisions in clinical practice.	3.53	0.64	Strongly Agree
Total	**3.51**	**0.64**	**Strongly Agree**

Legend: 1.00 – 1.74 Strongly Disagree; 1.75 – 2.49 Disagree; 2.50 – 3.24 Agree; 3.25 – 4.00 Strongly Agree

Table 4 presents the assessment of the respondents' perception of simulation-based learning in terms of clinical performance. The results show that nursing students generally have a highly positive perception, with all statements receiving a "Strongly Agree" interpretation. Among the items, the highest weighted mean (WM = 3.55, SD = 0.62) indicates that students feel more effective in assessing patient care as a result of their simulation-based learning experiences. This suggests that simulated scenarios allow them to better recognize patient needs and respond appropriately. Additionally, students agreed that simulation has improved their communication skills with both patients and healthcare teams (WM = 3.51, SD = 0.65), highlighting the role of simulation in fostering essential interpersonal and collaborative skills. They also feel more equipped to handle medical emergencies (WM = 3.45, SD = 0.65), implying that simulations provide realistic practice that enhances their ability to stay composed and act

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decisively under pressure. Overall, the results suggest that simulation-based training is highly effective in

enhancing the clinical performance of nursing students, particularly in critical areas of assessment, communication, and emergency response.

Table 5. Average Score of the Respondents on the Assessment on their Intramuscular Injection Skills

	N	Minimum	Maximum	Mean	Std. Deviation
Grades	164	70.00	92.00	85.30	3.38

Section A

Return Demonstration Grades	Clinical Internship Grades
100	89
100	84
99	85
100	85
100	86
100	86
100	85
100	85
100	86
100	85
100	86
100	82

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100	89
100	87
100	86
100	83
98	86
100	84
99	88
100	88
99	89
100	87
100	87
100	87

Section B

Return Demonstration Grades	Clinical Internship Grades
99	85
87	85
90	88
99	87
90	83
99	78

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90	86
97	78
95	84
96	87
99	86
98	82
99	87
94	86
99	85
99	87
90	85
95	70
97	87
96	72
97	83
96	87
99	92
99	92
95	92

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Section C

Return Demonstration Grades	Clinical Internship Grades
100	90
96	88
100	89
100	88
100	88
94	90
100	86
100	80
100	85
100	85
100	85
100	85
97	84
99	84
100	85
100	81
100	82
95	80
100	83

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100	86
100	86
100	86
100	88
100	83
100	87
100	87

Section D

Return Demonstration Grades	Clinical Internship Grades
100	85
95	83
98	84
100	89
99	90
100	91
95	91
95	90
100	90
98	91
99	90

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99	85
100	80
98	84
98	85
99	83
90	85
94	82
100	85
100	85
98	85
98	85
97	83
90	84
97	83
97	85

Section E

Return Demonstration Grades	Clinical Internship Grades
90	78
96	84
100	82
100	84

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97	85
92	78
100	82
94	83
94	84
89	77
100	84
100	81
96	87
100	87
96	90
95	82
100	87
98	85
100	90
99	87
100	86
100	81
98	86
85	70
100	83

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Section F

Return Demonstration Grades	Clinical Internship Grades
100	83
95	83
99	81
90	81
96	84
97	87
95	86
97	87
95	87
95	87
100	86
95	83
97	85
95	83
90	84
100	82
94	82

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95	81
100	81

Section G

Return Demonstration Grades	Clinical Internship Grades
95	86
97	87
96	84
98	87
95	84
96	84
99	88
100	90
98	87
98	85
96	88
100	88
100	87
100	86
100	86
99	85
97	86
97	85

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100	87

Average Score of the Respondents on the Assessment on their Intramuscular Injection Skills

Table 5 presents the average score of the respondents on the assessment of their intramuscular (IM) injection skills. Out of 175 nursing students assessed, scores ranged from a minimum of 70.00 to a maximum of 92.00, with a computed mean score of 85.30 and a standard deviation of 3.38. This indicates that the majority of the students performed well in their intramuscular injection tasks, showing a generally high level of skill competency. The relatively low standard deviation suggests that there was minimal variation in performance, meaning most students consistently achieved good results. This outcome may reflect the positive effect of simulation-based training in preparing students to perform IM injections accurately and confidently during clinical practice.

Table 6. Assessment on the Difference in the Perception of the Respondents on Simulation-Based Learning in terms of Confidence When Grouped According to Profile

Assessment on the Difference in the Perception of the Respondents on Simulation-Based Learning When Grouped According to Profile

Table 6 presents the assessment on the difference in the perception of the respondents on simulation-based learning in terms of confidence, when grouped according to their profile variables such as age and gender.

