Effect of Nursing Comprehensive Skills Training Program on Metacognitive Awareness for Undergraduate Nursing Students

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Abstract

Background: Metacognitive is an essential skill for critical thinking and self-regulation, especially for nursing students. It can help govern thinking, understanding, and problem-solving. **This study aimed to** evaluate effect of nursing comprehensive skills training program on metacognitive awareness for undergraduate nursing students. **Materials and methods:** A quasi-experimental design was used. A sample of 70 nursing students were recruited in second year using simple random sampling at Faculty of Nursing -Suez Canal University. Data were collected using nursing student profile questionnaire, and metacognitive awareness inventory. **Results:** All metacognitive awareness domains show a strong and statistically significant improvement (p < 0.001) as a result of the nursing comprehensive skills. After the intervention, there is a significant average improvement in performance of about 49.37%. Effect sizes ranged from 1.9 to 3.9 (Cohen's d).The findings demonstrate a significant increase of 47.86% in procedural knowledge, 48.85% in conditional knowledge, and 44.46% in declarative knowledge. Additionally, several aspects of cognitive regulation a significant increase of 39.59% to 56.29%. Also, there significant improvement in the level of metacognitive awareness with good level of 78.1 post comprehensive skills training program compared with 1.4% pre comprehensive skills training program. **Conclusion:** There was a statistically significant improvement in all metacognitive awareness domains after implementation of nursing comprehensive skills training program. **Recommendations:** Applying Nursing Comprehensive Skills Training Program for improving students' metacognitive awareness for Undergraduate Nursing Students

Keywords: Metacognitive awareness, nursing comprehensive skills, training program.

Introduction:

New graduates nursing students have encountered enhanced medical and health technology as a result of shifting disease patterns and rapid new discoveries for diagnostic and medical therapy **(Radwan et al., 2023)**. So, graduate nurses must have the scientific and technical abilities required to provide standardized advanced nursing care **(Dezhbankhan et al., 2021).** As a result, nursing educational systems created teaching and learning strategies to ensure that graduate nursing students are equipped to confront and manage new technology in health care settings **(Mott et al., 2018)**.Also, academics must train nursing students to improve their skills utilizing novel teaching approaches such as scenario-based learning and lifelong learning through online courses to increase metacognitive awareness. Thus, nursing education methods should bridge the gap between nursing curriculum and the nursing profession in the future by providing learning opportunities that align with nursing profession development **(Gholami et al., 2016).**

Metacognition is described as nursing skills that enable students to understand and monitor their cognitive processes **(Li et al., 2022)**. It is separated into two parts: the first, known as metacognitive knowledge, pertains to what nursing students understand about their own cognition or cognition in general. Furthermore, it can assist nursing students identify their own strengths and shortcomings, which can influence their desire and enthusiasm in learning. The second component is known as cognition regulation, which refers to metacognitive actions that assist in controlling one's thinking or learning **(Radwan et al., 2023)**.

Metacognition research focuses on the subcomponents of cognition knowledge and cognition control, which are commonly classified as declarative, procedural, and conditional knowledge **(Jang et al., 2019)**. Declarative knowledge refers to recognizing oneself as a learner and being aware of the factors that influence one's learning **(Mohseni et al., 2020)**. Declarative knowledge now incorporates people's understanding of their affective states, such as self-efficacy and motivation, and how they affect task performance **(Medina et al., 2017).**

Procedural knowledge refers to understanding how to carry out a task or achieve a goal. This domain includes understanding about learning methods and procedures. Strategies may include tactics such as taking notes, focusing on critical details, swiftly moving over less significant information, applying mnemonics, compressing major concepts, and constantly assessing oneself **(Lee et al., 2017)**. A person with conditional knowledge knows when, where, and why to use a particular procedure or technique **(Dezhbankhan et al., 2021)**. Individuals use conditional knowledge to analyze learning situations and select the optimal approaches for completing tasks. According to research, adults comprehend and can characterize cognition more accurately than youngsters **(Radwan et al., 2023)**.

Cognitive control has at least three subsystems: planning, monitoring, and assessment. Planning involves predicting, allocating time based on demands, recognizing pertinent prior information, and setting goals **(Çakici, 2018)**. Developmental variables may help with control through planning because "older, more experienced learners possess more knowledge about cognition and use that knowledge to guide their learning before embarking on a task. The ability to plan before beginning work may improve outcomes independent of the task's setting or topic (**Mohseni et al., 2020)**.

