Review Article

What are the Factors that Enhance Metacognitive Skills in Nursing Students? A Systematic Review

Abstract

Background: Metacognitive skills have an important role in training efficient learners and competent clinicians in health professions education. The aim of this systematized review was to determine the factors enhancing metacognitive skills in nursing students. **Materials and Methods:** For data collection, we searched the databases of PubMed, Ovid, Cochrane, Scopus, Web of Science, ProQuest, Springer, EMBASE, Science Direct, PsycInfo, Nursing and Allied Health, and ERIC up to the end of March 2019, using the study key words. We used PRISMA flowchart diagram for reporting the results of the study. Peer-reviewed articles in English, addressing factors enhancing metacognition in nursing students, were included in our review. The Critical Appraisal Skills Program (CASP) checklist was used for assessing the quality of the included studies. **Results:** Out of 2355 studies, 16 were included for the review. Several factors, namely "specific curricular activities," "self-regulated e-learning modules," "e-portfolio," "cognitive apprenticeship," "specific teaching techniques for classroom and experiential settings," "metacognitive wrappers," "problem-based learning," "blended learning," "grit," and "clinical log," enhancing metacognition in nursing students, were extracted. **Conclusions:** The findings of our study can contribute to planning for improvement of learners' metacognitive skills. However, there is a need for future research on determining further factors influencing nursing students' metacognitive skills.

Keywords: *Cognition, metacognition, metacognitive skills, nursing*

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Introduction

Metacognition, originally defined by Flavell in the 1970s, is explicated as "thinking about thinking" or a person's "knowledge and cognition about cognitive phenomena"[1] and comprises of planning, monitoring, and regulating processes in one's learning behavior, leading to learners' enhanced reasoning, learning, and problem-solving.[2-5] Acknowledging the role of metacognition in enhancing efficient learning, some studies have been conducted to understand the process of applying metacognitive skills to improve management of cognitive resources through engaging a variety of learners' abilities including academic skills and self-awareness. It has been reported that the level of learners' engagement in self-thinking, type of learning tasks, and the social context could reflect their metacognitive ability.[6]

Meanwhile, some studies have remarked that learners with higher levels of metacognitive skills would demonstrate various abilities, namely showing more strategic behavior,[7-9] being better problem-solver individuals,[10] having better prediction of their own performance in examinations,[11] and being endowed with higher skills of efficient reading.[12] Accordingly, these learners are assumed to be more successful in academic achievements due to their more effective learning behavior.[13,14]

Metacognitive skills are considered important in health professions education in order to train competent learners and efficient clinicians. This ability would prevent medical errors through fostering critical thinking and self-monitoring behavior in clinicians including nurses.[15,16] Hence, nursing students need to develop metacognitive skills to reflect and become aware of not only their learning strategies, but also their own strengths and weaknesses, leading to self-monitoring of the learning process.[17] Moreover, higher levels of metacognitive skills in nurses are associated with providing better patient

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care through enhancing clinical reasoning.[18] The same is true when it comes to nursing students' performance in examinations, that is, the more metacognitive thinkers they are, the better exam results they obtain.[19]

Several studies have shown the effectiveness of metacognition in nursing education[20-23]; however, to the best of our knowledge, we could not find a rigor research determining factors which improve metacognitive skills in nursing students in the literature. The aim of this systematized review was to determine the factors which enhance metacognitive skills in nursing students.

Materials and Methods

We followed Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement by the Cochrane Collaboration[24] to report the results of this systematized review. A systematized review is one of the literature review types which may not include all components of a systematic review.[25] We included all types of study designs in this systematized review.

We conducted an advanced search in PubMed, Ovid, Cochrane, Scopus, Web of Science, ProQuest, Springer, EMBASE, Science Direct, PsycInfo, Nursing and Allied Health, and ERIC databases. We performed the search on April 15th, 2019. The key words, based on Medical Subject Headings (MeSH), were "Metacognition," "Meta-cognitive Awareness," "Meta-cognitive Control," "Meta-cognitive Monitoring," "Metacognitive Knowledge," "Cognition," "Self-Concept," "Nursing students," "Nursing learners" as single terms or in combination with others. An example of search query used to retrieve the papers in Web of Science was as follows: TS = ((Metacognition OR Meta-cognition OR Meta-cognitive Awareness OR Meta-cognitive Control OR Meta-cognitive Monitoring OR Meta-cognitive OR Metacognitive Awareness OR Metacognitive Control OR Metacognitive Knowledge OR Metacognitive Monitoring OR Cognition) AND (Nursing Students OR Nursing learners)). After retrieving the articles, duplicates were removed by using Endnote X8.2.

