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Critical thinking level of undergraduate nursing students from first and last semesters in a university of Medellín, Colombia

Nivel de pensamiento crítico de estudiantes de primero y último semestre de pregrado en enfermería de una universidad en Medellín, Colombia

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Resumen

Introducción: El pensamiento crítico es un componente importante de la formación en Enfermería. Diferentes organizaciones exigen estrategias de pensamiento crítico para acreditar programas universitarios. Sin embargo, existe poca evidencia sobre la medición de sus niveles. **Objetivo:** Comparar el nivel de pensamiento crítico, en estudiantes de primero y último semestre de Enfermería en una universidad de Medellín-Colombia. **Materiales y métodos:** Estudio cuantitativo descriptivo, trasversal y comparativo del pensamiento crítico en una muestra a conveniencia de estudiantes de primero y último semestre. **Resultados:** En ambos grupos, el nivel es medio (primero 44,47; último 53,14; *p*<0,001). No obstante, se observa un incremento de 19,49% con respecto al primer semestre, con cambios significativos en los dominios: evaluación, argumentación e interpretación. No se encontraron diferencias en los dominios de inferencia y análisis. **Conclusiones:** Los hallazgos muestran un cambio positivo en el nivel de pensamiento crítico, que son un punto de partida para el análisis del proceso enseñanza aprendizaje en la facultad donde se desarrolló el estudio, con el fin de fortalecer los dominios donde se observaron incrementos significativos y desarrollar estrategias que favorezcan el desarrollo de habilidades en los que no se observaron cambios. Es importante desarrollar investigaciones con mediciones longitudinales e instrumentos confiables.

Palabras clave: Pensamiento; enfermería; educación superior. (Fuente: DeCS, Bireme).

Abstract

Introduction: Critical thinking is an important component of nursing education. Different organizations demand critical thinking strategies in order to accredit university programs. Nevertheless, there is limited evidence in regards to how critical thinking levels can be assessed. **Objective:** To compare the critical thinking levels of undergraduate nursing students from first and last semesters in a university of Medellin-Colombia. **Materials and methods:** A quantitative, descriptive, cross- sectional and comparative study of critical thinking carried out with an appropriate sample of students from first and last semesters. **Results:** Both groups showed a medium level (44.47 and 53.14 for first and last semester students, respectively). However, there is a 19.49% increase in last semester students compared to ones belonging to first semester, with significant changes in domains like evaluation, argumentation and interpretation. We did not observe significant changes in inference and analysis. **Conclusions:** Our findings show a positive change in the critical thinking level, a result that can be used as a starting point for the analysis of the teaching-learning processes developed in the Nursing Faculty. Our results are also important for strengthening the domains that showed significant increments and developing strategies to foster the development of skills in the areas where changes were not evident. We consider that it is relevant to carry out studies with longitudinal measurements and reliable instruments.

Key words: Thinking; nursing; education, higher. (Source: DeCS, Bireme).

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Introduction

Critical thinking (CT) is a relevant concept in education, especially in higher education since it is a useful cognitive tool for the student to learn how to filter information, unlearn and transform. In a dynamic environment driven by information and communication technologies, future professionals will face changes, ambiguities and contradictory information, which will undoubtedly force them to make difficult decisions and solve complex problems. Therefore, higher order cognitive skills, like CT, have been gradually gaining importance in higher education[1]. Critical thinking is more important than obtaining good grades or maintaining good academic standings as they are not good predictors of professional performance[2].

Nursing is a discipline that involves daily practices with high levels of diversity and complexity. In addition, technological advances have encouraged patients to move from being a passive actor to a person that questions and makes decisions about his/her health care procedures[3]. Similarly, the political and social changes from recent decades have transformed health care organizations to satisfy patients' demands for better quality services at a lower cost. In this context, patient care has become a challenge for nursing professionals, forcing them to make critical decisions in order to search for better care alternatives. Thus, approaches such as Evidence-Based Nursing (EBN)[4] and education based on competences (EBC) require a comprehensive analysis in order to promote a better adaptation of professionals to the actual social context. Indeed, these approaches have become essential and imperative elements in health sciences to educate professionals based on knowledge, abilities and attitudes that characterize nursing[5].