Furthermore, metacognitive awareness improves critical thinking and positive learning skills. Students with low metacognitive awareness usually adopt inappropriate learning strategies and are unable to think critically or develop practical abilities for overcoming learning challenges **(Radwan et al., 2023)**. As a result, focusing on metacognitive awareness as a method of changing learning motivation, positive learning capacity, and professional thinking is critical for improving nursing education quality **(Rashwan et al., 2021)**.

Significance of the Study:

Nursing comprehensive skills emerge as the ideal framework for studying learning in nursing education because they are aligned with widely accepted concepts of critical thinking and problem solving in nursing. Nursing Comprehensive Skills additionally specifies metacognition categories and their connections to cognition and motivation **(Li et al., 2022)**. Nursing comprehensive skills are based on clinical reasoning, making them an ideal fit for our study, which focuses on metacognition in pre-nursing learning **(Medina et al., 2017)**. Although metacognition research began over three decades ago, a review of the nursing literature indicates very little about metacognition in nursing. The present nursing research on metacognition focuses on the clinical reasoning of upper-level students and professional nurses. As a result, the current study analyze the evaluate effect nursing comprehensive skills training program on metacognitive awareness for undergraduate nursing students**.**

Aim of the study:

This study aimed to evaluate effect nursing comprehensive skills training program

on metacognitive awareness for undergraduate nursing students.

Research Hypotheses:

H1: There is a statistically significant improvement in undergraduate nursing students' metacognitive awareness after implementation of nursing comprehensive skills training program.

H0: There is no a statistically significant improvement in nursing students' metacognitive awareness after implementation of nursing comprehensive skills training program.

Methods

Research design:

A quasi-experimental design. The quasi-experimental research design involves manipulating the independent variable to observe the effect on the dependent variable. The pre-test and post-test results help establish the effectiveness of the nursing comprehensive skills training program proposed in the research **(Polit & Beck, 2017)**.

Setting:

The study was carried out at the Faculty of Nursing, Suez Canal University, Egypt, in clinical labs and classrooms. Clinical labs consisted of two labs, one each for simulation and medical surgical nursing, as well as ten classrooms.

Subjects:

Undergraduate students enrolled in medical surgical course first term/second level of academic year 2023/2024.

Sample:

A simple random sample of nursing students was included in the study. One hundred forty second-year nursing students from both gender at the Faculty of Nursing of Suez Canal University in Ismailia, Egypt, volunteered to participate in this study. The inclusion criteria are as follows: (1) nursing students in the first semester of the 2nd year in university; (2) voluntary course selection; (3) informed consent, willing to cooperate. The exclusion

criteria are as follows: (1) not interested and (2) research objects who are participating in other teaching reform.

Sample size:

The sample was calculated using G∗Power 3.1 was used for sample size calculations. With a power (1-β) of .98, the effect size was .25, error probability value was .05. Consequently, the total sample consisted of 70 students.

Tools for data collection:

Two tools were utilized in data collection, which included the following tools:

Tool (1): Nursing Student Profile Questionnaire:

Data was collected including age, gender, Pre – education before enrollment to the faculty, and background information about comprehensive metacognitive awareness.

Tool (2): Metacognitive awareness inventory

Metacognitive awareness inventory adopted by **(Vandergrift, et al., 2006).** Metacognitive awareness inventory (MAI) consisted of knowledge of cognition (17 items) and regulation of cognition (35 items), a total of 52 items. Knowledge of cognition includes declarative knowledge, procedural knowledge, and conditional knowledge. Regulation of cognition includes planning, information management, monitoring, debugging, and evaluation.

Scoring system: Each item was scored on a 5-point Likert scale. Total scores ranged from 52 to 260. The higher the score, the stronger the metacognitive awareness.

Validity and Reliability:

Data collection tool was assessed for content validity using a content validity index of 0.9. An evaluation was conducted by two medical and three nursing experts to assess the comprehensiveness and usefulness of the included items in achieving the study's objectives. Back translation was conducted for research tools. The reliability coefficient of the

assessment tool was determined to be 0.85 using Cronbach's alpha

Pilot study: It was carried out on a subset representing 10% of the total study population to evaluate the clarity and practicality of the tools. The necessary modifications were implemented according to the results of the pilot study. The pilot participants were not included.