The following inclusion criteria were considered for the selection of the studies: (1) English language, (2) original and peer reviewed, (3) addressing nursing students as the subject of the study, (4) reporting factors enhancing metacognition as the main result of the study, (5) published until the end of March 2019, and (6) availability of articles' full texts. Gray literature was not included in this review. Moreover, no specific study design was considered as an inclusion criterion.

After removing the duplicates, the titles and abstracts of the included studies were reviewed independently by two of the researchers who removed the irrelevant studies according to the exclusion criteria. Afterward, the two researchers reviewed full texts of the remaining studies. Any discrepancies between the reviewers were resolved through discussion or the intervention of a third reviewer.

In the next step, we extracted data from each of the studies selected as eligible. The data collected on the basis of our study objectives were: title, name(s) of author(s), publication place and year, research sample or population, type of study, and objectives. Furthermore, we summarized and recorded the key findings, and determined factors which were shown to improve metacognitive skills in each study. PRISMA diagram was used for assessing the retrieval, extraction, and removal of the articles. Moreover, we applied the Critical Appraisal Skills Program checklist (CASP)[26] to evaluate the quality of the studies.

Ethical considerations

Ethical code of this study was obtained from the Ethics Committee of Tehran University of Medical Sciences, no: IR.TUMS.VCR.REC.1398.483.

The authors assessed the quality and relevance of articles with the review purpose, and precisely followed the Critical Appraisal Skills Program checklist and PRISMA guidelines. Furthermore, each article was reviewed by two separate authors to evaluate with regard to the eligibility criteria.

Results

Selecting eligible studies

The primary search resulted in 2355 studies, among which 902 were duplicates. Reviewing titles and abstracts led to the exclusion of 450 articles. Finally, after reviewing the full texts and extracting the data according to the inclusion criteria 16 articles remained for close evaluation. Table 1

Table 1: Database search results

Database	Number of records
Nursing & Allied Health	310
ERIC	50
PubMed	14
Scopus	82
Springer	13
PsycInfo	440
Web of Science	222
EMBASE	11
Ovid	100
ProQuest	1000
Science Direct	15
Cochrane	98
Total	2355
Duplicates	902
Totals with duplicates removed	1453

shows the number of articles retrieved in each database, and Figure 1 demonstrates the PRISMA diagram[24] which summarizes screening process to identify, evaluate, and screen the studies for review. Considering the research methods, all 16 articles were compatible with eligibility criteria by their relevant CASP checklists.

Study characteristics and factors enhancing metacognitive skills

Table 2 demonstrates each study characteristics including the bibliographic information, objectives, and outcomes as well as the mentioned factors enhancing metacognitive skills. All the studies had assessed the effectiveness of metacognitive skills and introduced strategies for enhancement of the skills. The first study was published in 1998. The number of qualitative, quantitative, mixed method and reviews was two, five, one, and eight, respectively. It should be mentioned that one article[27] was written in Korean language, but due to its close relevance to the present study, some useful information was extracted from its abstract. In addition, the target group in some articles was nurses, whereas in some others nurses were a part of the study population. The factors enhancing metacognitive skills extracted from the reviewed articles were as follows:

Curricular activities consists of three components: (1) pre-lecture assignments which are guided homework delivered to students before attending the class, and are typically designed to prepare the students for in-class activities, (2) group work in the classroom which takes place in the context of a collaborative culture, and can motivate students to actively participate in higher-order thinking activities in small groups, and (3) exam review assignments which are in-depth reflective assignments delivered to the students at the end of each semester.[28]

