RESILIENCE, ENGAGEMENT AND SUPPORT AND FRIENDSHIP NETWORKS IN THE HEALTH AREA

RESILIÊNCIA, ENGAJAMENTO E REDES DE APOIO E AMIZADE NA ÁREA DA SAÚDE

RESILIENCIA, COMPROMISO Y REDES DE APOYO Y AMISTAD EN EL ÁREA DE SALUD

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ABSTRACT: Nursing and healthcare students can acquire the ability to successfully deal with adversity and the interaction between them results in learning networks. The objective of this research is to analyze the differences between the measures of centrality, based on the analysis of social networks, engagement and resilience of students in the years of the course. Quantitative and descriptive research enabled the analysis of support and friendship networks and the degree of resilience and engagement of students, in addition to identifying the way students exchange academic and friendship information. It was found that there is no difference in the measures of engagement and resilience of students from different years of the nursing course, except for the absorption dimension and that there is a relationship between student interaction with engagement and resilience in the first years of the nursing course. nursing. The results can be applied to educational strategies and in the work environment of health professionals.

KEYWORDS: Nursing Education. Social Network Analysis. Friendship and Support network. Psychological Resilience. Engagement at work.

RESUMO: *Estudantes de enfermagem e da área da saúde podem adquirir a capacidade de lidar com sucesso na adversidade, e a interação entre eles resulta em redes de aprendizagem. O objetivo desta pesquisa é analisar as diferenças entre as medidas de centralidade, a partir da análise de redes sociais, do engajamento e da resiliência dos estudantes nos anos do curso. A pesquisa quantitativa e descritiva possibilitou a análise das redes de apoio e de amizade e do grau de resiliência e engajamento dos estudantes além da identificação da forma como os estudantes trocam informações acadêmicas e de amizade. Constatou-se que não há diferença nas medidas de engajamento e resiliência de estudantes de diferentes anos do curso de enfermagem, exceto para a dimensão absorção, e que existe uma relação entre a interação dos estudantes com o engajamento e a resiliência nos primeiros anos do curso de enfermagem. Os resultados podem ser aplicados às estratégias educativas e no ambiente de trabalho dos profissionais da saúde.*

PALAVRAS-CHAVE: *Educação em Enfermagem. Análise de Redes Sociais. Rede de Amizade e Apoio. Resiliência Psicológica. Engajamento no Trabalho.*

RESUMEN: *Los estudiantes de enfermería y de la atención de la salud pueden adquirir la habilidad de enfrentar con éxito las adversidades y la interacción entre ellos resulta en redes de aprendizaje. El objetivo de esta investigación es analizar las diferencias entre medidas de centralidad, a partir del análisis de las redes sociales, el engagement y la resiliencia de los estudiantes en los años de la carrera. La investigación cuantitativa y descriptiva permitió analizar las redes de apoyo y amistad y el grado de resiliencia y compromiso de los estudiantes, además de identificar la forma en que los estudiantes intercambian información académica y de amistad. Se encontró que no existe diferencia en las medidas de engagement y resiliencia de los estudiantes de los diferentes años de la carrera de enfermería, excepto en la dimensión absorción y que existe relación entre la interacción de los estudiantes con el engagement y la resiliencia en los primeros años de la carrera de enfermería. curso enfermería. Los resultados pueden ser aplicados a estrategias educativas y en el entorno laboral de los profesionales de la salud.*

PALABRAS CLAVE: *Educación en Enfermería. Análisis de redes Sociales. Red de Amistad y Apoyo. Resiliencia Psicológica. Compromiso en el trabajo.*

Introduction

Social Network Analysis (SNA) investigates the relationship between actors and can be useful for understanding the network's relationship with resilience and their engagement in any professional or academic activity. ARS consists of links (or connections, or bonds) between actors through their joint participation in social activities. These common activities create networks of ties between actors (Faust, 1997). Furthermore, ARS presupposes that the actions of individuals, organizations and social entities inserted in their environments make up a relationship structure that allows understanding connections, which provides an understanding of their actions and movements (Granovetter, 1985) with research on many themes in academic literature, such as “information”, “knowledge” and “social capital” (Braga; Maciel, 2020).