Fieldwork:

Assessment phase:

The researchers interviewed students in teaching classes to collect a nursing student profile questionnaire. They subsequently requested patients to complete the metacognitive awareness inventory as a pre-test. Each tool required 20 to 30 minutes to complete. The students were evaluated based on their responses to the previous tools (Pre-Test Assessment)

Implementation phase:

Nursing comprehensive skills training program was conducted for studied nursing students in teaching classes, and medical-surgical nursing labs. It was in the form of modules, which included three modules. Contents of nursing comprehensive training program included;1) basics about metacognitive awareness;2)metacognitive knowledge which included procedural knowledge, conditional knowledge, and declarative knowledge; 3)metacognitive regulation which included planning, comprehension monitoring, information management strategies, debugging strategies, and evaluation. Applying metacognitive awareness to medical surgical nursing skills which included ECG, wound dressing, urinary catheterization (insertion and irrigation), nasogastric tube insertion and feeding, blood transfusion, cast and traction care, colostomy care, blood glucose testing, oxygen and inhalation therapy.

Module one was conducted during the first three weeks. It included 2 h online and 6 h offline every week; it covered the medical surgical nursing curriculum introduction, basics about metacognitive awareness, metacognitive knowledge and regulation. Module two covered

application of metacognitive knowledge and regulation that was conducted from the fourth week to the end of thirteen week, with each nursing skill every week (2 h online, 6 h offline), for a total of nine nursing skills. This covered problem-oriented self-learning skills, classroom guidance and training nursing skills.

Evaluation phase metacognitive awareness was evaluated after the conclusion of nursing comprehensive skills training program using the same questionnaire that was used for the pretest to assess the student metacognitive awareness.

Ethical consideration:

Prior to recruiting participants and collecting data, approval was obtained from the Research Ethics Committee of the Faculty of Nursing with code (232:8/2023). Written consent was obtained from each participant after they were informed about the study's nature, purpose, and benefits. Subjects were advised that participation is optional and they have the ability to withdraw at any moment without providing reasons. Data confidentiality was maintained by coding all information acquired. The researchers informed subjects that the data would be utilized solely for research purposes.

Statistical design:

The study was performed using the Statistical Package for the Social Sciences (SPSS) Version 27 for Windows. Data analysis: Descriptive statistics can summarize the profile of nursing students. Matched pair t-test was utilized to examine the difference between before and post measurements. Cohen's d was used to measure the effect size when comparing means by quantifying the difference in standard deviation units. The P value was statistically significant at $<.05$.

Results:

Table (1) reveals that the mean age of studied sample was 19.85 with SD .52, 84.3% of them were female, and 61.4% had technical pre – education before enrollment to the faculty.

Figure (1) shows that 97.1% of the studied sample didn't have any background information about metacognitive awareness .

Table (2): All metacognitive awareness domains show a strong and statistically significant improvement as a result of the given comprehensive skills training program. After comprehensive skills training program, there is a significant average improvement in performance of about 49.37%. Effect sizes ranged from 1.9 to 3.9 (Cohen's d), indicating significant improvements in each category and subcategory. Furthermore, all areas constantly show extremely significant results ($p < 0.001$) from the t-test analysis, highlighting significant improvement of the comprehensive skills training program. The findings demonstrate a significant increase of 47.86% in procedural knowledge, 48.85% in conditional knowledge, and 44.46% in declarative knowledge. Additionally, several aspects of cognitive regulation a significant increase of 39.59% to 56.29%. The overall composite score significantly improved overall, rising from a mean of 17.57 prior to comprehensive skills training program to 43.24 following it.

Figure (2): Interval plot reveals that the total mean score of metacognitive awareness was 43.24 post comprehensive skills training program with 95% confidence interval 41.09 to 45.40 compared with a mean score of 17.57 pre comprehensive skills training program with 95% confidence interval 16.55 to 18.59.

Figure (3) shows that there significant improvement in the level of metacognitive awareness with good level of 78.1 post comprehensive skills training program compared with 1.4% pre comprehensive skills training program.

Table (3) denotes that there was statistically significant positive correlation between age and total metacognitive awareness post comprehensive skills training program with r of 0.440 and P value <0.001*. Also, there was statistically significant difference in total metacognitive awareness in subjects who had taken training about comprehensive learning with mean score 35 compared with who hadn't with mean score 17.06 with P value <0.001*, and .011 respectively.