Self-regulated e-learning modules

Each of these modules consists of videos, reading materials, and a quiz planned for self-assessment, time management, reading and note taking, successful study skills, and test-taking strategies. The modules are designed according to phases of self-directed learning cycle in order to facilitate learning.[29]

Using e-portfolio

e-Portfolio is a tool which gathers students' personal and academic achievements with regard to fulfillment of curricular activities. Therefore, e-portfolio provides students with the possibility to assess their learning through self-reflection on previous tasks and new goal setting in order to compensate learning deficiencies.[30]

Cognitive apprenticeship

In cognitive apprenticeship, teaching is delivered by focusing on the processes deployed by experts while performing complicated tasks. Thus, it is believed that this strategy would enhance both cognitive and metacognitive skills. It consists of the following interconnected dimensions: (1) content including knowledge and thinking methods, an integral part of expertise, (2) method referring to teaching strategies which are effective for developing expertise, (3) sequence which focuses on organizing learning tasks to help students learn challenging and diverse tasks, (4) sociology which focuses on the effect of students' intrinsic motivation and communication,[22] and (5) specific teaching strategies in both classroom and experiential settings. There are several teaching methods
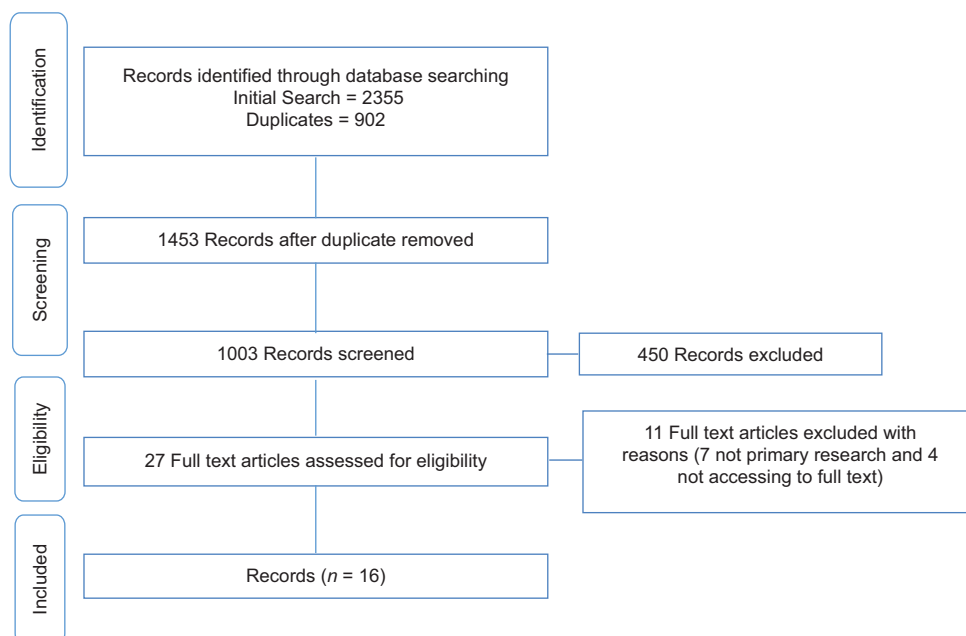

Figure 1: PRISMA 2009 Flow diagram

Table 2: Methodological characteristics, demographic information, and main results for studies on main factors enhancing metacognition

