

METACOGNITIVE PROFILE OF NURSING STUDENTS AND ACADEMIC PERFORMANCE

PERFIL METACOGNITIVO DE ESTUDANTES DE ENFERMAGEM E DESEMPENHO

ACADÊMICO

PERFIL METACOGNITIVO DE ESTUDIANTES DE ENFERMERÍA Y RENDIMIENTO

ACADÉMICO

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ABSTRACT

Objective: to identify the metacognitive profile of newcomers in nursing undergraduate courses and their potential to predict academic performance during the first academic semester. **Method:** prospective, descriptive and explanatory longitudinal observational study. We used the Schraw and Dennison's Metacognitive Awareness Inventory to identify characteristics of the metacognitive profile of the students and the final grades achieved in the subjects taken in the first semester as an indication of academic performance. **Results:** the newcomers were predominantly women, under 21 years, single, self-declared brown and with some form of scholarship. The Correction Strategy metacognitive skill was the most put into practice by the surveyed students. We noted a correlation ($p < 0.05$ and $r = 0.2844$) between the Planning skill and the final yield grade. **Conclusion:** the Planning skill was the only one with the potential to predict better academic performance, although it is not the skill most practiced by students.

Descriptors: Education in Nursing; Metacognitive Evaluation; College Education; Nursing; Metacognition; Learning.

RESUMO

Objetivo: identificar o perfil metacognitivo de ingressantes na graduação em enfermagem e seu potencial de predizer o desempenho acadêmico durante o primeiro semestre letivo. **Método:** estudo observacional longitudinal prospectivo, descritivo e explicativo. Utilizou-se o Inventário de Consciência Metacognitiva de Schraw e Dennison para identificar características do perfil metacognitivo dos ingressantes e as notas finais alcançadas nas disciplinas cursadas no primeiro semestre como indicativo do desempenho acadêmico. **Resultados:** os ingressantes eram predominantemente mulheres, com menos de 21 anos, solteiras, autodeclaradas pardas e com

alguma forma de bolsa de estudo. A habilidade metacognitiva de Estratégia de Correção foi a que os estudantes mais colocaram em prática. Observou-se correlação ($p < 0,05$ e $r = 0,2844$) entre a habilidade de Planejamento e a nota de aproveitamento final. **Conclusão:** a habilidade de Planejamento foi a única com potencial de prever melhor desempenho acadêmico, embora ela não seja a habilidade mais praticada pelos estudantes. **Descritores:** Educação em Enfermagem; Avaliação Metacognitiva; Educação Superior; Enfermagem; Metacognição; Aprendizagem. **Descritores:** Educação em Enfermagem; Avaliação Metacognitiva; Educação Superior; Enfermagem; Metacognição; Aprendizagem.

RESUMEN

Objetivo: identificar el perfil metacognitivo de los principiantes en cursos de pregrado en enfermería y su potencial para predecir el rendimiento académico durante el primer semestre lectivo. **Método:** estudio observacional longitudinal prospectivo, descriptivo y explicativo. Se utilizó el Inventario de Conciencia Metacognitiva de Schraw y Dennison para identificar las características del perfil metacognitivo de los principiantes y las calificaciones finales obtenidas en las materias cumplidas en el primer semestre como indicador del rendimiento académico. **Resultados:** los participantes eran predominantemente mujeres, menores de 21 años, solteras, autodeclaradas pardas y con algún tipo de beca. La habilidad metacognitiva de la Estrategia de Corrección fue la que la mayoría de los estudiantes pusieron en práctica. Se notó una correlación ($p < 0.05$ y $r = 0.2844$) entre la habilidad de Planificación y la calificación de rendimiento final. **Conclusión:** la habilidad de Planificación fue la única con potencial para predecir un mejor rendimiento académico, aunque no es la habilidad más practicada por los estudiantes.

Descriptores: Educación en Enfermería; Evaluación Metacognitiva; Educación Universitaria; Enfermería; Metacognición; Aprendizaje.

