Learning style and level of satisfaction in nursing clinical simulation

Estilo de aprendizagem e grau de satisfação em simulação clínica em enfermagem

Estilo de aprendizaje y nivel de satisfacción en simulación clínica en enfermería

Cristiano Gimenez Olímpio[1] https://orcid.org/0000-0003-0286-9271
Francine Lima Fulquini[1] https://orcid.org/0000-0003-2655-2009
Danielle Cristina Garbuio[2] https://orcid.org/0000-0002-0516-5213
Emilia Campos de Carvalho[1] https://orcid.org/0000-0003-0738-0539

How to cite:
Olímpio CG, Fulquini FL, Garbuio DC, Carvalho EC. Learning style and level of satisfaction in nursing clinical simulation. Acta Paul Enferm. 2021;34:eAPE001675.

DOI
http://dx.doi.org/10.37689/acta-ape/2021AO001675

Keywords
Learning; Education, nursing; Simulation; Simulation training; Students, nursing

Descritores
Aprendizagem; Educação em enfermagem; Simulação; Treinamento por simulacão; Estudantes de enfermagem

Descriptores
Aprendizaje; Educación en enfermería; Simulación; Entrenamiento simulado; Estudiantes de enfermería

Submitted
June 29, 2020

Accepted
December 7, 2020

Corresponding author
Emilia Campos de Carvalho
Email: ecdcava@usp.br

Abstract

Objective: To analyze the relationships between the learning styles of nursing students and the degree of satisfaction with simulated clinical experiences.

Methods: Descriptive study, carried out with undergraduate nursing students (n=46) from a public institution in Sao Paulo, Brazil, in February and March 2018, after approval by the Institution Research Ethics Committee. Each student individually responded to the identification instrument, the New Learning Styles Index and the *Escala de Satisfação com as Experiências Clínicas Simuladas*. The average scores of the different dimensions of the instruments were evaluated, as well as the differences among the average scores of the satisfaction dimensions in relation to those of the learning styles.

Results: Learning styles varied, with sensory and sequential styles prevailing. The degree of satisfaction with the clinical simulation was high regardless of the learning style. There was a difference ($p<0.05$) when relating the average satisfaction scores with simulation and some learning styles. Students with visual or verbal learning styles showed differences in the practical, cognitive dimensions and the total scale, indicating satisfaction with the simulated clinical experiences; whereas those with active or reflective styles, the difference was presented only in the practical dimension involving simulation.

Conclusion: The results obtained show differences in satisfaction in simulation depending on the learning style; reinforce the need for reflection on potentialities or difficulties involving the use of clinical simulation by nursing students.

Resumo

Objetivo: Analisar as relações entre os estilos de aprendizagem de estudantes de enfermagem e o grau de satisfação com experiências clínicas simuladas.

Métodos: Estudo descritivo, realizado com estudantes de graduação em Enfermagem (n=46) de uma instituição pública do Estado de São Paulo, Brasil, em fevereiro e março de 2018, após aprovação pelo Comitê de Ética em Pesquisa da Instituição. Cada estudante, individualmente, respondeu ao instrumento de identificação, ao Novo Índice de Estilos de Aprendizagem e à Escala de Satisfação com as Experiências Clínicas Simuladas. Foram avaliados os escores médios das distintas dimensões dos instrumentos, bem como, as diferenças entre os escores médios das dimensões de satisfação em relação aos dos estilos de aprendizagem.

Resultados: Os estilos de aprendizagem variaram, prevalecendo os estilos sensorial e sequencial. Foi elevado o grau de satisfação com a simulação clínica independentemente do estilo de aprendizagem. Houve diferença ($p<0,05$) ao se relacionar os escores médios da satisfação com simulação e alguns estilos de aprendizagem.

[1]Ribeirao Preto Nursing School, University of Sao Paulo, Ribeirao Preto, SP, Brazil.
[2]Central Paulista University Center, Porto Ferreira, SP, Brazil.
Conflicts of interest: none to declare.

Estudantes com os estilos de aprendizagem visual ou verbal apresentaram diferença nas dimensões prática, cognitiva e o total da escala, indicando satisfação com as experiências clínicas simuladas em sua totalidade; já os que possuem os estilos ativo ou reflexivo, a diferença foi apresentada somente na dimensão prática envolvendo simulação.

Conclusão: Os resultados obtidos evidenciam diferenças na satisfação em simulação a depender do estilo de aprendizagem; reforçam a necessidade de reflexão sobre potencialidades ou dificuldades envolvendo o uso da simulação clínica pelos estudantes de enfermagem.