Cárdenas, et al.[6] state that cognitive skills are more recognized than psychomotor abilities in the current field of nursing, which have been highly overrated in past professional training. CT stands out among those cognitive skills to such an extent that different organizations and universities worldwide have incorporated strategies to promote CT in their professional nursing training curricula. This is the case of the American Association of Colleges of Nursing (AACN)[7] and National League of Nursing (NLN)[8], in the United States, which have included competences in CT as a requirement for the accreditation of university programs since 1989. Also,

the Ibero-American Research Group in Nursing Education (RIIEE in Spanish) has been investigating and highlighting the importance of CT in nursing education in the region[6,9,10].

Nevertheless, as described by Cardenas, et al.[10], recognizing the importance of CT in professional nursing training and including CT competences in their curricula do not guarantee the development of critical thinkers. They conclude that in the Ibero-American region, CT in nursing is a complex concept that has several meanings, according to either the theoretical focus or context.

There have been important contributions to reach a consensus with respect to the definition of CT, as the one by the American Philosophical Association (APA)[11]. Subsequently, ten different views of CT were documented by Basco, et al. during the time period of 2001 – 2013[12]. At present, there are several instruments to assess CT, including: California Critical Thinking; Critical Thinking; Appraisal; Halpern Critical Thinking; Health Sciences Reasoning; PENCRISAL; and Critical Thinking Diagnostic. In this study, we chose the instrument proposed by Ospina, et al.[13] that was developed in 2016 (Medellín-Colombia) and validated with nursing and sociology students. This test measures the level of CT using skills such as evaluation, argumentation, analysis, inference, and interpretation.

In the Ibero-American region there is insufficient quantitative research on the measurement of CT levels in professional nursing training[14]. Thus, it is important to: (i) identify the current levels of CT at the beginning and at the end of professional nursing training; (ii) study changes in the different skills measured by the instrument used in this study; (iii) propose strategies to strengthen and improve those levels; and (iv) develop this important cognitive skill in nursing trainees.

Therefore, this research is aimed at comparing the CT levels in nursing students from initial and final training stages, mainly focusing on the domains of evaluation, argumentation, analysis, inference and interpretation.

Materials and methods

A quantitative descriptive cross-sectional and comparative study was conducted with a population of undergraduate students, enrolled during the

2016/2 academic semester at a university from Medellín-Colombia. A census was used to include all the students from both first and last academic periods, who participated voluntarily in this study. Exchange students and those belonging to academic mobility programs were excluded. Also, students who responded to less than 75% of the questionnaire because of unpunctuality or did not show a good disposition towards the study were also excluded. Thus, the study sample included 104 participants out of 120 enrolled students.

Participants were first informed about the objectives and benefits of the investigation. They were first asked to sign the informed consent form, then the information was collected. The questionnaire included sociodemographic data and 50 multiple selection questions to measure CT, which were scored between 0 to 100 points. This instrument is a modified version of the one proposed and validated by Ospina, *et al*.[13]. Both instruments calculate the CT global index using five subscales of the following domains or dimensions: argumentation, analysis, interpretation, inference, and evaluation.

A pilot test was applied to 90 students (55 from nursing and 35 sociology programs) to assess the reliability and validity of the instrument used in this study. They were enrolled in the first and last academic semesters of each program. Reliability of this pilot group was assessed by means of the Cronbach's alfa test, whose result was 0.519. The application of the test on the study population produced a Cronbach's alfa of 0.659. On the other hand, a confirmatory factor analysis (which reported a KMO index of 0.52) and a Bartlett test (with a $p<0,001$) were applied in order to assess validity. A variability of 69.48% was obtained, which means that the constructed items can explain about 70% of the dimensions that make up the CT. Finally, a high concordance was found between the item's correlation and the dimension to which it belongs, according to the theoretical proposal.

The SPSS 23 statistical software was used to process the data. The measures of central tendency, dispersion, and frequency were calculated for sociodemographic variables, CT index and its dimensions. T-student tests were applied for independent groups in order to compare the means of the CT global assessment between the first and last semesters, according to CT's dimensions. The Spearman correlation coefficient and chi-square tests were applied to examine possible relationships between CT levels and academic semesters, according to sociodemographic variables. In all cases, a level of <0.05 was considered as statistically significant.

Ethical considerations

This study followed the ethical principles and standards established by Resolution 8430 of 1993 of the Colombian Ministry of Health. Voluntary participation and confidentiality of students was guaranteed. The study was approved by the Research Ethics Committee of the Nursing Program of the University of Antioquia.