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How to cite this article

Espindola CKN, Santos DB dos, Nascimento LL, Matos RS, Silva SM da, Marion-Martins ADM. Perfil metacognitivo de estudantes de enfermagem e desempenho acadêmico. J Nurs UFPE on line. 2021; 15(2):e244980 DOI: <https://doi.org/10.5205/1981-8963.2021.244980>

Nursing education, which was historically technician, has become an evidence-based teaching-learning process. In particular, teaching that transmits information and procedures has been disengaged from a model focused on reflection and critical thinking for problem-solving approaches.¹

Nevertheless, the training of nurses remains a challenge for Higher Education Institutions (HEIs) responsible for creating environments coherent to the demands of health services. Reports point to considerable discussion about new teaching configurations and the use of methods and techniques that favor student engagement and transformation.² Part of the nursing courses continues to mostly employ expository classes and laboratory practices. These strategies keep the student in a secondary and passive position in the dynamics of the process.³

Teaching methodologies contribute to learning, and those that demonstrate student participation in learning favor the development of metacognition. In order to understand and evaluate the learning process, the identification of metacognitive skills used by students can be valuable as a predictor of academic success.⁴ In the constructivist model, metacognition is understood as the ability to be aware of the way in which one learns, handles and puts knowledge into practice.⁵ In other words, it is the knowledge and regulation of the cognitive system itself.⁶

Studies point out that the student that develops his/her metacognitive ability and participates in teaching with active methodologies has shown himself/herself to be increasingly efficient in the development of learning. He/she also has autonomy in the teaching-learning process, becoming co-responsible and able to build his/her knowledge cooperatively and propose solutions to the problems.⁷⁻⁸⁻⁹ Therefore, by knowing the metacognitive aspects of students, we can identify the learning strengths and weaknesses, enable the improvement of metacognitive skills and also produce impacts on the student's self-efficacy.¹⁰

In Brazil, few studies describe the metacognitive profile of nursing students and their possibility of predicting academic performance. Silva, Santos and Vargens⁸ pointed out the need to explore the theme. The metacognitive skills used by nursing students and the skills related to the student's self-efficacy during training, demonstrated by the good performance in the subjects of the course, are precious information for the nursing education process and for the pedagogical didactic process used in institutions that train nurses. This information can guide fundamental changes for the cognitive development of students and entail a better performance during the undergraduate training.

OBJECTIVE

The objective of this study was to identify the metacognitive profile of newcomers in nursing undergraduate courses and relate metacognitive characteristics to the performance in the first academic semester of 2017.

METHOD

This is a prospective, descriptive and explanatory longitudinal observational study. The study is prospective longitudinal, as it establishes the model that metacognitive skills could predict academic performance at the end of the semester. It is also descriptive, as it characterizes the studied sample; and explanatory, since, in addition to describing the profile of the newcomer, it also sought to identify correlation of the self-declared metacognitive profile with academic performance.

The research had the participation of nursing students attending the first semester of a private HEI in the Federal District, which, in each semester, offers 210 annual vacancies in three campuses. The target population of newcomers in the first semester of 2017 was 128 students and the sample included 77 of them.

The inclusion criteria were: to be regularly enrolled in the first semester of the course, to be present on the day the questionnaire was applied and to accept to participate in the research by signing the Free and Informed Consent Form (when over 18 years) or by means of the assent of the student and the signature of parents or legal guardians (when under 18). Students who were transferred or who did not complete the questionnaire properly were excluded.

The data were collected in two stages: (1) during the month of May through the application of a structured questionnaire and (2) during the month of August, through research in a secondary source, namely, in the student monitoring system record, data referring to grades in subjects of the first semester.

In order to characterize the student, we applied a questionnaire with closed questions and sociodemographic variables similar to the ENADE (Brazilian National Student Performance Examination), namely: gender, age, marital status, race and student funding. The Metacognitive Awareness Inventory (MAI) was also added to the questionnaire, published in 1994 by Schraw and Dennison¹¹ and which is already cross-culturally adapted by Lima Filho and Bruni.⁶

The Inventory is composed of 52 questions that investigate metacognitive characteristics of knowledge and cognition regulation, as shown in Table 1. Each assertion presents the choice of scores, regarding the frequency of use of a certain skill, scored on a Likert scale with five gradations: 1 (never), 2 (almost never), 3 (sometimes), 4 (almost always) and 5 (always). We

followed the order of the questions proposed by Schaw and Dennison,^{6,11} not grouping them by category, which could induce similar answers, generating an addiction to the answer. The outcome (academic performance), in turn, was calculated by the average of the marks obtained at the end of each subject taken in the first semester.