Resumen

Objetivo: Analizar la relación entre los estilos de aprendizaje y el nivel de satisfacción respecto a las experiencias clínicas simuladas de estudiantes de enfermería.

Métodos: Estudio descriptivo, realizado con estudiantes universitarios de enfermería (n=46) de una institución pública del estado de São Paulo, en febrero y marzo de 2018, luego de su aprobación por el Comité de Ética de Investigación de la institución. Cada estudiante respondió de forma individual el instrumento de identificación, el Nuevo Índice de Estilos de Aprendizaje y el Índice de Satisfacción sobre Experiencias Clínicas Simuladas. Se evaluaron las puntuaciones promedio de las distintas dimensiones de los instrumentos, así como las diferencias entre la puntuación promedio de las dimensiones de satisfacción con relación a los estilos de aprendizaje.

Resultados: Los estilos de aprendizaje son variados, con una prevalencia del estilo sensorial y secuencial. El nivel de satisfacción respecto a la simulación clínica fue elevado, independientemente del estilo de aprendizaje. Se observó una diferencia ($p<0,05$) al relacionar la puntuación promedio de la satisfacción de simulación con algunos estilos de aprendizaje. Los estudiantes con estilo de aprendizaje visual o verbal presentaron diferencias en la dimensión práctica, cognitiva y el total del índice, lo que indica satisfacción respecto a las experiencias clínicas simuladas en su totalidad. Por otro lado, en los que tenían estilo activo o reflexivo, las diferencias se presentaron solo en la dimensión práctica que incluye simulación.

Conclusión: Los resultados obtenidos evidencian diferencias en la satisfacción de la simulación dependiendo del estilo de aprendizaje y refuerzan la necesidad de reflexionar sobre las posibilidades o dificultades en torno al uso de la simulación clínica por parte de los estudiantes de enfermería.

Introduction

In any learning process, the brain acts as an information processor[1] and the knowledge generated by the individual results from the personal analysis of their experiences. This process is related to the different learning styles and their influences on the way each person understands, appropriates and processes information.[2,3]

Thus, it is understood that it is the task of educators to promote the development of different learning styles,[2-4] since they are related to the way the individual prefers to receive and process information to obtain knowledge. Styles are built over time and are influenced by demographic characteristics, personality traits and teaching environments,[1,4] that is, they can change over time.

The learning model of Felder and Silverman[5] proposes different ways to achieve knowledge. They comprise four dimensions: perception, reception, processing and understanding of information. The student has preferential behaviors in each dimension that represent each of the learning styles: Active-Reflective (A/R), Sensory-Intuitive (S/I), Visual/Verbal (V/V) and Sequential/Global (S/G).[6]

The characteristics or behaviors of students corresponding to the learning styles are: Active - they tend to better learn the information by working actively, discussing, applying or explaining the information to other people; Reflective – they choose first to reflect gradually on the information; Sensory – they learn best with facts, solving problems with strongly defined methods, without complications or surprises; Intuitive – they prefer to discover possibilities and connections, appreciate news and hate repetitions; Visuals – they learn best from what they see, such as figures, diagrams, movies, demonstrations, among others; Verbal – they take greater advantage of words, lectures, written or oral explanations; Sequential – they learn in a linear way, with steps that follow a logical sequence; and finally, Global - who tend to learn in great leaps, assimilating information randomly, to then assimilate everything suddenly.[5]

One way of identifying students' learning styles is through the Index of Learning Styles - ILS, which seeks to identify trends or behavioral profiles. It was translated and adapted to the Brazilian context, with engineering undergraduate students, and named the New Index of Learning Styles (N-ILS).[7]

Regardless of the learning area, experimentation has been considered substantial for establishing relationships between theory and practice.[8] Thus, among the different methods that favor the learning process, subjects on the area of health have used the simulation, either because of its versatility in creat-

ing authentic settings that save patients from exposure to a teaching practice,[9,10] or because it offers learning opportunities through experiences aiming at combining theoretical and practical knowledge, in addition to the development of psychomotor skills and critical thinking,[11-13] self-confidence, autonomy and satisfaction to face the clinical context of students.[14,15] The technological advances that have made their use in nursing education more accessible also contributed.[16] Each stage of clinical simulation (setting and debriefing) has an important role in learning and involves different learning processes.