Results

The study population consisted of 55 students from first semester and 49 students from the eighth semester of the Nursing undergraduate program. The average age of students from the first semester was 19 ± 2 years, with a minimum age of 17 years and a maximum age of 26 years. In contrast, the average age was 23 ± 2 years for students from the eighth semester, with minimum and maximum ages of 21 and 32 years, respectively. In terms of gender, 3 out of 4 students (78%) were female students. Most of the participating students (60,6%) were living in Medellín, while 33% came from other municipalities belonging to the metropolitan area. Only 5,8% of participants lived in other municipalities from the Antioquia Department. Most students (94%) belonged to socioeconomic strata 1, 2 or 3. Whereas the majority of participants (94,2%) identified themselves as mestizo, only 2,9% and 1,9% self-identified as indigenous and Afro-descendant, respectively. 94,2% of the participants were single, 93,1% did not have children and one out of four students worked. The sociodemographic characteristics are presented in Table 1. Statistically significant differences were only recorded for gender and employment status.

There were no statistically significant differences between CT levels and gender. The average level of CT for men was 50.45 ± 13.20 and 48.04 ± 9.79 for women (t=0.946, p=0.346). The Pearson's correlation coefficient between age and CT level was 0.322 (t=3.41, p=0.01), which suggests a weak correlation and implies that as age increases the level of CT also improves.

Table 1. Sociodemographic characteristics of nursing students from first and last semesters in Medellín-Colombia

Variables	First		Last		X²	p
	n	%	n	%		
Gender						
Male	6	10.91	16	32.65	7.346	0.007
Female	49	89.09	33	67.35		
Marital status						
Single	54	98.18	44	89.80	3.352	0.097*
Married	1	1.82	5	10.20		
Number of children						
0	51	98.08	43	87.76	5.59	0.133
1	0	0.00	4	8.16		
2	0	0.00	1	2.04		
3	1	1.92	1	2.04		
Socioeconomic stratum						
1	7	12.73	3	6.12	4.94	0.293
2	22	40.00	14	28.57		
3	23	41.82	29	59.18		
4	2	3.64	3	6.12		
5	1	1.82	0	0.00		
Type of high school attended before enrolling into the nursing program						
Public	46	83.64	42	85.71	0.086	0.769
Private	9	16.36	7	14.29		
Currently working						
Yes	5	9.09	21	42.86	15.757	<0.001
No	50	90.91	28	57.14		

Fisher's exact test was applied

The average assessment scores for CT and its domains are shown in Table 2. First semester students obtained better average scores in analysis (capacity to identify inference relationships, real or not, between statements or other form of representations, based on available evidence[15]) and interpretation (capacity to understand the meaning of a wide variety of experiences, situations and events. It involves classifying, decoding and clarifying a meaning[15]). The lowest score was obtained in inference (capacity to identify the elements necessary to derive conjectures and hypotheses, based on available information[15]). With respect to the CT global index and based on Ospina *et al.*[13], first semester students are placed at an average CT index.

Last semester students performed better in the five domains compared to first semester students,

showing the highest scores in evaluation (capacity to value the credibility and logical strength of provided information[15]), argumentation (capacity to justify the reasoning through results with convincing and demonstrable arguments and considering the context of the experience[15]), and interpretation. These domains showed statistically significant differences and, even though this was a cross-sectional study, such differences cannot be attributable to chance (Table 2). There were no statistically significant changes between the students of both semesters with respect to inference (low levels in both groups) and analysis (a slightly positive change). Despite an increase of 8.67 points in the general assessment of the CT index, last semester students are still placed at an average level of CT.