The self-declared scores in the universe from 1 to 5, for the set of questions that described each metacognitive skill, were analyzed by means of trend (most self-declared score in a set), average and standard deviation; constituting the distributions of variables for three analyses of the behavior of each of the eight metacognitive skills in relation to the total of the eight skills (Chart 1). In addition, we used the analysis by means of the scores in the set of questions for each metacognitive skill to explore the correlation of such skills with the academic performance in subjects of the first semester (newcomers). The analyses were non-parametric, since the Shapiro-Wilk normality test detected a predominance of non-Gaussian distributions in the studied variables.

METACOGNITIVE CATEGORIES	METACOGNITIVE SKILLS	QUANTITATIVE OF THE SET OF QUESTIONS
Cognition Knowledge	Conditional Knowledge - CK	Knowledge of skills, intellectual resources and skills as an apprentice. 5
	Declarative Knowledge - DK	Knowledge of how to implement learning procedures. 8
	Procedural Knowledge - PK	Knowledge of when and why to use learning procedures. 4
Cognition Regulation	Correction Strategy - CS	Strategies used to correct understanding and execution errors. 5
	Evaluation - E	Analysis of the performance and effectiveness of the strategy after learning. 6
	Information Management Strategy - IMS	Sequence of competencies and strategies used in order to process information more effectively. 10
	Monitoring - M	Evaluation of learning or use of strategy. 7
	Planning - P	Planning, goal and allocation of resources before learning. 7

CONCEPT OF EACH SKILL

The differences in trend, average and standard deviation of the set of questions for each skill in relation to the total of the eight investigated metacognitive skills (CK, DK, PK, CS, E, IMS, M and P) were detected by the Kruskal-Wallis test, followed by the Dunn's multiple comparison test, considering significant differences with $p<0.05$. After the non-parametric analysis, such data were presented in box-plots in the Tukey plotting model (average and quartiles of the 95% confidence interval with outliers outside the box-plot).

In turn, the associations between the academic performance obtained in the first semester (outcome) and the average score indicated in each metacognitive skill (predictors) were analyzed by the Spearman's Correlation test, followed by a scatter plot with linear regression modeling assuming as significant only correlations with tendencies in associations between predictor and outcome or significant associations between them. Thus, only the correlation coefficients (r) of tendencies ($0.05<p<0.10$) or significance ($p<0.05$) were presented in the titles of the scatter plots.

The value was categorized from the correlation coefficient into low association ($r<0.2500$), moderate association ($0.2500\leq r<0.5000$), good association ($0.5000\leq r<0.7500$) or excellent association ($r\geq 0.7500$). Non-significant correlations ($p>0.05$) were not shown in charts.

The study respected the ethical principles of research with human beings described in Resolution 466/2012, being submitted and approved by the Ethics Committee by CAAE number 66050117.3.0000.5056 and opinion number 2.011.595.

RESULTS

The sociodemographic profile of the 77 sampled individuals (Table 1) represented 60% of the target population of the study ($n=128$). We noted a predominance of female nursing students, under 21 years of age, mostly single and self-declared brown. We should also underline the high dropout rate (26%) in the first semester and, because it is a private institution, the evidence that all participants had some form of scholarship (University for All Program - PROUNI or Student Funding Program - FIES).

Table 1 - Sociodemographic profile of newcomers in the nursing course - DF, 2017.