Both the construction of knowledge in Nursing and the way of transmitting it to students have been the object of interest to scholars in this area;[17] it is known that students satisfaction is related to greater motivation for learning, in addition to being considered a good indicator to evaluate teaching and contribute to the identification of factors that interfere in the teaching and learning process.[18,19]

The motivated students acquire more knowledge quantitatively and qualitatively when they believe in the potential of what they learn for their future practice; high levels of satisfaction, related to simulated practices, do not always reveal a good performance in clinical practice. However, students satisfaction is a good indicator to evaluate teaching, providing data for its improvement.[14]

One way of measuring satisfaction in learning by clinical simulation is the *Escala de Satisfação com as Experiências Clínicas Simuladas (ESECS).* This scale, of Portuguese origin, was adapted, validated and applied in Brazil, with nursing students, showing high levels of reliability.[14]

Considering learning as a dynamic and integral process aimed at the subject and the existence of different learning styles, as well as simulation as an important teaching strategy in undergraduate health care and on the rise, we justify the need to contribute to the reflection of this theme. The objective of this study was to analyze the relationship between the learning styles of undergraduate nursing students and the level of satisfaction with simulated clinical experiences.

Methods

This is an exploratory descriptive study of the relationships between the variables of interest, with a quantitative approach;[20] the writing of the manuscript was based on the STROBE script. It was developed in a public institution of higher education in nursing in Sao Paulo, Brazil, in February and March 2018.

Students from the last year of the Bachelor of Nursing course participated in the study, with regular enrollment. The last year of graduation was selected to guarantee students access to most curricular subjects that offer the practice of simulation.

For data collection, each student individually answered to the three self-applicable instruments: 1) Instrument of characterization of the sample, containing information about gender and age; 2) New Index of Learning Styles (N-ILS)[7] to identify learning styles. The N-ILS is composed of twenty questions distributed in four dimensions or factors: 1- processing (active/reflective style); 2- perception (sensory/intuitive style); 3- entrance (visual/verbal style); and 4- understanding (sequential/global style). Each dimension has five questions with two poles (a and b); the students should mark only one of the poles, that is, the alternative of their preference. As an example, a question of visual/verbal style was: I prefer to obtain new information through: a) figures, diagrams, graphs or maps; b) written instructions or verbal information. The alternatives for identifying the styles are categorized through a sequence of steps. Initially, the answers of the poles a and b are added, of all five questions of each dimension; then, the lowest value is subtracted from the highest total obtained; the balance and the predominant letter determine the preference (weak, moderate or strong) of each style, in each dimension. Detailed instructions for this process of analyzing responses are presented by Vieira[7] at the end of the instrument, allowing the students to define the learning style; in this study, the instructions were used by the researcher to analyze the data. The reliability of the instrument adapt-

ed to Brazil[7] was measured in each dimension, showing the respective Cronbach's alpha values: processing = 0.60; perception = 0.65; entrance = 0.66 and understanding = 0.48. 3) *Escala de Satisfação com as Experiências Clínicas Simuladas (ESECS)*,[15] for the assessment of satisfaction with the simulated practice of the participants; in this one, the participants consider the level of satisfaction with simulated clinical activities in relation to the practical, realism, cognitive and global dimensions, being classified on a scale of one (the lowest degree of satisfaction), to ten (the highest degree of satisfaction). In the ESECS validation study, with Portuguese students, the scale presented a high index of validity and reliability (global Cronbach's alpha= 0.91). In a study that used the same scale with Brazilian students, it showed a global Cronbach's alpha of 0.91.[14]

For data organization, they were inserted in a double-feed spreadsheet in the Microsoft Excel Windows® program, version 2010 and later exported to the IBM statistical program - SPSS, version 25.0. The data referring to the ESECS were submitted to descriptive statistics, through the calculation of measures of central tendency (mean and median) and measure of dispersion (standard deviation), relative to the global scale and to each of its dimensions. The answers regarding the N-ILS were analyzed according to the author's proposal;[7] their results were submitted to quantitative discussion, using frequency and distribution of students according to the proposed dimensions. The Kruskal-Wallis test was used to assess the relationship between students' satisfaction and learning styles. The reliability of the instruments in the sample was also examined, using Cronbach's alpha, following the example of the authors of the instruments used, obtaining a global alpha of 0.85 for the ESECS scale and 0.53 for the N-ILS.