Table 2. Comparison between the obtained average scores and the assessment of CT and its domains

Domain	First Semester		Last Semester		t	p
	Average	S.D.	Average	S.D.		
Inference	30	13.88	31.84	11.31	0.734	0.464
Evaluation	40.36	22.77	54.08	16.7	3.467	0.001
Argumentation	47.27	15.21	53.06	10.45	2.235	0.028
Analysis	50.73	18.34	57.14	15.28	1.925	0.057
Interpretation	54	22.82	69.59	19.79	3.701	<0.001
Critical Thinking	44.47	10.94	53.14	8.07	4.551	<0.001

Discussion

We did not find statistically significant differences in the average levels of CT when comparing by gender, which is similar to what was reported by Salahshoor and Rafiee[16]. They compared CT levels in a sample of five private language institutes using the Watson-Glaser instrument and did not find differences between men (43.2 ± 9.07) and women (40.94 ± 7.37 p=0.064). However, there was a weak directly proportional correlation between age and CT level, which can be explained by the fact that learning styles are affected by multiple factors, including age. Indeed, there is a personal and intellectual growth of the students as they get older[17], which is influenced by the type of university education[18,19]. On the other hand, the results of this study do not coincide with those of Azizi, et al.[20], who found an inversely proportional correlation (r=-0.172, p=0.06) in a population of students from first and last years of a nursing program in Iran. Finally, Hunter, et al.[21] did not find statistically significant differences between age groups and CT levels in nursing students from Australia.

We observed that the CT level is lower in first semester students compared to those from the last semester of the nursing program (44,47 and 53,14, respectively). Nevertheless, the index developed by Ospina et al.[13] (constructed from a merely theoretical perspective) places these two values in an average CT level. It is important to highlight that at the moment there is no a CT reference value to compare our results. On the contrary, the IQ quotient of people is often compared to the IQ of historical figures like Albert Einstein[22].

An objective measurement to compare the CT level between students belonging to first and last semesters of nursing can be used as reference for first semester students since the difference we reported (8.67 points) is equivalent to a 19.49% increase in CT. These results are consistent with the findings of Tahery, et al.[23], who examined CT and its domains through a different instrument (*Watson-Glaser Critical Thinking*). They reported average CT levels in third semester students (42.29), which increased in students from last semesters (49.0, p<0.001) in 2018 in students from Iran. They also found statistically significant differences in inference (5.12-6.45, p=0.010), recognition of assumptions (8.81-11.54 p<0.001) and interpretation (9.67-11.0 p=0.003). Interestingly, these results contradict those from Azizi-Fini et al.[20], who in 2015 used the *California Critical Thinking* test to measure CT in first and last semester students from a nursing program in Iran and found no statistically significant differences in CT levels and other skills assessed by that instrument.

Measuring CT values enables training institutions of nursing professionals, and their professors, to know the CT level of their students and implement strategies to strengthen and develop this cognitive skill and its domains. In this context, a review by Carter, et al.[24] found 28 studies in 8 countries that evaluated 12 different teaching interventions to promote CT in nursing students, highlighting the importance of strategies such as problem-based learning, concept maps, simulation, and narrative pedagogy due to their optimal results. They also concluded that it is necessary to design studies to identify good pedagogical practices for the development and strengthening of CT.

All these previous reports reinforce the importance of improving the methodological designs in order to ensure (i) an objective measurement of CT, (ii) a successful control of possible biases, and (iii) the implementation of educational strategies to track chronological changes in CT. Villatoro et al.[25] describe a methodological proposal containing teaching-learning strategies to significantly enhance CT in nursing students through both problem-based and challenge-based learning strategies. Carreño and Mallorga[26] state that a clear understanding of statistical concepts facilitates the development of CT to become better consumers of scientific literature, which makes Evidence-Based Nursing more effective.

Identifying the best strategies to stimulate CT provides proper tools for its inclusion in nursing curricula[27]. Once these strategies can be included in the discussion, it is possible to assess their impact on CT, which would be necessary to re-direct efforts and transformations in order to ensure that training programs in nursing effectively promote CT skills.

A limitation of this study is its descriptive approach, which did not permit to establish causal relationships or correlations between the factors and particular strategies that characterize the training of students at the university where this study was conducted. It is important to contemplate future longitudinal studies with analytical designs to determine the chronological effect of promoting CT training in nursing.

Conclusions

The findings of this study show a positive change in the level of critical thinking, which represents a starting point for the analysis of the processes of teaching-learning adopted by the nursing program where this study was carried out. Also, it is important to strengthen the domains that experienced statistically significant increases and develop strategies that promote the improvement of the domains where no changes were observed.

Given the importance of CT in nursing education, it is necessary to focus on implementing strategies that go beyond the inclusion of competences in either curricula or training profiles. Also, It is essential to propose didactic pedagogies and institutional policies to promote CT, together with objective measurements of CT levels using validated and reliable instruments.

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Conflict of interest: None.

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