First author year	Study objective(s)	Study design	Main factor(s) enhancing metacognition	Study outcome	Population
Dang *et al*. 2018[28]	The impact of repeated curricular activities to enhance metacognition and academic achievement	Mixed method	Curricular activities including: Pre-lecture assignments, Collaborative work, Exam review assignments	Curricular activities designed to promote metacognition do indeed help students improve their self-evaluation skills and may preferentially help lower-performing students.	Students in an introductory biology course*
Briscoe and Brown 2018[29]	Developing and delivering self-regulated e-learning modules to perusing students. Learning evidence-based techniques to facilitate learning	Likert-like survey	Self-regulated e-learning modules	Self-regulated e-learning modules enhances students' retention and success.	Pre-nursing students.
Anderson *et al*. 2017[30]	Using e-portfolio for fostering Doctor of Nursing Practice (DNP). Enhancing students' reflection, concepts' integration, and technological abilities by e-portfolio	Action research	e-Portfolio	Applying e-portfolios in DNP program enhances metacognitive skills and consequently practice performance.	DNP students
Lyons *et al*. 2017[22]	Assessing the way and extend of applying cognitive apprenticeship theory in health sciences education	Qualitative synthesis and review	Cognitive apprenticeship	Cognitive apprenticeship theory highlights the process enhancing the cognitive and metacognitive abilities essential for being an expert through making expert thinking visible to students.	Various disciplines*
Medina *et al*. 2017[15]	Identifying the strategies to enhance learners' metacognitive abilities in classroom and experiential environment	Narrative review	Techniques for classroom setting: General planning, General monitoring, General evaluating, Examination reviews, Thinking out loud Techniques for experiential setting: Mastery goal setting, Questioning and feedback, Clinical documentation with explanation, Experiential rotation structure	Using teaching strategies regardless of setting can raise learners' self-awareness and help metacognitive thinking to occur more automatically	Health professional education including nursing students
Poorman and Mastorovich 2016[21]	Enhancing metacognitive ability by homework, lecture, and tests	Narrative review	Metacognitive wrappers including: homework, lecture, examination	Using metacognitive wrappers, that is, homework, lecture, and examination help students enhance their ability to think critically and prioritize information in a cost-effective manner.	Nursing students

Contd...

Table 2: Contd...

First author year	Study objective(s)	Study design	Main factor(s) enhancing metacognition	Study outcome	Population
Choi 2014[27] (Only abstract)	Assessing the influence of problem-based learning (PBL) on metacognitive skills, critical thinking, and problem-solving process (This article is in Korean language)	Pre-/posttest with a non-equivalent control group design	PBL teaching method	PBL enhances participants' metacognition and problem-solving ability but not their critical thinking capacity.	Nursing students
Hsu and Hsieh 2014[17]	Assessing the influence of demographic, learning involvement, and learning performance variables on metacognitive skills via blended learning system	Cross-sectional, correlational survey design	In a blended learning environment: Frequency of online chats Attitude toward case analysis Self-evaluation of case analysis Satisfaction of blended learning	There are significant associations between the level of students' metacognitive skills and frequency of online chats, attitude toward case analysis, self-evaluation of case analysis, and level of satisfaction with blended learning.	Nursing students
Arslan *et al.* 2013[23]	Assessing the relationship between metacognition and grit	Correlational design	Grit dimensions including: consistency of interest perseverance of effort	There are significant correlations between metacognitive skills and dimensions of grit, that is, consistency of interest and perseverance of effort.	University students
Norris and Gimber 2013[20]	Showing the advantages of metacognitive ability Providing examples as a pedagogical technique for enhancing metacognition through social technology	Narrative review	Social technologies that incorporate a social connection (Twitter, Blackboard, and e-Portfolio).	Social technologies, that is, Twitter, Blackboard, and e-Portfolio, provide instructors with the chance of improving students' metacognitive skills through developing good assignments.	Nursing students
Burke and Mancuso 2012[31]	Gathering instances of metacognition which are developed through theory-based implementation of simulation learning	Narrative review	Simulated learning	Theory-based facilitation of simulated learning improves cognitive processes of Social Cognitive Theory (SCT), metacognition, and self-directedness.	Nursing students
Hardin and Richardson 2012[32]	Describing a framework for teaching to train conceptual learners through addressing misconceptions, developing enduring understandings, and learning metacognitive skills. Presenting five teaching methods to be applied in concept-based curricula	Narrative review	Effective conceptual teaching methods including: Misconception and preconception check The discrepant event Concept maps Approximate analogies Check your knowledge quiz	Applying conceptual teaching methods, which consists of addressing misconceptions, developing enduring understandings, and acquiring metacognitive skills, for nursing students have more benefits compared to the traditional curricula.	Nursing students
González and Ruiz 2012[33]	Enhancing reflection, metacognition, and self-evaluation by clinical practice diary	Ethnography	Clinical practice diary	Clinical practice diary has a positive effect of students' continuous reflection and self-criticism. Metacognition is a feature of clinical practice diary	First-year nursing students

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Table 2: Contd...