The research project was authorized by the educational institution and approved by the Research Ethics Committee (CAAE: 74231517 6 0000 5393; Craft CEP: 226/2017). All subjects involved agreed to participate voluntarily and signed the Informed Consent Form (ICF), in two copies.

Results

A total of 46 students participated in the study, with an average age of 21.85 years old, median of 22 years old, minimum age of 20 years old and maximum of 25 years old, 38 (82.61%) were women.

The data from N-ILS point out that the styles varied when considering each learning dimension; as for information processing, most students reported neutral and reflective behaviors; in the reception dimension, sensory characteristics predominated; in the reception of information the visual style; and as for the understanding of the information, the sequential style prevailed (Figure 1). The indices of participants who were neutral in these dimensions, despite the expressive frequencies, indicate a slight preference for both poles. At the poles of each dimension, the frequencies indicate a strong or moderate preference for them.

As for satisfaction with simulated clinical experiences, measured by ESECS, the mean scores for the three dimensions - practical (8.39), realism (9.08) and cognitive (8.64) - showed high scores, with realism being the most appreciated by students. The average total score was 8.70. Participants who showed a high degree of satisfaction in one of the dimensions of the ESECS also showed high satisfaction in the other dimensions; on the other hand, those who presented medium/low satisfaction in one dimension also presented in the others. Furthermore, we sought to assess the possible relationships between the dimensions of the ESECS and the ones of the N-ILS (Table 1).

When analyzing satisfaction with the practical dimension of simulation (ESECS), the dimension of learning style (N-ILS) that obtained the highest average was the Visual/Verbal dimension (reception of information) in the neutral element. In the Active/Reflective (processing) dimension, the active learning style obtained the highest average value. When analyzing satisfaction with the cognitive dimension of simulation (ESECS) and learning styles related to the reception of information (N-ILS), considering the Visual/Verbal poles, the highest mean value was in the neutral element. When analyzing satisfaction with simulation realism (ESECS), the highest aver-

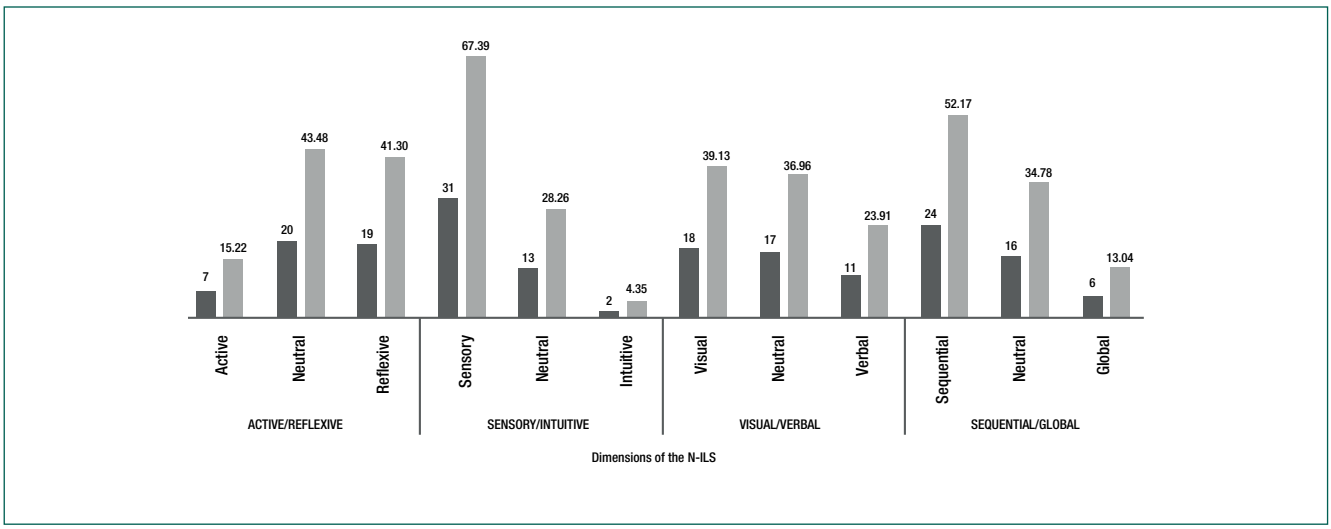

Figure 1. Descriptive statistics (absolute and relative frequencies) of the dimensions of the New Index of Learning Styles (n=46) instrument

Table 1. Distribution of the mean scores of the *Escala de Satisfação com as Experiências Clínicas Simuladas* dimensions according to the New Index of Learning Styles dimensions