Table (1): Percentage distribution of nursing students' profile (n=70).

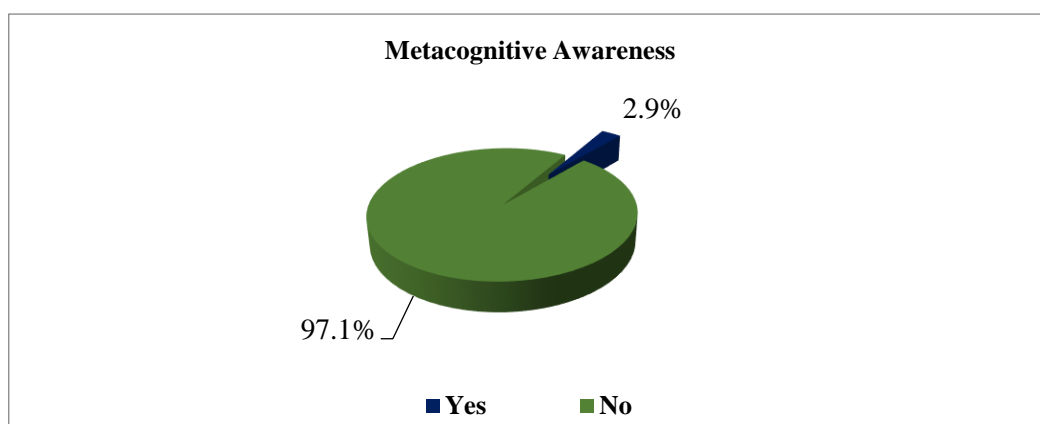| Items	No.	%
Age (Years)		
a) 19	15	21.4
b) 20	50	71.4
c) 21	5	7.1
Mean±SD	19.85±.52	
Gender		
a) Male	11	15.7
b) Female	59	84.3
Pre – education before enrollment to the faculty		
a) Technical institute	27	38.6
b) Secondary school	43	61.4

Figure (1): Percentage distribution of faculty students training about metacognitive awareness (n=70).

Table (2): Difference in mean scores of faculty students regarding metacognitive awareness dimensions pre and post comprehensive skills training program (n=70).

Items	Pre Mean±SD	Post Mean±SD	Percent of Change (%)	Cohen' d effect size	t test (P value)
1. Procedural Knowledge	1.51±.65	3.46±.91	47.86	3	16.17(**<0.001***)
2. Conditional Knowledge	1.91±.91	4.36±1.05	48.85	2.7	14.93(**<0.001***)
3. Knowledge about Cognition					
Declarative Knowledge	2.23±1.01	5.79±1.47	44.46	3.5	17.17(**<0.001***)
4. Regulation of Cognition					
a. Planning	2.37±.99	5.14±1.35	39.59	2.8	13.96(**<0.001***)
b. Comprehension Monitoring	2.53±1.27	6.26±1.28	53.27	2.9	19.88(**<0.001***)
c. Information Management Strategies	3.03±1.44	8.66±2.17	56.29	3.9	18.68(**<0.001***)
d. Debugging Strategies	1.83±.82	4.43±.97	52	1.9	17.01(**<0.001***)
e. Evaluation	2.16±.96	5.16±1.26	50	3.1	17.14(**<0.001***)
Total score	17.57±4.27	43.24±9.05	49.37	6	23.71(**<0.001***)