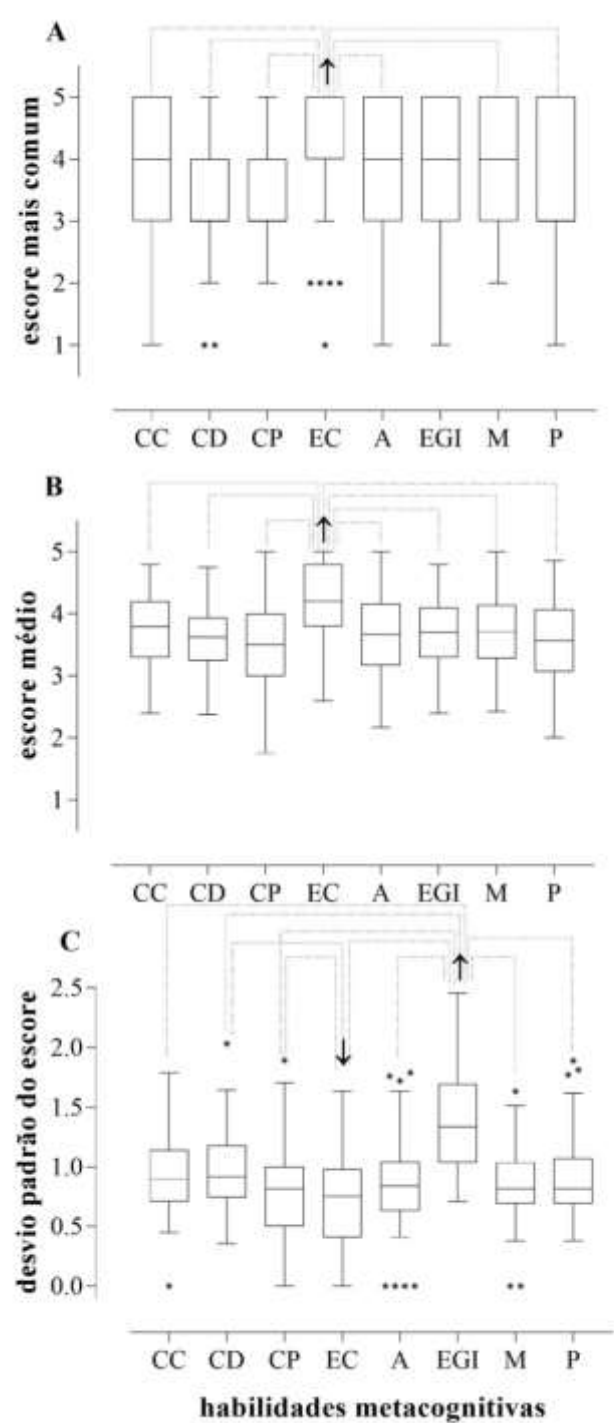
Variables	Classes	Total
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		n	%
	Sample	77	100%
Gender	Female	58	75%
	Male	19	25%
Age group	Under 21 years	58	75%
	From 21 to 30 years	14	18%
	From 31 to 40 years	2	3%
	Over 40 years	3	4%
Marital status	Single	71	92%
	Married	5	6%
	Separated	1	1%
Race	White	23	30%
	Black	2	3%
	Brown	50	65%
	Yellow	2	3%
Scholarship and funding	No	0	0%
	Yes	77	100%
First semester grade (average)	1.0-5.99	8	10%
	6.00-6.99	23	30%
	7.00-7.99	31	41%
	8.00-8.99	7	9%
	Without grade	8	10%
Dropout from the course	No	57	74%
	Yes	20	26%

Table 1 - The frequency distribution by classes of each variable was presented in absolute (n) or relative value as a percentage of the total sample (%).

The self-declared score for the set of questions that defined each metacognitive skill (Figure 1) revealed a predominance of application of the Correction Strategy (CS) skill, identified both by the trend analysis (Figure 1A) and by the analysis of the average of the scores (Figure 1B). Although the trend of scores in the CS skill was significantly higher than in other skills (100% of the sample presented scores equal to or greater than 3 as trend), we noted a similarity of the

other scores being declared with values equal to or greater than 3 in 75% of the sample (Figure 1A).



Captions: *Escore mais comum*=Most common score; *Escore médio*=Average score; *Desvio padrão do escore*= Standard deviation of the score; *Habilidades metacognitivas*=Metacognitive skills; CC=CK; CD=DK; CP=PK; EC= CS; A=E; EGI=IMS; M=M; P=P.