Dimensions of the ESECS	Dimensions of the N-ILS											
	Active/Reflective			Sensory/Intuitive			Visual/Verbal			Sequential/Global		
	Active	Neutral	Reflective	Sensory	Neutral	Intuitive	Visual	Neutral	Verbal	Sequential	Neutral	Global
Practical	8.61	8.63	8.04	8.42	8.27	8.55	8.26	8.87	7.83	8.25	8.43	8.83
Cognitive	8.61	8.6	8.7	8.69	8.53	8.5	8.48	9.01	8.33	8.51	8.66	9.11
Realism	9.05	8.98	9.18	9.12	8.92	9.4	8.97	9.21	9.03	8.95	9.23	9.13
Total	8.76	8.73	8.64	8.74	8.57	8.81	8.57	9.03	8.4	8.57	8.77	9.02

ESECS-Escala de Satisfação com as Experiências Clínicas Simuladas; N-ILS – New Index of Learning Styles

age value of learning styles (N-ILS) related to the perception of information was intuitive, although, in general, the results show that students, regardless learning style, are satisfied with the realism of the simulated activities. Regarding the participants' global satisfaction with the simulated clinical experiences, the dimensions of learning styles that obtained the highest mean values were in relation to Visual/Verbal reception in the neutral element and in relation to the Sequential/Global understanding, in the global style. In general, students seem to be satisfied with their learning involving simulation, regardless of learning styles. It was also intended to verify possible differences between the average scores of the dimensions/total of the ESECS in relation to the dimensions of the learning styles. Regarding the Visual/Verbal learning style, the practical dimension (p=0.007), the cognitive one (p=0.034) and the total scale (p<0.01) showed a difference. In the Active/Reflective dimension, only the practical dimension showed a difference (p=0.037). In the other learning styles, there was no significant difference in relation to the ESECS domains (Table 2).

The difference obtained for the practical dimension of ESECS in relation to the Active/Reflective dimension of learning styles (N-ILS) (p=0.037) shows that individuals who have the Active/Reflective learning style tend to be more satisfied with the practical classes involving simulation. Still, the differences obtained in the Visual/Verbal dimension of learning styles (N-ILS) in relation to the practical (p=0.007), cognitive (p=0.034) and total (p=0.01) dimensions of ESECS emphasize that individuals with the Visual/Verbal learning style they tend to be more satisfied globally with the simulated clinical experiences.

Discussion

The different learning styles among the participants in this study may be due to multifactorial reasons

Table 2. Relationship between the degree of satisfaction of participants with simulated clinical experiences and the dimensions of the *Escala de Satisfação com as Experiências Clínicas Simuladas* and the New Index of Learning Styles

Dimensions of the ESECS	Variables	Dimensions of the N-ILS			
		Active/Reflective	Sensory/Intuitive	Visual/Verbal	Sequential/Global
Practical	Kruskal-Wallis H	6.568	0.095	9.823	3.348
	Degree of Freedom	2	2	2	2
	p-value	0.037*	0.954	0.007*	0.187
Cognitive	Kruskal-Wallis H	0.176	0.302	6.79	2.719
	Degree of Freedom	2	2	2	2
	p-value	0.916	0.86	0.034*	0.257
Realism	Kruskal-Wallis H	1.016	1.476	2.211	2.072
	Degree of Freedom	2	2	2	2
	p-value	0.602	0.478	0.331	0.355
Total	Kruskal-Wallis H	0.179	0.648	9.216	3.227
	Degree of Freedom	2	2	2	2
	p-value	0.914	0.723	0.01*	0.199

ESECS- *Escala de Satisfação com as Experiências Clínicas Simuladas*; N-ILS – New Index of Learning Styles; * - p<0.05 (Kruskal-Wallis)

and attributed mainly to the fact that students adjusted their own learning styles during their training to adapt to the teaching environment and style at the university. In addition, the workload and exhaustive schedules can provide students with changes in learning styles, migrating to more comprehensive and flexible ones.[1,6,21]

Most students in this study showed an inclination towards sensory learning styles about the perception of information, and sequentially for understanding it; followed by neutral and reflective styles for processing and visual and neutral styles for receiving information.