t test is paired sample t test was used to test difference between pre, and post intervention. P value is significant <.05
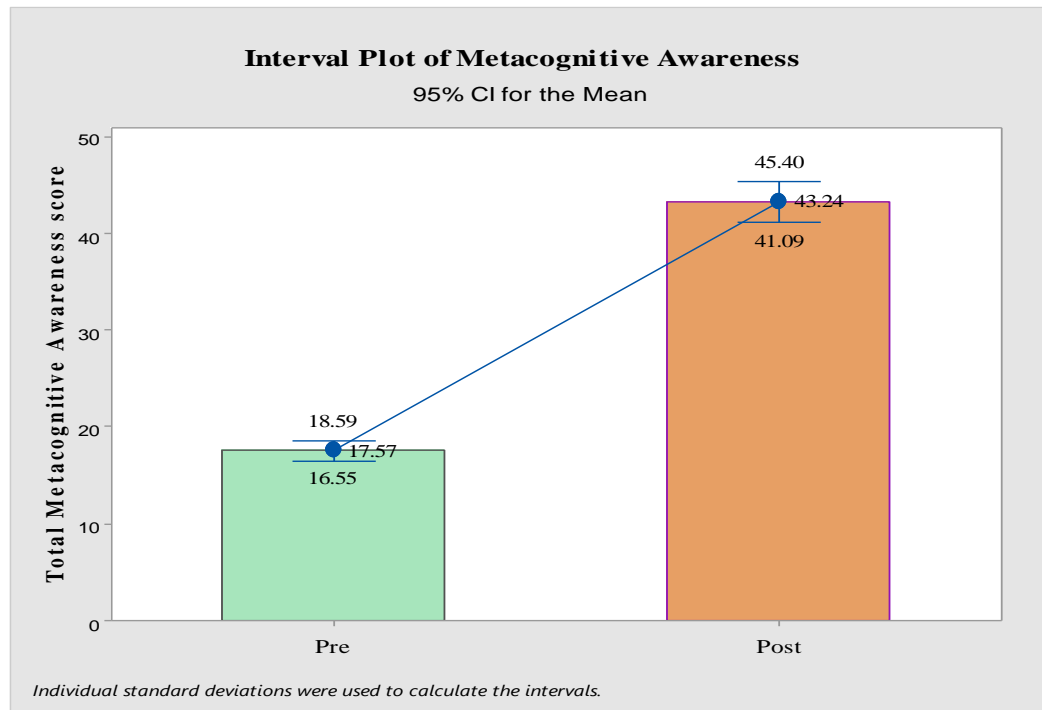
Figure (2): Interval plot of 95% Confidence interval of total metacognitive awareness (pre-post comprehensive skills training program) (n=70)
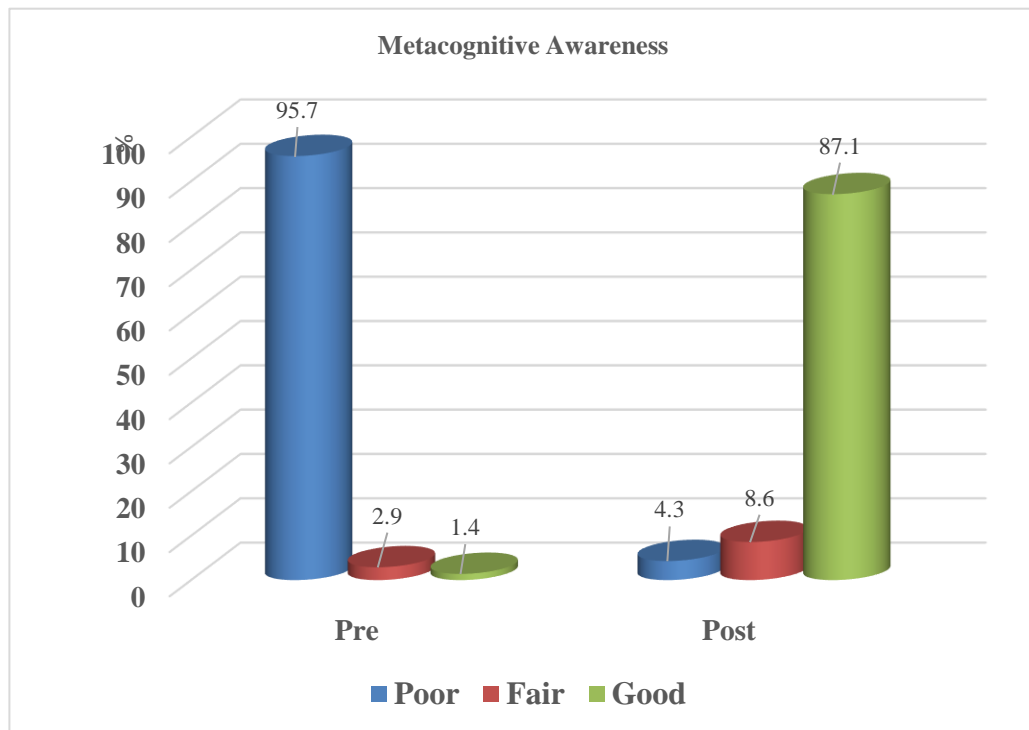

Figure (3): Percentage distribution of metacognitive awareness of faculty students (pre, and post comprehensive skills training program) (n=70).