Figure 1. Box-plots of trend (A), average (B) and standard deviation (C) of scores per set of questions for each metacognitive skill. Dashed connections indicate significance ($p<0.05$) detected by the Dunn's multiple comparison test, which followed the significant variations in medians ($p<0.05$) in the Kruskal-Wallis test. Arrows indicate the metacognitive skills that had the most significant increases and decreases in the comparisons. Dots indicate outliers.

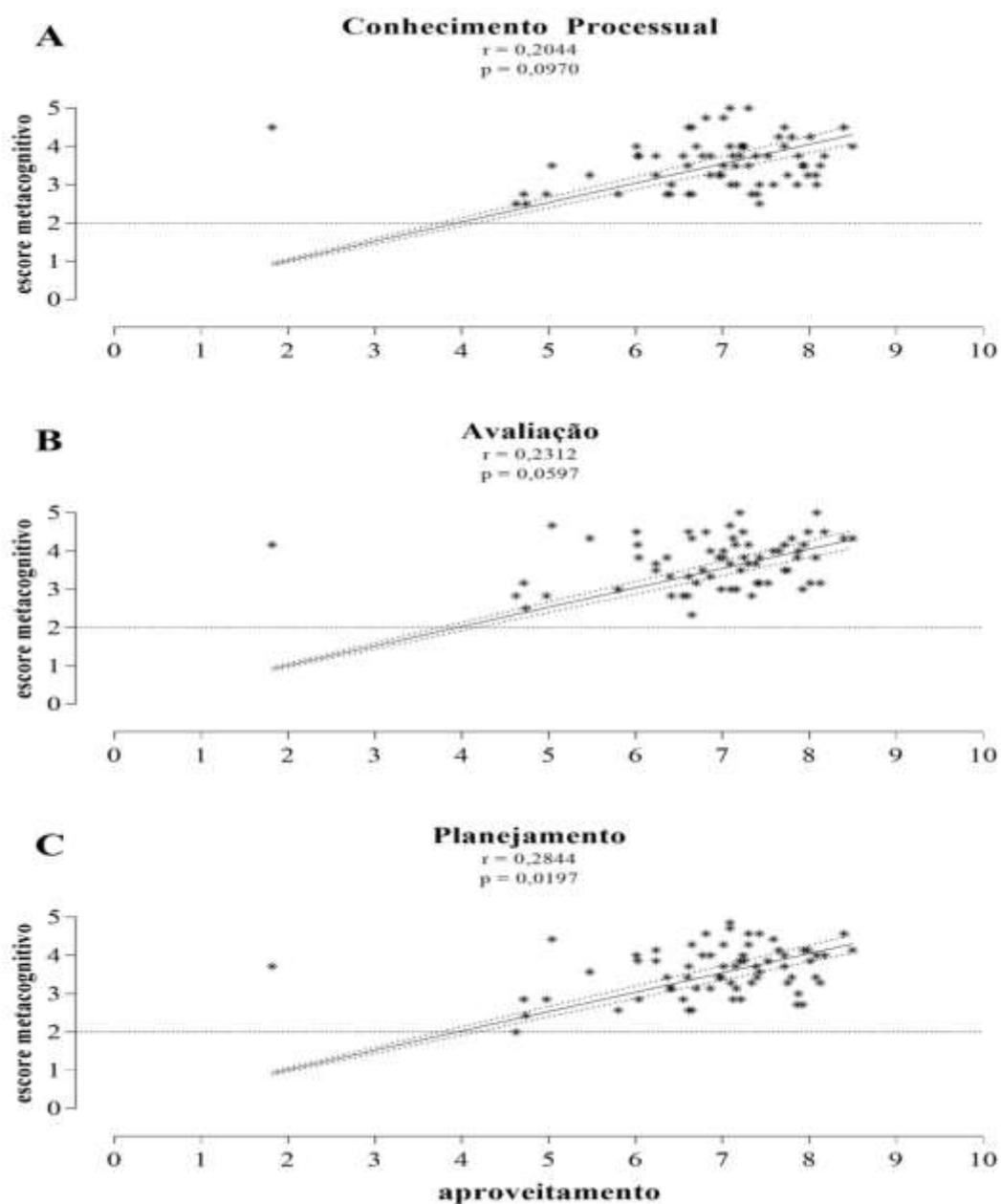
In general, students evaluated themselves with scores above 2 with a higher concentration of scores between 3 and 4 (Figure 1), demonstrating that they judge that they sometimes or almost always use all metacognitive skills. In turn, when analyzing the standard deviation of the set of scores (Figure 1C), we perceived that the scores of the questions of the CS skill were also

those that deviated less from the average in relation to the deviations observed in the other skills, being accompanied by a significantly increased standard deviation in the choices for the questions related to the Information Management Strategy (IMS) skill.