Considering information processing, students who show preference for the Active style tend to better understand the information by working actively, discussing, applying or explaining the information to others.[5] Thus, they are able to improve their learning using realistic simulation, because they build competencies and critical-reflective thinking through active participation and interaction with colleagues and professors.[10] On the other hand, those who have a predominance of the Reflective style prefer to reflect calmly on the information received. Still, these students are benefited in the debriefing phase of the simulation, as it makes it possible, through reflection, to maximize learning.[12,13,22]

Those who showed neutrality in the Active and Reflective pole, tend to learn easily using both styles freely,[5,23] suggesting a balance in learning situations.[6] The last two styles predominated among the participants in this study.

The students will learn more easily if the teaching environment favors the dimension they prefer. Therefore, in view of the perception of information, individuals who present the Sensory style learn better with facts, solving problems with strongly defined methods, without complications or surprises and do not like subjects that have no connection with reality.[5,23] Thus, individuals who have this learning style are also benefited by teaching strategies such as simulation, as this emphasizes the interaction between the individual and the action and supports the new learning in the experience, while simultaneously valuing the context and reflection, encompasses the understanding and transformation of experience with the theory associated with practice in a safe environment.[6,8,10,24] Those with an Intuitive learning style prefer to discover possibilities and connections between information, are better with concepts, mathematical formulas, abstractions, they appreciate news, they are quick and creative. Those who were neutral in these dimensions benefit in environments that favor both Sensory/Intuitive styles.[5,23]

Regarding the reception of information, in Visual style, students learn best from what they observe (figures, diagrams, films, demonstrations, among others); in Verbal, they will take greater advantage of words, making it easier to use oral explanations, lectures or written explanations.[5,23] Individuals who showed neutrality in this dimension will be helped in teaching environments that favor both learning styles.[5,23] In this study, visual

and neutral styles prevailed; possibly this is due to the greater preparation during graduation for subjects that instigate reflection, oral explanation and writing, due to the indispensability of these competences for the future profession.

With regard to understanding the information, students who have the Sequential style learn best in a linear way, with steps that follow a logical sequence;[9,28] they tend to maximize their learning in simulation environments, due to the settings having sequential stages where the students will have the opportunity to train skills in a safe environment and that allows them to refine skills in the course of the simulated activity.[24,25] Those who have the Global style tend to learn in great leaps, assimilating the information suddenly. Those who were neutral will have their learning facilitated in environments that favor both poles.[5,23] In this study, a higher percentage of students who prefer the sequential style were identified.

It is known that students aspire for a highly qualified professors and for various teaching strategies and methods. The professors, understanding and knowing the predominant style of their students, will be able to develop modes of exposure appropriate to this demand, as well as adapt the contents offered in the classroom, with the purpose of increasing student adherence and learning. Some studies suggest that the professor provide activities that involve several learning styles simultaneously.[1,4,8]

Thus, professors can divide students into different groups with homogeneous or heterogeneous learning styles. Studies indicate that groups that learned with a heterogeneous learning style were better than those with a homogeneous learning style, since every student can act as a multiplier to share their learning experience with others and improve learning strategies.[1,6,26]

In the cognitive dimension of ESECS, academics who are neutral with regard to Visual/Verbal learning styles indicate that they are more satisfied with the reflections after the simulated practice in addition to the content taught in the classroom.[14]

The reflective learning style showed the lowest average satisfaction in the practical dimension and this result corresponds to what is found in the literature, since individuals with the reflective style prefer to think calmly about the information received and do not maximize their learning in contexts that require active participation.[5,7]

Visual or verbal individuals learn best from what they observe or take greater advantage of words and oral explanations, being able to maximize their learning by participating as observers in the simulated setting and at the moment of debriefing.[5,7,10-12]

The questions of the realism dimension of ESECS obtained the highest levels of satisfaction. Thus, regardless of the learning style they have, the participants are highly satisfied with the quality of the equipment used in the simulated practices, with the quality of the simulators, the theoretical-practical connection in the simulations, adequacy of settings to the themes developed in the classroom and with debriefing.[14]

Considering that individuals who have an active learning style tend to maximize their learning in environments that promote conditions for them to work actively, discussing, applying and/or explaining information to colleagues,[5,7,23] the simulation offers these learning conditions in a controlled setting, stimulating the construction of individual skills through active participation and interaction with the environment, colleagues and teachers.[10,12,22]

As for the reflective learning style, which tend to learn more and best after patient reflection,[9,11] the simulated experience tends to increase their learning gains, especially in debriefing, the phase in which intentional reflection occurs.[11,12,27]

Still, the interaction with the environment and with other people involved in the setting, reflections complementary to the theoretical classes during practice and debriefing, make these individuals more satisfied with learning.[14]