Table (3): Relation between personnel characteristics, and total metacognitive awareness (pre, and post comprehensive skills training program)

Items	Total Metacognitive Awareness	
	Pre	Post
	Mean ±SD	Mean ±SD
Age (r (P value))	.130(.282)	.440(**<0.001***)
Gender		
Female	17.97±4.90	43.95±8.52
Male	15.64±2.87	39.45±11.18
t(P value)	1.66(.102)	1.53(.131)
Pre – education before enrollment to the faculty		
Technical institute	17.14±3.12	44.56±6.95
Secondary school	18.26±5.63	41.15±11.48
t(P value)	1.07(.288)	1.55(.126)
Training about comprehensive learning		
Yes	35.00±1.41	49.00±1.41
No	17.06±3.06	43.04±9.11
t(P value)	16.82(**<0.001***)	3.99(**.011***)

r is Pearson correlation test; t is independent t test, P value is significant <.05

Discussion:

Comprehensive skills training for nursing students aims to educate them how to learn. Metacognitive skills, as well as critical thinking (cognitive skills), are regarded to be vital for the development of better clinical reasoning and better performance or test scores **(Asadzandi et al., 2020),** thus, this study aimed to investigate the effect of nursing comprehensive skills training program on metacognitive awareness for undergraduate nursing students

The majority of nursing students who demonstrated high metacognitive awareness in the study were female. The current study's findings are consistent with a study conducted by **Abdelrahman's (2020)**, which found that female students had a higher level of metacognitive comprehension and management. **Özçakmak et al., (2021)** found that male and female students had similar average metacognitive knowledge scores. Furthermore, **Ibrahim, (2018)** found no gender effect on

metacognitive skills at various levels of education, contradicting the current study's findings.

Nursing students' mean age was less than twenty years, and there was no significant relationship between their age and their level of metacognitive awareness. A prior study in a South Korean nursing institution found that younger nursing students had higher metacognitive awareness **(Gu & Sok 2021)**. The current study found no significant relationship between pre-education before entering the faculty (technical institution or general secondary school) and metacognitive awareness. According to the researcher, this conclusion could be attributed to kids' poor academic performance and high dropout rates in secondary school.

The study found that most nursing students had a good level of metacognitive awareness compared to pre-intervention. These findings could be interpreted in the light of the fact that mixed online offline learning needs to be guided by case problems, and scenarios

provided by problem- based learning, where considered the core of skills taught through medical- surgical nursing curriculum. Also, clinical-phase nursing students are more experienced in learning allowing them to be conscious of their strategies.

Moreover, **Radwan et al., (2023)** pointed out that comprehensive skills training programs encourage students to apply critical thinking and problem solving. Furthermore, metacognitive knowledge is the awareness and understanding of one's own cognition creating more independent learning opportunities in the clinical environment and being exposed to PBL.

The current study's findings are congruent with those of **Li et al., (2023)**, who found that nursing students had a high metacognitive awareness score after implementing a comprehensive skills training program. Also, study findings reveals that cognitive knowledge has improved significantly, followed by declarative and procedural knowledge. Following the program's implementation, an improvement was observed among the students under study. The findings can be validated by recognizing that cognition knowledge refers to students' awareness of their learning and metacognitive strategies. Declarative knowledge is defined as comprehending what students know, how they learn, and the factors that influence the learning process **(Radwan et al., 2023).** On the same line, a study done by **Ibrahiem, (2018),** reported that metacognitive skills educational program improved students' metacognitive awareness, self-efficacy, and skills of problem solving

Conditional knowledge refers to a nursing student's capacity to effectively use previously learned knowledge in a variety of external contexts, as guided by nurse educators to achieve transferable learning goals. Procedural knowledge refers to students' awareness of how specific cognitive skills or approaches are used in a learning setting **(Moza, 2022)**. Researchers believe that students should be given more training and advice on this topic from their instructors. Recent metacognitive awareness studies corroborated the findings of the current study, which demonstrated that metacognitive skills may be

increased by education **(Duruk, 2020 & Li, 2023)**. Furthermore, these findings are supported by a study by Petra University students in Jordan, who discovered that declarative knowledge had the greatest mean score and procedural knowledge had the lowest mean score **(Aljaberi & Gheith, 2015).**

In terms of cognitive regulation, approximately half of nursing students had a high level of general metacognitive awareness. The nursing students tested showed a considerable improvement in cognitive regulation as compared to prior nursing comprehensive skill training program. This included improvements in students' planning, information management, monitoring, debugging, and evaluation skills. According to the researchers, these findings could be attributed to metacognitive awareness, a multifaceted process that includes individual awareness in recalling and thinking about information before converting it into behavior as supported by **Chan et al., (2021),** who showed that metacognitive awareness is multidimensional approach that foster clinical reasoning skills.