Resilience is a term used in this research as the ability to successfully deal with adversity (Connor; Davidson, 2003), that is, the ability to transform adversity into opportunities with the lowest physical and psychological cost (Amsrud *et al., 2019*; Ríos *et al*., 2016; Fernández-Martínez *et al*., 2017; Turner; Holdsworth; Scott-Young, 2017). Amsrud *et al*. (2019) demonstrated that there is no significant amount of research on how to develop resilience in nursing students.

The concept of engagement refers to a positive or satisfactory and persistent cognitive affective state related to work. Engagement contributes to the student's willingness to exert the effort necessary to understand complex ideas and master difficult skills (De Clercq *et al*., 2012). Furthermore, the way the student relates to peers can have an impact on engagement (Rayle; Kurpius; Arredondo, 2006), and authors Dan *et al*. (2023), who found that the construct “professional nursing practice environment” has a direct influence on the construct “work engagement” and indirectly when mediated by the constructs “self-efficacy” and “motivation to achieve”, highlighted that other constructs could be included in the model to better explain the phenomenon.

Therefore, there is an understanding that interaction in the classroom is relevant for students to have access to information that resolves their doubts about the content of the classes and that strengthens their bonds of friendship. So, the objective of this research is to analyze the differences between centrality measures, based on the analysis of social networks, engagement and resilience of students in the course years.

The research is quantitative and descriptive and based on responses from students in the first, second and third years of the nursing course at a public higher education institution (IPES), located in Brazil.

The justification for the study is that classroom interaction can result not only in improved academic and professional performance, but also in the creation of emotionally sustainable networks. Thus, identifying the actors that have the highest centrality measures in the network would enable the application of educational methodologies aimed at greater engagement and resilience in nursing students, both in the classroom and in the professional environment.

Literature review

ARS is interested in understanding the relationships between the actors participating in a given group, which makes it a strategic approach to studying relationships between groups and/or between companies and their interactions (Costa *et al.,* 2018). The ARS can provide ways of analyzing interactions between students during the nursing course and is particularly interesting for understanding the exchange of information, as it provides data on the number of contacts, the flow of communication and the social distance between actors. (Silva; Avelar; Farina, 2013).

The ARS can identify the student or students who stand out with the best positioning in the communication network (Silva; Avelar; Farina, 2013). Meyer and Shatto (2018) understand that increased communication is relevant to the development of resilience, and the most cited way of sharing academic and personal information by students is the WhatsApp application (Pimmer et *al*., 2018; Fernández-Martínez *et al*., 2017; Thomas; Revell, 2016; Grunspan; Wiggins; Goodreau, 2014).

The ARS is a relevant tool for measuring the relationship between resilience and engagement based on friendship and support networks among nursing students. Network interactions and information exchanges can occur in a social, corporate and academic environment between the members that compose them, creating links and connections between their actors (Costa *et al*., 2018; Wasserman; Faust, 2013).

Marqués-Sánchez *et al.* (2019) emphasize that ARS can be a way to improve relationships between students in undergraduate courses and that it would be interesting to analyze networks, resilience and student engagement issues to improve communication between them. ARS identifies the network of relationships, facilitating the understanding of how communication occurs.

Central actors know the network better than peripheral actors, from a cognitive point of view. Central actors are perceived by other actors as having greater power, which gives them

different treatment and can thus obtain better results. An actor's centrality measures, considering the network perspective, represent that actor's relationships within the network (Brass; Krackhardt, 2012).

Opportunities and constraints can describe an actor in a network. In this way, an actor can have more opportunities and fewer restrictions when its structural position is more favorable, or have greater influence, obtain more information and demonstrate its knowledge about issues occurring in the network or be a reference for other actors in less favorable positions. (Hanneman; Riddle, 2005).