First author year	Study objective(s)	Study design	Main factor(s) enhancing metacognition	Study outcome	Population
Kuiper and Pesut 2003[34]	Exploring the effect of self-regulated learning theory on reflective practice Developing clinical reasoning skills by cognitive and metacognitive skills	Integrative review	Self-regulated learning strategies	Applying self-regulated learning strategies by nursing students and practitioners helps them strengthen their cognitive and metacognitive skills in clinical contexts.	Literature performed on nursing education, social sciences, educational psychology, and professional education
Tobias S 1995[35]	Examining the effect of text passages designed to arouse situational interest on students' metacognitive skills	Randomized experimental	Interesting contents	Students' metacognition be enhanced on content that aroused situational interest and was related to students' topic interests	Nursing students
Fonteyn and Cahill 1998[36]	Assessing the effectiveness of a reflective clinical log on students' metacognitive and thinking strategies	Scoping review	Reflective clinical log	Clinical logs assist students to become more active learners, manage their own thinking, and improves their metacognition.	Nursing students

that could be employed to help students apply cognitive and metacognitive processes and to learn through guided experience. In this regard, Medina states some practical techniques.[15]

General planning

Students learn better when they concentrate on learning objectives presented by the instructor. This includes the following strategies: (1) monitoring, whereby learners learn better when they monitor their understanding during teaching–learning process, that is, metacognitive awareness, (2) evaluating by which students become more aware of the impact of their metacognitive skills on learning, if they learn how to evaluate themselves while studying, (3) reviewing examination by which students review their mistakes and use metacognitive skills to learn from them, (4) thinking aloud which is a feasible model of learning to be applied in the classroom, (5) reflection which is a simple method allowing students to improve their actions, abilities, and knowledge through thinking and analyzing past experiences.

Cognitive apprenticeship techniques

These techniques are recommended to be used in the experiential settings and include: (1) mastery goal setting, a structure compatible with metacognitive processes, promoting competency development, practicing new skills, and focusing on learning to understand which should be encouraged in experiential environments, (2) questioning and feedback by which instructors, who provide their students with immediate feedback on their performance from the beginning of clinical training, help them enhance

their metacognitive processes, (3) clinical documentation with explanation, a technique by which students explain their thinking process and reasoning, so that they can have a basis for written and verbal communication, thereby enhancing metacognition, and better communication and patient care, (4) experiential rotation structure, a technique focusing on providing a scaffolding experiential environment both between and within a rotation for learners. In the other words, students experience a more supportive setting at the beginning of their training and then gradually go through a less dependent procedure, promoting their metacognitive skills.[15]

Metacognitive wrappers

Homework, lectures, and examinations are considered three type of wrappers which enhance metacognitive abilities through helping students prioritize information presented in lectures, readings, and exam mistakes and consider the practice of nursing preferences.[21]

Problem-based learning (PBL)

This learner-centered strategy provides students with the opportunity to learn about a subject by solving an open-ended problem, which results in strengthening students' self-learning and lifelong learning skills and metacognitive skills.[37]

Blended learning environment

Blended learning, defined as combining classroom and online learning, can develop students' metacognitive ability. In this regard, learning involvement (the amount of internet usage in minutes and frequency of online chats)

and learning performances (attitude toward case analysis, self-evaluation of case analysis, and satisfaction level) are considered to be effective factors.[17]

Grit

Grit is defined as showing a diligent and passionate behavior to achieve long-term goals and is related to one's trait. As a matter of fact, this is the point of difference for various levels of success in learners with the same degree of intelligence.[23]

Social technologies

They maintain a social connection (Twitter, Blackboard, and e-portfolio) and apply a user-friendly social technology enhancing students' metacognitive skills, classroom achievement, and patient care. The main technologies which maintain a social connection in the context of interactive environments are Twitter, Blackboard, and e-Portfolio.[20]

Simulation-based learning

This provides learners with a wide range of scenarios from simple ones about patients' basic hygiene needs to complicated ones requiring critical care related to decision making. This strategy incorporates various methods from role-playing to using high-tech manikins based on the learning task type and objectives and emphasizes on enabling learners to be intentional, self-reactive, and self-reflective.[31]