Metacognition studies found that nursing students had a high regulatory cognitive score after implementing a complete skills training programme. It also displayed the necessary skills for students to organize, manage information, oversee teams, and self-debug. Furthermore, developing such competences would most likely necessitate one semester in a university learning environment, which the NCST-C may fulfil **(Moza, 2022 & Li et al., 2023).**

Finally the study results imply the effectiveness of nursing comprehensive skills training model, where it is a novel and effective teaching approach that can be applied in the nursing field. It has great potential to enhance students' development of generic capabilities and metacognitive awareness. Also adopting activities that enhance metacognitive awareness in medical-surgical nursing field, where it is a suitable environment for innovative educational processes for nursing students.

Conclusion:

There was a statistically significant improvement in all metacognitive awareness domains after implementation of nursing comprehensive skills training program including procedural knowledge conditional knowledge, and declarative knowledge. Additionally, aspects of cognitive regulation showed a significant improvement

Recommendations:

• Applying nursing comprehensive skills training program for improving metacognitive awareness for undergraduate nursing students.

• Conduct a long-term study to evaluate the impact of nursing's complete skills training program on metacognitive awareness.

• Further researches directed toward nursing comprehensive skills training program for improving metacognitive awareness for post graduate nursing students.

References:

Abdelrahman R. M. (2020). Metacognitive awareness and academic motivation and their impact on academic achievement of Ajman University students. *Heliyon, 6(9)*, e04192. https://doi.org/10.1016/j.heliyon.2020.e04192

Aljaberi, N. M., & Gheith, E. (2015). University students' level of metacognitive thinking and their ability to solve problems. *American International Journal of Contemporary Research*, *5*(3), 121-134.

Arslan, S., & Akin, A. (2014). Metacognition: As a Predictor of One's Academic Locus of Control. *Educational Sciences: Theory and Practice*, *14(1),* 33-39.

Asadzandi, S., Mojtahedzadeh, R., & Mohammadi, A. (2022). What are the factors that enhance metacognitive skills in nursing students? A systematic review. *Iranian Journal of Nursing and Midwifery Research*, *27*(6), 475.

Çakici, D. (2018). Metacognitive awareness and critical thinking abilities of pre-service EFL teachers. *Journal of Education and Learning, 7(5),* 116-129.

Chan, C. W. H., Tang, F. W. K., Chow, K. M., & Wong, C. L. (2021). Enhancing generic capabilities and metacognitive awareness of first-year nursing students using active learning strategy. *BMC nursing, 20(1)*, 1-8.

Demirel, M., Derman, I., & Karagedik, E. (2015). A study on the relationship between reflective thinking skills towards problem solving and attitudes towards mathematics. *Procedia-Social and Behavioral Sciences*, *197*, 2086-2096.

Dezhbankhan, F., Baranovich, D. L., Abedalaziz, N., & Dezhbankhan, S. (2021). Impacts of Metacognition Management System (MMS) Training Course on Metacognitive Competencies. *International Education Studies, 14(1)*, 12-27.

Duruk, Ü. (2020). Investigating Students' Scientific Creativity and Metacognitive Awareness Level According to RIASEC Interest Inventory. *Online Submission*, 7(5), 1-20.

Gholami, M., Moghadam, P. K., Mohammadipoor, F., Tarahi, M. J., Sak, M., Toulabi, T., & Pour, A. H. H. (2016). Comparing the effects of problem-based learning and the traditional lecture method on critical thinking skills and metacognitive awareness in nursing students in a critical care nursing course. *Nurse education today, 45,* 16-21.