The engagement of nursing students aims to analyze the cognitive dimension, as it refers to the student's desire to understand and master the skills required by the profession. Ayala and Manzano (2018) identified high engagement in first-year university students, based on motivation, high levels of well-being and academic satisfaction. First-year university students who are engaged tend to obtain higher grades (De Clercq *et al*., 2012). López-Alonso *et al*. (2016) and Fernández-Martínez *et al*. (2017) observed in relation to engagement that at the beginning of the course, students show greater vigor (tenacity, effort), greater absorption (concentration) and a higher level of dedication (enthusiasm, inspiration, pride, challenge) to academic tasks. Based on this indication from academic literature, the first hypothesis is presented, H0 versus Ha:

Ha-engagement: There is a difference in engagement (vigor, dedication and absorption) between students in the first, second and third year of the nursing course.

As mentioned, the concept of resilience adopted is from Connor and Davidson (2003) who state that a resilient person is someone capable of dealing with adversity successfully. Resilience is positioned as a fundamental skill for students, as it is the ability to transform adversities into opportunities. Thus, educators can be facilitators to develop resilience in nursing students (Amsrud *et al*., 2019; Ríos *et al*., 2016; Fernández-Martínez *et al*., 2017; Thomas; Revell, 2016; Turner; Holdsworth; Scott-Young, 2017).

In terms of resilience, first-year students had a higher average than other years (Fernández-Martínez *et al*., 2017). This observation allows the elaboration of the second hypothesis, H0 versus Ha:

Ha-resilience: there is a difference in resilience in students in the first, second and third year of the nursing course.

This work focuses on nursing students who will face practical contact with patients, exposure to communicable diseases, intimate care or death that may cause a high degree of

discomfort or anxiety. For this reason, resilience and engagement can be useful in dealing with these difficulties. Thus, identifying students who have the greatest influence on others, checking their engagement and resilience, and analyzing the networks formed by students can be a support for everyone to successfully deal with adversity and master skills to deal with situations which can cause a high degree of discomfort or anxiety in the classroom and also in professional life.

Method

This study followed national and international guidelines, as well as Resolution CNS/MS 510/16 in the area of Human/Social Sciences. The project was submitted to the Research Ethics Committee of the university where the study was carried out, located in the metropolitan region of the city of São Paulo, and was approved (10304119.0.0000.5510 – Consubstantiated Opinion from CEP 3.310.303).

The study, of a quantitative and descriptive nature, investigated how the exchange of information occurred between students of the three years of the nursing course, totaling 69 respondents, from a Public Higher Education Institution (HEI), located in Brazil, with the objective of analyzing the differences between centrality measures, based on social network analysis, student engagement and resilience in the course years.

One of the differences between this research and the research carried out by the authors Fernández-Martínez *et al.* (2017) is the test of hypotheses that were not tested in Spain, however, even so, some comparisons were made with the aim of enriching the results found in both universities on the relationship between resilience and engagement based on friendship and support networks between nursing students.

Data collection instruments

The data collection instrument used to identify the exchange of information between the students surveyed was the questionnaire, which was answered by 100% of those enrolled in the first, second and third year of the course in question. The collection instrument was divided into four blocks to meet the study objectives. The first block refers to the respondent's profile and has four items: i) Name; ii) Semester; iii) Age; iv) the condition of whether the respondent is employed and whether he or she works in the nursing profession or works in another area; and iv) sex. Such information was used as attributes of students on the course researched in Brazil.

The second block of the collection instrument aimed to obtain the variables for structuring the Type 1 (support network for course activities in the classroom) and Type 2 (friendship network) networks. Both networks are used to calculate student centrality measures. For Type 1 the question was: Who do you ask for help?, and for Type 2: Who is your friend? Students responded based on the list of classmates' names.

Type 1 and Type 2 networks were analyzed using the Ucinet 6 software (Borgatti; Everest; Freeman, 2002). The social network analysis measures used in this work were *indegree, outdegree, eingenvector, closeness and betweenness*, as they describe the position of an actor in terms of its centrality in relation to the network (Borgatti *et al.*, 2009).