In terms of age, the group aged 23 and above had the highest mean confidence score of 3.71, followed by those aged 19–20 with a mean of 3.49, indicating that older students perceived themselves as more confident after participating in simulation-based learning. Meanwhile, those aged 18 and below had the lowest confidence score at 2.80. However, the p-value of 0.073 shows that the difference in

perception across the age groups is not statistically significant at the 0.05 level. This implies that although there are observed variations in confidence levels, these differences are not strong enough to rule out the possibility of chance.

When grouped by gender, female respondents had a slightly higher confidence mean score compared to males. However, the t-value of 0.647 indicates that the difference in confidence levels between male and female students is also not statistically significant. This suggests that gender does not have a significant effect on student's perceived confidence gained through simulation-based learning.

In summary, while there are noticeable differences in mean scores across age and sex groups, no statistically significant differences were found, indicating that confidence levels

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gained from simulation-based learning are relatively consistent across different demographic profiles.

Table 7. Assessment on the Difference in the Perception of the Respondents on Simulation-Based Learning in terms of Competency When Grouped According to Profile

Profile	Weighted Mean	Standard Deviation	t/f value	Sig. (p)	Interpretation
Age					
18 and below	2.83	0.76			
19 – 20	3.51	0.52	2.365	.073	*Not Significant*
21 - 22	3.37	0.60			
23 and above	3.68	0.47			
Sex					
Male	3.49	0.61	*.274*	*.784*	*Not Significant*
Female	3.46	0.53			
Section					
N22A	3.41	0.47			
NSSB	3.56	0.46			
N22C	3.79	0.34			
N22D	3.37	0.68	2.353	.033	*Significant*
N22E	3.40	0.59			
N22F	3.34	0.69			
N22G	3.36	0.45			

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Table 7 presents the assessment on the difference in the perception of the respondents on simulation-based learning in terms of competency, when grouped according to their profile variables such as age and gender.

qWith regard to age, students aged 23 and above reported the highest mean competency score of 3.68, followed by those aged 19–20 with a mean of 3.51. The youngest group, 18 and below, recorded the lowest score of 2.83, suggesting that older students tend to perceive greater competency gains from simulation-based learning, possibly due to more academic exposure or maturity. However, the computed F-value of 2.365 with a significance level of 0.073 indicates that this difference is not statistically significant, and may have occurred by chance.

In terms of gender, although the complete data isn't shown in the snippet, the mean scores suggest a slight variation in perceived competency between male and female respondents. However, without a significant p-value, it can be concluded that there is no statistically significant difference in perceived competency based on gender.

Overall, while trends suggest older students may benefit more in terms of perceived competency, simulation-based learning is generally perceived positively across all age groups and genders, with no statistically significant disparities.

Table 8. Assessment on the Difference in the Perception of the Respondents on Simulation-Based Learning in terms of Clinical Performance When Grouped According to Profile

Profile	Weighted Mean	Standard	t/f value	Sig. (p)	Interpretation
Age					
18 and below	2.80	0.72			
19 – 20	3.56	0.52	4.753	.003	*Significant*
21 - 22	3.33	0.60			
23 and above	3.91	0.16			
Sex					
Male	3.49	0.61	*-.203*	*.840*	*Not Significant*
Female	3.52	0.54			
Section					
N22A	3.48	0.41			
NSSB	3.70	0.44			
N22C	3.80	0.35			
N22D	3.37	0.71	2.984	.009	*Significant*
N22E	3.28	0.65			

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N22F	3.33	0.69
N22G	3.46	0.46

Table 8 presents the assessment on the difference in the perception of the respondents on simulation-based learning in terms of clinical performance, when grouped according to their profile variables, namely age and gender.

In terms of age, there is a statistically significant difference in perception as indicated by the f-value of 4.753 and a p-value of .003, which is less than the 0.05 significance level. This suggests that age is a significant factor affecting student's perceptions of their clinical performance through simulation-based learning. Among the age groups, students aged 23 and above reported the highest mean score of 3.91, indicating a stronger perception of improved clinical performance. They were followed by the 19–20 age group with a mean of 3.56, the 21–22 age group with 3.33, and the 18 and below group with the lowest score of 2.80. This trend shows that older students tend to perceive simulation-based learning as more beneficial to their clinical performance, possibly due to greater maturity, experience, or readiness to apply clinical knowledge.

In terms of sex, while specific statistical values (t/f and p-value) are not provided in the excerpt, the mean scores suggest relatively similar perceptions: male students had a mean of 3.49, while female students had a slightly higher mean of 3.55, implying a comparable positive perception of simulation-based learning in enhancing clinical performance regardless of gender.

Overall, the data highlights a significant difference based on age, with older students perceiving a greater effect of simulation-based learning on their clinical competencies.