Conceptual teaching methods

These are the methods which "relieve educators from attending to miniscule particulates of overly contextualized items of information" as stated in the related article. Effective conceptual teaching methods are as follows: (1) misconception and preconception check which is a short and simple questionnaire gathering students' beliefs and ideas about misunderstandings and misinformation which interfere with their learning process, (2) discrepant events which are leaving students in a situation contrary to the expected one, in a way that they should understand and explain what has happened, thereby enhancing their observational skills, strengthen the power of predicting possible scenarios, and understand the benefit of avoiding premature judgment about cases, (3) concept maps a method by which students draw the relationship of concepts as a diagram or flowchart, and then share maps with their peers during a course period which leads to improvement of their metacognitive skills, (4) approximate analogies which are considered as a quick method to learn connections between concepts while the instructor presents the first half of the analogy and asks students to find the second one, and explain and share their answers with their peers,[22] and (5) check the knowledge quiz, a short and ungraded quiz developed on the basis of key points of learning objectives. In fact, the aim of the quiz is to estimate students' information on the content at one point in time.[32]

Clinical practice diary

This tool provides students with the chance of continuous self-reflection on their aims and competencies in clinical setting, thereby gaining insight into their level of awareness or knowledge through a metacognitive process. In this way, they enhance the ways of thinking, the content of knowledge, and the ability to control these processes, leading to better learning.[33]

Self-regulated learning strategies

These strategies enable nursing students to acquire competencies for clinical reasoning through reflection resulting in proper transition from university to real practice.[34]

Presenting interesting contents

Contents could be interesting regarding two aspects of the situation and topic. Situational interest is related to items like situation's novelty or intensity, and the attractiveness of various content types. On the other hand, topic interest refers to students' preferences for different topics, tasks, or contexts and the way they learn.[35]

Reflective clinical log

A clinical log is a tool in which students describe and document their own experiences in their own words resulting in enhanced self-evaluation, self-monitoring, and self-determination. Consequently, students' metacognitive awareness would increase.[36]

Generally, six studies reported specific methods or strategies to be used for metacognitive enhancement, that is, clinical practice diary,[33] e-portfolio,[30] reflective clinical log,[36] PBL,[27] social technology,[20] and simulation-based learning.[31] On the other hand, ten studies addressed more general concepts including some specific techniques.[15,17,21-23,28,29,32,34,35] Finally, considering the research methodology, eight articles were review studies, including one qualitative synthesis[22] and seven narrative reviews.[15,20,21,29,30,31,34] There was only one qualitative synthesis and review, in which the authors included just four databases in their search, though they followed the defined process for this type of review, namely defining a research question, appropriate key words, search strategies, timeline, inclusion and exclusion criteria, quality assessment, qualitative and narrative synthesis as well as thematic analysis. While five out of seven narrative reviews lacked some essential steps of review such as stating search strategy, or explaining how the articles were identified,[20,21,29-31] two studies[15,34] explained their methodology and used appropriate tables and figures to interpret their findings. Moreover, one study had a randomized experimental design[17] and one quasi-experimental design.[27]

Discussion

One of the main goals of training students of professional disciplines, including students of nursing, is to help them learn how to learn. In this regard, developing reflective thinking, (metacognitive skills), alongside with critical thinking (cognitive skills) are considered important for the development of better clinical reasoning.[33] Considering the importance of metacognition in nursing education, we aimed at extracting factors which enhance metacognitive skills in nursing students through a systematized review of the literature. After searching, screening, and critical appraisal of the articles included in our review, we identified 16 articles addressing factors which could enhance metacognitive skills, and 15 influencing factors for enhancement of the skills in nursing students.

Students' higher metacognitive skills result in better understanding of not only their own ideas, but also those expressed by their peers. This helps them become aware of their progress in understanding of the taught materials.[38] Hence, identifying the factors that affect these skills is necessary in order to plan for their improvement. In addition, being aware of these factors help students understand, monitor, and control their cognitive skills/ performance, leading to learning achievements.[39] There are several studies which have addressed individual factors enhancing students' metacognition[39,40]; however, a cumulative list of such factors could be beneficial to both teachers and learners.