This fact reveals two aspects to be considered. The first aspect reveals that, for the CS skill, students chose scores above 3 without much divergence between them (the lowest standard error, downward arrow in Figure 1C), indicating that they had no doubts that they applied such a strategy. Whereas, the second aspect, shows that, although the IMS skill presents similarity in terms of fashion and average of scores self-declared by questions (Figures 1A and 1B) with the other metacognitive skills, students had more disagreements in relation to the central tendency (the highest standard error, upward arrow in Figure 1C).

Starting from the analysis of the associations between the average academic performance obtained by the students with the average scores of the set of questions per metacognitive skills, we noted that only the Procedural Knowledge (PK) and Evaluation (E) skills showed a tendency to predict better performance ($0.05 < p < 0.10$); while the Planning skill (P) was the only one with significant predictive potential ($p < 0.05$) (Figure 2). The other non-significant associations ($p > 0.05$) were not presented in charts.

The associations of the PK and E skills with the average performance revealed low correlation tendencies, suggesting that the students who used these skills were the ones who tended to obtain the best academic performances, as observed in figures 2A and 2B, where the ascending line represents the linear regression model of the causality relationship. In turn, the P skill was potentially significant in predicting better performances with a moderate correlation between the predictor variable and the outcome, revealing a better success of the P skill as a metacognitive strategy.



Captions: *Conhecimento Processual=Procedural Knowledge; Avaliação=Evaluation; Planejamento=Planning; Aproveitamento=Yield; Escore metacognitivo=Metacognitive score.*

Figure 2. Scatter plots between average scores of metacognitive skills that showed significant tendencies or associations with academic performance. Correlations with the Procedural Knowledge (A) and Evaluation (B) skills showed a tendency ($0.05 < p < 0.10$), while the correlation with the Planning skill (C) identified significance ($p < 0.05$). Correlation coefficient (r) and p values are indicated in the title. The dotted horizontal line highlights that all average scores attributed were equal to or greater than 2.

DISCUSSION

The sociodemographic profile of newcomers in the nursing course, specifically age, marital status and self-declared race, is similar to other studies that also identified the profile of nursing students.¹²⁻¹⁴ Despite the female predominance, the presence of male students in nursing courses seems to increase when compared to the proportion between genders in older articles, which presented a percentage of 8% to 13% of men¹⁴⁻¹⁵, while there was a representation of 25% of the participants in the present study.

We perceived the importance of support programs such as PROUNE and FIES (as per their Portuguese acronyms), as, in our sample, 100% of students received some form of funding. According to the Higher Education Census (Censup, as per its Portuguese acronym), in 2017, 87.9% of Brazilian HEIs were private, with the majority of higher education vacancies coming from these institutions. Funding programs play a key role in attracting and including students in these institutions.

We also noted a high dropout rate. Such phenomenon may be related to the loss of the scholarship due to low academic performance and/or failure. Apparently, students without a scholarship would not be able to continue their education, making low performance a possible obstacle to the continuity and completion of the course.¹⁶

With regard to metacognitive evaluation, we found that most students believe they employ the Correction Strategy skill with a high degree of confidence. It is the ability to identify failure in learning and be able to use strategies that facilitate recovery. This skill favors the autonomy of the undergraduate who shares responsibilities with teachers in the teaching-learning process.¹⁷ The same standard was observed by Bortone Di Muro E Sandoval⁵ in a research with new students in the engineering course, demonstrating that, despite being newcomers, students indicate they have metacognitive skills to manage learning.