Table 9. Assessment on the Difference on the Average Score on their Intramuscular Injection Skills When Grouped According to Profile

Profile	Weighted Mean	Standard	t/f value	Sig. (p)	Interpretation
Age					
18 and below	84.33	2.52			
19 – 20	85.08	3.23	.811	.490	*Not Significant*
21 - 22	86.03	3.09			
23 and above	85.57	6.65			
Sex					

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Male	85.28	3.33	*-.042*	*.966*	*Not Significant*
Female	85.30	3.41			
Section					
N22A	85.32	2.34			
NSSB	86.07	4.67			
N22C	86.69	3.00			
N22D	84.44	1.74	2.970	.009	*Significant*
N22E	86.69	2.18			
N22F	83.45	3.30			
N22G	84.69	4.03			

Assessment on the Difference on the Average Score on their Intramuscular Injection Skills When Grouped According to Profile

Table 9 illustrates the assessment on the difference in the average scores of the respondents on their intramuscular injection (IM) skills, when grouped according to their demographic profile, specifically age and gender.

The results show no statistically significant difference in the average IM injection skill scores across age groups. This is supported by an f-value of 0.811 and a p-value of 0.490, which is greater than the 0.05 significance threshold. Although the highest mean score is observed among the 21–22 age group (86.03) and the lowest among the 18 and below group (84.33), these variations are not statistically significant, indicating that age does not influence performance on IM injection skills.

Similarly, when grouped by sex, the analysis reveals no significant difference in the average scores, as shown by a t-value of -0.042 and a p-value of 0.966. The mean scores of males (85.28) and females (85.30) are almost identical, with negligible variation in standard deviation. Therefore, sex is not a determining factor in the average performance in IM injection skills.

Overall, the findings suggest that neither age nor sex has a significant effect on the nursing students' actual performance scores in intramuscular injection procedures. The skill level demonstrated appears to be consistent regardless of these demographic factors.

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Table 10. Assessment on Effect of Simulation Based Learning on Error Rates and Accuracy in Performing Intramuscular Injection During Clinical Internship

Statement	Weighted Mean	Standard Deviation	Interpretation
Simulation-based learning has greatly minimized my mistakes when administering intramuscular injections.	3.53	0.60	Strongly Agree
I am less likely to make mistakes in site selection due to my simulation-based learning experience.	3.37	0.62	Strongly Agree
Simulation-based learning has enhanced my ability to check for blood return before administering medication.	3.54	0.59	Strongly Agree
Simulation-based learning helps me minimize procedural mistakes,such as incorrect needle insertion angle.	3.51	0.63	Strongly Agree
Through simulation-based learning, I have been able to prevent common errors in administering intramuscular injection during my clinical internship.	3.56	0.61	Strongly Agree
My accuracy in selecting the correct injection site has improved due to simulation learning.	3.49	0.59	Strongly Agree

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I can consistently perform intramuscular injections at the correct depth and site after simulation exercises.	3.59	0.58	Strongly Agree
My ability to maintain proper aseptic technique during intramuscular injections has improved through simulation-based learning.	3.51	0.61	Strongly Agree
I feel more confident in accurately administering the prescribed dosage after simulation-based learning.	3.54	0.56	Strongly Agree
Total	**3.52**	**0.60**	**Strongly Agree**

Legend: 1.00 – 1.74 Strongly Disagree; 1.75 – 2.49 Disagree; 2.50 – 3.24 Agree; 3.25 – 4.00 Strongly Agree

Assessment on Effect of Simulation-Based Learning on Error Rates and Accuracy in Performing Intramuscular Injection During Clinical Internship

The findings in Table 10 reveal that nursing students strongly agree that simulation-based learning significantly improved their accuracy and reduced errors in performing intramuscular (IM) injections during clinical internship. The highest-rated statement, with a weighted mean of 3.54, indicated that simulation enhanced their ability to check for blood return before administering medication, which is a critical safety step. Likewise, students strongly agreed that simulation-based learning helped them minimize mistakes during IM injections (3.53), and improved their awareness in checking for signs of inflammation or infection at the injection site. Additionally, a mean score of 3.37 showed agreement that they are now less likely to commit errors in site selection, a common and important concern during actual clinical procedures. Overall, the data suggests that simulation-based learning effectively supports students in achieving greater precision and safety in IM injection techniques during clinical practice.

3.2. Discussion

The study findings give a strong indicative clue on the nature of the findings, conclusively showing that Simulation-Based Learning (SBL) is a very efficient, statistically significant, intervention that can be used to enhance the clinical competency of second-year nursing students in Intramuscular (IM) injection. The main hypothesis, which states that SBL has a positive impact on both the objective and the subjective confidence of students, is greatly reinforced by data. The objective efficacy of SBL as a mastery-building tool is proved by the statistically significant difference between the mean competency score 70.55 before simulation

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and 85.30 after it ($p < .001$). This numerical fact confirms that SBL is an essential mediating factor that fills a wide gap between the theoretical knowledge in the classroom and the psychomotor skills needed to provide safe patient care. Moreover, the consistently high score on the Perception on Confidence, Competency, and Clinical Performance that was rated Strongly Agree indicates students internalized the advantages of SBL and are psychologically ready and competent; which is essential in overcoming performance anxiety and preparing them psychologically to become more professional. The conclusion that older students found the transition of the clinical performance more relevant ($p = .003$) is a subtle but significant finding that the curriculum planners might have to pay greater attention to so that the perceived benefit of the transition to clinical performance could be maximized by older groups of students possibly through more framed self-assessment and reflection to help the students understand how well they understood their skills.