Bearing in mind that the visual style is inclined to learn more from what they see, such as demonstrations; verbal style tends to get better use of words and oral explanations,[5,7] individuals with these styles can benefit from being observers during a simulated experience and in the debriefing phase.[10-12]

It is important to emphasize that no learning style is superior to others and making students make the most of their own learning style is essential.[1,4,6] The opinion of the students as users and beneficiary is increasingly considered, because the important link between satisfaction and motivation to learn is known. It is indisputable that motivated students learn more and best, believing in the potential usefulness of what they learn for their future practice.[14,15,19,24]

The high levels of satisfaction presented show that the participants consider themselves satisfied with learning using clinical simulation. High satisfaction scores are not always representative of good clinical performance.[14] However, this indicator contributes to assess teaching and teachers.

The study included students from the last academic term, from a public institution and in an assessment of previous clinical simulation experiences; new research designs are suggested with evaluations of the subjects, right after their completion, and throughout the different phases of the course.

The existence of different learning styles conditions students' satisfaction with the simulated clinical activities; knowing the styles of the students collaborates with the choice of strategies by the professor. On the other hand, the high satisfaction of students with the practice in a simulated context can be a determinant to stimulate greater investments in this teaching strategy, which has been well evaluated by students. However, identifying that there are students who learn more easily through styles not covered by simulation should also be prioritized, for greater management of pedagogical resources.

The investigation of the relationship between learning styles and students' satisfaction in the simulated clinical experiences contributes to the discussion of potentials and challenges involving the use of simulation based on the consideration of the influence of students' learning styles. Furthermore, it is understood that the findings of this study can provide elements for reflection on the daily practice of professors and the teaching strategies used.

The study has limitations regarding the value of the reliability coefficient of the scale of learning styles. It is worth noting that there is no consensus in the scientific literature regarding the interpretation of the reliability of a scale based on the value of the coefficient obtained, although most authors consider an adequate value from 0.70, while others do not mention minimum values.[28] However, values from 0.50 have been acceptable for the instrument, since it measures attitudes/behaviors.[7,29] It is also inferred that the results could be reinforced with a larger sample value.

Conclusion

Most undergraduate students participating in this study showed an inclination towards Sensory (67.39%) and Sequential (52.17%) learning styles. Students satisfaction with simulated clinical activities obtained high approval rates for most areas of the different learning styles; the average scores varied from 6.73 to 9.50, with the realism dimension showing the highest averages. Statistical differences were obtained among students, when relating the average satisfaction scores with simulated clinical activities and learning styles: with respect to the Visual/Verbal learning style, the practical, cognitive and total scale dimensions showed differences ($p<0.05$); in the Active/Reflective dimension, only the practical dimension showed a difference ($p<0.05$). In the other learning styles, there was no significant difference in relation to the ESECS domains. The results show the importance of professors choosing the teaching strategies that can contemplate the different learning styles of the students.

Acknowledgements

The corresponding author had a Research Productivity Grant from the National Council of Science and Technology (CNPq), Process 305531/2013-1.

Collaboration

Olimpio CG e Fulquini FL: conception, analysis and interpretation of data; writing of the article; approval of the final version to be published. Garbuio DC:

relevant critical review of intellectual content; final approval of the version to be published. Carvalho EC: conception, analysis and interpretation of data; relevant critical review of intellectual content; final approval of the version to be published.