Besides the specific teaching strategies, namely clinical practice diary, e-portfolio, reflective clinical log, PBL, social technology, and simulation-based learning mentioned to be effective for improving students' metacognition, some other notable techniques were also reported. In particular, two articles introduced cognitive apprenticeship as a general strategy to improve metacognition[15,22]; one of them elaborated on the concept in more detail and suggested practical techniques for classroom and clinical settings,[15] which could be useful for instructors and were shown to be effective in disciplines other than nursing.[41-43] Four articles focused on curriculum design at the course level,[17,21,28,29] two of which were related to a totally e-learning[29] or blended learning environments.[17] It is shown that there is a significant positive relationship between SRL and metacognitive skills and online academic success.[43] According to the findings of those articles, suitable assignments, self-assessments, and exam reviews were shown to be influencing factors. Two studies reported students' inner preferences, that is, grit[23] and being interested in content.[35] Indeed, the positive effects of these factors on learning have already been reported in some previous studies.[44-46] To elaborate more, there is evidence supporting that metacognition is affected not only by individual differences in awareness about cognitive ability and its regulating role, but also by the influence of other cognitive skills such as grit.[44,46] Besides, interesting contents may enhance metacognition by motivating students to concentrate more on the materials and to continue performing the task for a longer period.[45] One of the articles mentioned conceptual teaching methods as a factor enhancing metacognition in nursing students.[32] That study explained some detailed practical strategies which are found to be effective in other disciplines or contexts too.[47,48] In the study discussing SRL strategies, no specific technique was mentioned in this regard, and self-regulation learning theory and its relation to cognition and metacognition was the main concern.[34] However, the positive effects of SRL strategies on learning have been reported in some other studies too.[49,50]

As mentioned before, six studies had addressed specific methods or strategies to be used for metacognitive enhancement. By evaluating those six articles, the following points are concluded: Three studies mentioned methods for self-documentation of real clinical experiences by students themselves, that is, clinical practice diary,[33] e-portfolio,[30] and reflective clinical log.[35] In fact, all these methods provide students with the opportunity for self-evaluation and self-monitoring which lead to the enhancement of metacognitive skills. As a matter of fact, the positive effect of clinical practice diary on metacognition has been shown in some studies in other desciplines.[51,52] The positive effects of e-portfolio[53,54] and clinical log[55,56] have also been supported. Two studies had addressed specific teaching methods, namely PBL[27] and simulation-based learning.[37] In fact, both of these methods focus on students' critical thinking and problem-solving skills which cause metacognition improvement. This has been supported by some studies conducted in other disciplines both for PBL[57,58] and simulation-based learning.[59,60] The last article in this classification, similar to some studies performed in other disciplines,[61,62] focused on employing social technologies as an effective strategy to enhance nursing students' metacognitive skills; however, the effectiveness of these technologies depends on the way the instructors employ them.[20]

Moreover, five studies mentioned factors directly and independently promoting students' reflective skills. Those factors were clinical practice diary,[33] e-portfolio,[29] reflective clinical log,[35] grit,[22] and conceptual teaching methods performed by students themselves.[32] In contrast, other 11 studies put more emphasis on instructors' course plan for improving students' metacognition.[15,17,20-22,27-29,31,34,35] This shows that instructors and the way they design their courses play an important role in helping students develop their metacognitive competencies.

Finally, although the authors of the eight articles with the review design study included in our study discussed pros and cons of their assessed documents, they remarked the limitations of their studies. Considering this point and

the insufficiencies in their methodologies, there is a need for performing more rigorous research studies to identify further specific factors enhancing metacognition in nursing students and deepen the knowledge on this issue.

Non-English articles, with the exception of the one in Korean language, which was appraised on the basis of the English abstract, were not included in this review.

Conclusion

Considering the importance of identifying the factors which improve nursing students' metacognition, the findings of the present study add to the accumulative list of such factors in the literature. However, further research with specific focus on determining the influential factors will enrich the literature and help in planning for the development of metacognitive skills.

Conflicts of interest

Nothing to declare.

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