This research uses the Utrecht Work Engagement Scale (UWES), developed by Schaufeli and Bakker and validated in several countries. The UWES aims to assess engagement in the individual's work practices and includes: i) Vigor, which translates energy (tenacity, effort); ii) Dedication, which refers to the emotional aspect (enthusiasm, inspiration, pride, challenge), and iii) Absorption, which refers to the cognitive aspect (concentration), giving rise to the UWES scale (Fernández-Martínez *et al*., 2017; Cadime *et al*., 2016; López-Alonso *et al*., 2016; Schaufeli; Bakker, 2003).

Authorization to use the UWES-S scale (engagement) was requested from Wilmar Schaufeli by email in April 2019, who promptly granted free use. The third block of the research instrument assesses engagement in its three dimensions: absorption, dedication and vigor, with 17 items composed of the three dimensions, and which assessed the degree of agreement or disagreement with each of them, by the respondent, with the attribution of a value taken from the range 0 to 6.

Authorization, through payment, to use the CD-RISC 10 scale, was requested from Jonathan Davidson, in April 2019, who suggested the use of the translated version, which was inserted in the fourth block of the collection instrument with the aim to measure the resilience

of nursing students in Brazil. This block has 10 items and evaluates the degree of agreement or disagreement in relation to each of them with the respondent assigning a value, which varies from 0 to 4. The hypotheses presented in this work were tested using the Kruskal Wallis, because it is simple and does not require data distribution assumptions.

Data collection was carried out by the authors of this work in the first semester of the 2019 academic year. Student confidentiality was ensured by assigning numerical codes to the questionnaires. The next section describes the results for the six networks.

Results and discussions

This section is structured as follows: a) comparison of the research carried out in Brazil with the research by Fernández-Martínez *et al*. (2017), b) results of hypothesis tests, c) analysis of support and friendship networks, d) comparison of centrality measures of the two networks, e) result of the Quadratic correlation test Assignment Procedure, f) analysis of the places and means that students use to obtain support and friendship and g) analysis of correlations between measures of engagement and resilience with measures of centrality.

Table 1 shows the distribution of students between first, second and third years in HEIs in Brazil and Spain.

Table 1 – Number of students surveyed in Brazil and Spain.

Year of study	**Total Brazil N (%)**		**Total Spain N (%)**	
First year	15	21.74%	48	35.82%
Second year	24	34.78%	44	32.84%
Third year	30	43.48%	42	31.34%
Total	69	100.00%	134	100.00%

Source: Authors. The study in Brazil was compared with the research by Fernández-Martínez *et al.* (2017)

The inclusion criterion in the research is to be a nursing student, regularly enrolled at the HEI researched. Based on Table 1, there is a more equal distribution of the number of students in Spain per year of the course, different from the course researched in Brazil, which has a smaller number of students in the first year of the course. Despite the difference between the number of students, the percentage analysis was carried out.

Table 2 presents the mean and standard deviation of the three dimensions of student engagement at the two universities researched. The averages per year of the absorption and dedication dimensions of Brazilian students are higher than the averages of students from Spain and close in the vigor dimension. It is noted that the standard deviation of the absorption, dedication and vigor dimensions are lower in Brazilian students when compared to Spanish students, except for the standard deviation of vigor in the third year. Brazilian students have a general average of 3.99 (absorption), 5.19 (dedication) and 2.99 (vigor), higher than the general average of Spanish students, which was 2.98 (absorption), 4.82 (dedication) and 3.14 (vigor), respectively.

Table 2 – Descriptive measures of student engagement.

Engagement		**Brazil**			**Spain**		
		N	**Average**	**Standard deviation**	***N***	**Average**	**Standard deviation**
Absorption	First year	15	4.54	0.70	48	3.27	1.03
	Second year	24	3.92	0.68	44	2.80	1.02
	Third year	30	3.77	0.76	42	2.83	1.00
Dedication	First year	15	5.45	0.46	48	4.83	0.93
	Second year	24	5.09	0.44	44	4.75	0.77
	Third year	30	5.15	0.47	42	4.88	0.71
Force	First year	15	3.47	1.04	48	3.40	1.08
	Second year	24	2.94	1.06	44	2.92	1.16
	Third year	30	2.79	1.06	42	3.06	1.01

Source: Authors. The study in Brazil was compared with the research by Fernández-Martínez *et al.* (2017)

The dedication dimension obtained the highest averages among the engagement dimensions for both countries. Spanish students showed more vigor in the first year and the same occurred with Brazilian students. The Absorption measures were higher in the first year for both students, and the dedication dimension measure was higher in the first year for Brazilian students and higher in the third year for Spanish students.