References

1. Zhu H, Zeng H, Zhang H, Zhang H, Wan F, Guo H, et al. The preferred learning styles utilizing VARK among nursing students with bachelor degrees and associate degrees in China. Acta Paul Enferm. 2018;31(2):162–9.
2. Schmitt CS, Domingues MJ. Estilos de aprendizagem: um estudo comparativo. Avaliação (Campinas). 2016;21(2):361–86.
3. Kolb DA. Experiential learning. New Jersey: Prentice Hall; 1984. 416p.
4. Felder RM, Soloman BA. Index of learning styles questionnaire. Raleigh: North Carolina State University; 1991.
5. Felder RM, Silverman LK. Learning and teaching styles in engineering education. Am J Eng Educ. 1988;78(7):674–81.
6. Lizote SA, Alves CR, Teston SF, Olm JW. Learning styles, academic performance and teaching evaluation. Rev Catarinense Ciên Contábil. 2019;18:1–15.
7. Vieira Junior N. Planejamento de um ambiente virtual de aprendizagem baseado em interfaces dinâmicas e uma aplicação ao estudo de potência elétrica [tese]. Ilha Solteira: Universidade Estadual Paulista, 2012. 234 p.
8. Pimentel A. A teoria da aprendizagem experiencial como alicerce de estudos sobre desenvolvimento profissional. Estud Psicol. 2007;12(2):159–68.
9. Qayumi K, Pachev G, Zheng B, Ziv A, Koval V, Badiei S, et al. Status of simulation in health care education: an international survey. Adv Med Educ Pract. 2014;5:457–67.
10. Barreto DG, Silva KG, Moreira SS, Silva TS, Magro MC. Simulação realística como estratégia de ensino para o curso de graduação em enfermagem: revisão integrativa. Rev Baiana Enferm. 2014;28(2):208–14.
11. Cantrell MA. The importance of debriefing in clinical simulations. Clin Simul Nurs. 2008;4(2):E19–E23.
12. Mariani B, Cantrell MA, Meakim C, Prieto P, Dreifuerst KT. Structured debriefing and students clinical judgment abilities in simulation. Clin Simul Nurs. 2013;9(5):E147–E155.
13. Silva JL, Oliveira-Kumakura AR. Clinical simulation to teach nursing care for wounded patients. Rev Bras Enferm. 2018;71(4 Suppl 4):1785–90.
14. Baptista RC, Martins JC, Pereira MF, Mazzo A. Students' satisfaction with simulated clinical experiences: validation of an assessment scale. Rev Lat Am Enfermagem. 2014;22(5):709–15.
15. Mesquita HC, Santana BS, Magro MC. Effect of realistic simulation combined to theory on self-confidence and satisfaction of nursing professionals. Esc Anna Nery. 2019;23(1):e20180270.
16. Brewer EP. Successful techniques for using human patient simulation in nursing education. J Nurs Scholarsh. 2011;43(3):311–7.
17. Martins JC, Mazzo A, Baptista RC, Coutinho VR, Godoy S, Mendes IA, et al. The simulated clinical experience in nursing education: a historical review. Acta Paul Enferm. 2012;25(4):619–25.
18. Roza RH, Nakano TC, Wechsler SM, Silva TF. Tecnologia no contexto educacional: teste informatizado para avaliação de estilos de aprendizagem. Psicol Educ. 2018;(46):11–20.
19. Oliveira SN, Massaroli A, Martini JG, Rodrigues J. From theory to practice, operating the clinical simulation in Nursing teaching. Rev Bras Enferm. 2018;71 (Suppl 4):1791–8.
20. Polit DF, Beck CT. Fundamentos da pesquisa em enfermagem: avaliação de evidências para a prática de enfermagem. 7th ed. Porto Alegre: ArtMed; 2011. 456 p.
21. Caetano C, Luedke R, Antonello IC. The importance of identifying learning styles in medical education. Rev Bras Educ Med. 2018;42(3):189–93.
22. Reed SJ, Andrews CM, Ravert P. Debriefing simulations: comparison of debriefing with Video and Debriefing Alone. Clin Simul Nurs. 2013;9(12):E585–E591.
23. Angeli dos Santos AA, Mognon JF. Estilos de aprendizagem em estudantes universitários. Bol Psicol. 2010;60(133):229–41.
24. Boostel R, Felix JV, Bortolato-Major C, Pedrolo E, Vayego SA, Mantovani MF. Stress of nursing students in clinical simulation: a randomized clinical trial. Rev Bras Enferm. 2018;71(3):967–74.
25. Aebersold M, Tschannen D, Bathish M. Innovative simulation strategies in education. Nurs Res Pract. 2012;2012:765212.
26. Dalmolin AC, Mackeivicz GA, Pochapski MT, Pilatti GL, Santos FA. Learning styles preferences and e-learning experience of undergraduate dental students. Rev Odontol UNESP. 2018;47(3):175–82.
27. Cogo AL, Lopes EF, Perdomini FR, Flores GE, Santos MR. Building and developing realistic simulation scenarios on safe drug administration. Rev Gaúcha Enferm. 2019;40(Spe):e20180175.
28. Da Hora HR, Rego Monteiro GT, Arica J. Confiabilidade em questionários para qualidade: um estudo com o coeficiente alfa de Cronbach. Produto & Produção. 2010;11(2):85–103.
29. Felder RM, Spurlin J. Applications, reliability and validity of the Index Learning Styles. Int J Cont Engin Educ Lif-Long Learn. 2005;21(1):103-12.