Gu, M., & Sok, S. (2021). Factors Affecting the Academic Achievement of Nursing College Students in a Flipped Learning Simulation Practice. *International journal of environmental research and public health, 18(11),* 5970. https://doi.org/10.3390/ijerph18115970

Meslhy, M. H., Ibrahim, A. M., & Abdeen, M. A. (2020). The impact of metacognitive skills educational program on metacognitive awareness, self-efficacy, and problem-solving skills among nursing students. *American Journal of Nursing Research, 8(2),* 289-296. https://doi.org/10.12691/ajnr-8-2-19

Jang, S., Kim, S., & Park, N. (2019). Factors influencing metacognition, communication skills, and confidence in the performance of core basic nursing skills on clinical competency in nursing students. *The Journal*

of Korean academic society of nursing education, 25(4), 448-458.

Lee, M. N., Nam, K. D., & Kim, H. Y. (2017). Effects of simulation with problem-based learning program on metacognition, team efficacy, and learning attitude in nursing students: Nursing care with increased intracranial pressure patient. CIN: Computers, Informatics, Nursing, 35(3), 145-151.

Li, S., de Ala, M., Mao, D., Wang, A., & Wu, C. (2022). Effect of a Nursing Comprehensive Skill Training Course (NCST-C) on Nursing Students' Metacognitive Awareness: A Quasi-experimental Study. Asian Nursing Research, 16(5), 275-281.

McCabe, J. (2011). Metacognitive awareness of learning strategies in undergraduates. Memory & cognition, 39, 462-476.

Medina, M. S., Castleberry, A. N., & Persky, A. M. (2017). Strategies for improving learner metacognition in health professional education. American journal of pharmaceutical education, 81(4), 78.

Mohamed, A. H. H. (2012). The relationship between metacognition and self-regulation in young children. Procedia-Social and Behavioral Sciences, 69, 477-486.

Mohseni, F., Seifoori, Z., Ahangari, S., & Khajavi, Y. (2020). The impact of metacognitive strategy training and critical thinking awareness-raising on reading comprehension. Cogent Education, 7(1). https://doi.org/10.1080/2331186X.2020.1720946

Mott, S., Fogg, N., Foote, N., Hillier, M., Lewis, D. A., McDowell, B. M., Saunders, K., Taylor, J. T., Wiggins, S., Ivey, J. B., O'Brien Benedetto, C., Beam, P. H., McKnight, K. B., Taha, A. A., & Vann-Patterson, A. (2018). Society of Pediatric Nurses' Core Competencies for the Pediatric Nurse. Journal of pediatric nursing, 38, 142-144. https://doi.org/10.1016/j.pedn.2017.11.006

Moza, A. B. (2022). Metacognitive Awareness Perceptions of Students with High and Low Scores on TIMSS-Like Science Tests. International Journal of Cognitive Research in Science, Engineering and Education, 10(3), 73-82.

Özçakmak, H., Köroglu, M., Korkmaz, C., & Bolat, Y. (2021). The Effect of Metacognitive Awareness on Academic Success. African Educational Research Journal, 9(2), 434-448.

Radwan, R. I. M., Morsy, S. R., Badr, O. E., & Saleh, S. E. S. (2023). Association between Metacognitive Awareness of Pediatric Nursing Students and Their Academic Achievement: A Correlational Study. Menoufia Nursing Journal, 8(3), 337-356.

Rashwan, Z. I., Busebaia, T. J., Al-Sabbagh, A. S., & Eweida, R. S. (2021). Effect of guided reciprocal peer questioning strategy on pediatric nursing students' self-esteem and metacognitive awareness: Current approach and future directions. Nurse Education Today, 107, 105153.

Rivers, M. L., Dunlosky, J., & Persky, A. M. (2020). Measuring Metacognitive Knowledge, Monitoring, and Control in the Pharmacy Classroom and Experiential Settings. American journal of pharmaceutical education, 84(5), 7730. https://doi.org/10.5688/ajpe7730

Siqueira, M. A. M., Gonçalves, J. P., Mendonça, V. S., Kobayasi, R., Arantes-Costa, F. M., Tempski, P. Z., & Martins, M. D. A. (2020). Relationship between metacognitive awareness and motivation to learn in medical students. BMC medical education, 20(1), 1-10.

Vandergrift, L., Goh, C. C., Mareschal, C. J., & Tafaghodtari, M. H. (2006). The metacognitive awareness listening questionnaire: Development and validation. Language learning, 56(3), 431-462.