On the other hand, the Information Management Strategy skill showed high variability in scores, showing that students do not use this skill constantly. The skill in question is related to self-knowledge for learning and, specifically, to the development of thinking for practical action. In nursing, previous thinking in decision-making is known as critical thinking. Thus, the skill in question needs to be developed throughout the course, not being inherent to the newcomer.¹⁸

Regarding skills predictive of success in academic performance, we found a positive correlation only for the Planning skill and a tendency for a positive correlation for the Procedural Knowledge and Evaluation skills. In this case, the students who reported using these skills more frequently obtained a better performance, confirming the causality between Planning and academic performance.¹⁷

Procedural Knowledge refers to knowledge about the execution of skills. The student has awareness and management of cognition including knowledge of metacognitive strategies. The greater the procedural knowledge, the easier it is for the individual to solve problems,¹⁹ favoring the evaluative process, especially if the questions cover problem-solving reasoning.

In turn, the Planning and Evaluation skills are part of the cognition regulation. The Planning involves the selection of strategies and the allocation of resources to carry out the learning activity more efficiently, while the Evaluation is the ability to consider if the objective

of the activity has been achieved.⁵ Knowing how to regulate learning can contribute to the cognitive process and entail better academic performance,²⁰ facilitating the good use of time and resources. Since the participants were newcomers, they probably acquired such skills throughout their lives. More advanced students in the course may have a different metacognitive profile.

In their study, Hong et al.¹⁷ show that, with the progression of the course, students tend to gain metacognitive skills. Moreover, Raeise et al.¹⁰ found that older students had more developed metacognitive skills. Despite the fact that, in our study, only one metacognitive skill was associated with academic performance, studies such as that of Hayat et al.⁵ conclude that the students who most used metacognitive skills have better academic performance. Therefore, skills must be stimulated during the undergraduate training by teachers, evaluating the effectiveness of learning and correcting inefficiencies.

One way to develop metacognitive skills would be to use active teaching methods. Gholami et al.¹ compared the development of metacognitive skills between teaching methodologies and noted that the Problem-Based Learning (PBL) method favored the development of regulatory metacognitive skills more than traditional methods. PBL is an example of active methodology, which stimulates student autonomy and the development of metacognitive skills.²¹ The higher education institution has a key role in the development of metacognitive skills by fostering, training and encouraging teachers in the use of active methodologies.²² Such activities will contribute to the training of critical and reflective professionals capable of solving problems in their daily work.

This study has some limitations to be considered before extrapolating the findings to other locations, given the fact that the population has specific characteristics, such as the studied semester, the study setting (Brazilian Federal District) and the nature of the HEI in question (private). Participants who dropped out from the course or did not complete the questionnaire properly were not considered in the processing. These data could contain information different from that presented in this work.

We should highlight the importance of this study for teachers, managers and nursing teaching institutions, since we found the need for actions focused on developing metacognitive skills during the undergraduate training, especially in the early years. The Planning skill must be prioritized as it directly affects the self-efficiency and performance of the nursing student. We suggest new studies comparing the development of metacognitive skills throughout the nursing course, as well as checking the association of the teaching methodology with the development of skills and also the associations among these variables with academic performance.

CONCLUSION

The metacognitive profile of the studied undergraduate nursing students showed that these students believe they use all metacognitive skills sparingly. The Correction Strategy skill stood out as the one that is most applied by the students. The Planning skill showed potential to predict better student performance in the first semester, while the Procedural Knowledge and Evaluation skills showed a tendency to predict better performance. These skills, which were identified because they predict a better performance of nursing students, were not widely used. Therefore, it is suggested that they be developed in the first semesters of the nursing course to enhance the student's self-efficacy, better rates of permanence and better yield in the course.

CONTRIBUTIONS

We inform that all authors contributed equally in the design of the research project, data collection, analysis and discussion, as well as in the writing and critical review of the content with intellectual contribution and in the approval of the final version of the study.

CONFLICTS OF INTERESTS

Nothing to declare.

FUNDING

UNIEURO University Center.

ACKNOWLEDGEMENTS

We thank prof. Dr. Emerson Fachin Martins for sharing his expertise in statistical analysis and in the use of statistical software.

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Submissão: 04/16/2020

Aceito: 05/20/2021

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