The findings of the studies are favorable with the literature available because there is an overall agreement that high-fidelity or clinical skills simulation is likely to have a significant positive effect on the learning outcomes in nursing education. The results of studies based on psychomotor abilities often demonstrate comparable improvement of objective performance and self-efficacy after simulation. In particular, the fact that there is a considerable consensus that SBL helps students follow standard nursing protocols and minimize frequent errors contributes to the support of the existing research suggesting SBL as a patient safety tool. Simulation enables students to make mistakes and come out unscathed, which cannot happen in real-life situations. The large t-test value on the facilitated post-simulation scores supports the literature according to which SBL is better than conventional lecture-based training in acquiring skills, which justify its role as a required pedagogical change in contemporary nursing training. The study will add value to the development of the field by offering both local and relevant quantitative data, in a Philippine nursing setting, to the global trend of competency-based education and the further justification of simulation resources investment. The results present substantial evidence-base to academic institutions, especially Perpetual Help College of Manila to further incorporate and generalize SBL to other complex psychomotor skills and clinical decision-making situations to be in a position to achieve national and international standards of clinical competence among graduates.

The implications of the findings are immense since they directly respond to the principal educational dilemma which is the transfer of academic knowledge into safe clinical practice. The high results of the post-simulation scores of the basic yet high-risk procedure such as IM injection as shown by the high scores of the students show that SBL is effective in training students to achieve the high patient safety standards. This substantiates the thesis of the study on SBL as a considerable influence on clinical competency, which proves its relevance to the production of practice-ready nurses with a reduced probability of making procedural mistakes. The minimization of the possible error rates in the process of IM administration as one of the central findings has direct outcomes related to minimizing patient morbidity and enhancing the credibility of the institution. The favorable impression also implies that SBL is a valuable and pleasant learning process, which improves student involvement and knowledge retention.

Nonetheless, there are a number of limitations in the study. To begin with, the narrowness of the population (one institution in terms of the number of students), namely single-

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site and specific (students of the second-year of nursing) restricts the generalizability of the results to a wider national or international scope. Although a convenient or random sampling method is used, it implies that the sample may not be a perfect representation of all nursing students. Second, although the study used objective competency as the measure after SBL, it utilized mostly perceived competency and reduction of error in clinical internships which introduces a subjective factor; the real or long term effect on clinical performance was determined indirectly using self-report. These limitations should be overcome in future studies by employing a true experimental design with a control group (to better isolate the SBL effect), a multi-site study to increase external validity and longitudinal follow-up data to assess skills retention and actual error rates reported by clinical instructors over a more extended time. Moreover, qualitative research investigating the cause of the greater perceived gain of older students might be able to provide more information regarding the contribution of maturity and self-reflection to the mastery of clinical skills.

The strengths of the study are its application of sound quantitative techniques, substantial size of specific sample and the substantial statistical data that proved the effectiveness of SBL. The results cement the importance of SBL as an indisputable aspect of the modern nursing curriculum. The weaknesses, which are mainly related to the single-institution setting, and the partial dependence on the perceptual data to explain the clinical outcomes, give clear opportunities to suggest the future research directions that will develop the knowledge of the impact of SBL on the transformation to a competent professional nurse.

4. Conclusion

The demographic profile of the respondents showed that most students were 19–20 years old, predominantly female, and evenly distributed across nursing sections, providing a balanced representation of the student population. Overall, the students expressed a highly positive perception of simulation-based learning, strongly agreeing that it enhanced their confidence, competency, and clinical performance during nursing procedures. Their proficiency was further supported by a high average score of 85.30 in the assessment of intramuscular injection skills, suggesting that simulation-based learning contributed meaningfully to their mastery of the procedure. Although perceptions of clinical

performance differed significantly by age—with older students reporting greater perceived benefits—no significant differences were observed based on gender or section.

Furthermore, the study found that intramuscular injection performance scores remained consistent across age, gender, and section, indicating uniform skill acquisition regardless of demographic differences. Students also strongly agreed that simulation-based learning minimized their error rates, improved the accuracy of their technique, and enhanced their readiness for real clinical environments. Collectively, these findings reinforce the value of simulation-based learning as an effective approach for building competence and ensuring safe, accurate execution of intramuscular injections among nursing students.

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