Regarding the outcome of engagement, a study carried out in Portugal with high school and undergraduate students showed that the sample of undergraduate students had higher scores in vigor and absorption, but not in dedication (Cadime *et al*., 2016). However, the study cited only compares the results of the sample of undergraduate students (n = 229) with that of high school students (n = 251). The authors used the UWES scale in the study.

Regarding the hypotheses tested in this work, the Ha-engagement hypothesis tested for the Dedication dimension resulted in a p-value equal to 0.409 and was not accepted, that is, there is no difference between the years of the nursing course, based on the sample a significance level of 5%.

The same test for the Vigor dimension indicated a p-value of 0.162 and Ha was not accepted, based on the sample. For the Absorption dimension, the p-value was 0.047, which indicated a difference between students in the nursing course years, and first-year university students in this study showed greater absorption when compared to third-year students based on the sample researched. Thus, for the Vigor and Dedication dimensions, the results are not the same as those found in academic literature, except for absorption (Fernández-Martínez *et al*., 2017).

Table 3 presents the results of the resilience averages between the two surveys. In this way, the ability of students from the first to the third year to respond to stress in a healthy way was measured, thus ensuring psychological well-being (Ayala; Manzano, 2018; Turner; Holdsworth; Scott-Young, 2017; Ríos-Risquez *et al*., 2016; Thomas; Revell, 2016). The results in relation to the sample were given by the sum of the averages, and in accordance with research in Spain. Thus, the sum of the Spanish students' resilience averages (28.6) was slightly higher than the sum of the Brazilian students' averages (27.98).

Table 3 – Descriptive results of student resilience.

Resilience	**Brazil**		**Spain**	
	N	**Sum of averages**	***N***	**Sum of averages**
First year	15	29.80	48	29.42
Second year	24	27.38	44	27.57
Third year	30	26.77	42	28.79
Total	69	27.64	134	28.61

Source: Authors. The study in Brazil was compared with the research by Fernández-Martínez *et al*. (2017)

Spanish students are slightly more resilient and presented a higher value in the first-year group when compared to the second- and third-year groups. The same occurrence occurred with the sample of Brazilian students. Thus, the Spanish university researched has students with greater psychological well-being, commitment and quality of service when compared to Brazilian students at the researched university. Walsh *et al*. (2020) emphasized that resilience should be part of nursing students' curriculum and therefore educators should provide

opportunities for the development of skills and knowledge through appropriate learning (Amsrud *et al.,* 2019).

As for the second alternative hypothesis Ha-resilience, the Kruskal Wallis test resulted in a p-value equal to 0.209, which means non-acceptance of the alternative hypothesis, that students from different years of the nursing course do not show a difference in resilience based in the researched sample, which is not in accordance with the academic literature.

However, Amsrud *et al.* (2019 p. 12) emphasized that resilience is not a static or innate characteristic, but a contextual and dynamic process. Therefore, there is a need to implement systematic work through educational strategies to develop resilience in nursing students.

Table 4 presents the densities of the six networks and the number of student ties. Density explains students' search for information, and in cases where density is greater it means that more students ask for support, in the case of the support network, or that they are more friends with each other in the friendship network (Hanneman; Riddle, 2005).

Table 4 – Density of support and friendship networks in the sample of Brazilian students.

Year	Network Type	Density	Ties
First	Friendship	0.238	50
	Support	0.200	42
Second	Friendship	0.263	145
	Support	0.134	74
Third	Friendship	0.117	102
	Support	0.115	100

Source: Prepared by the authors

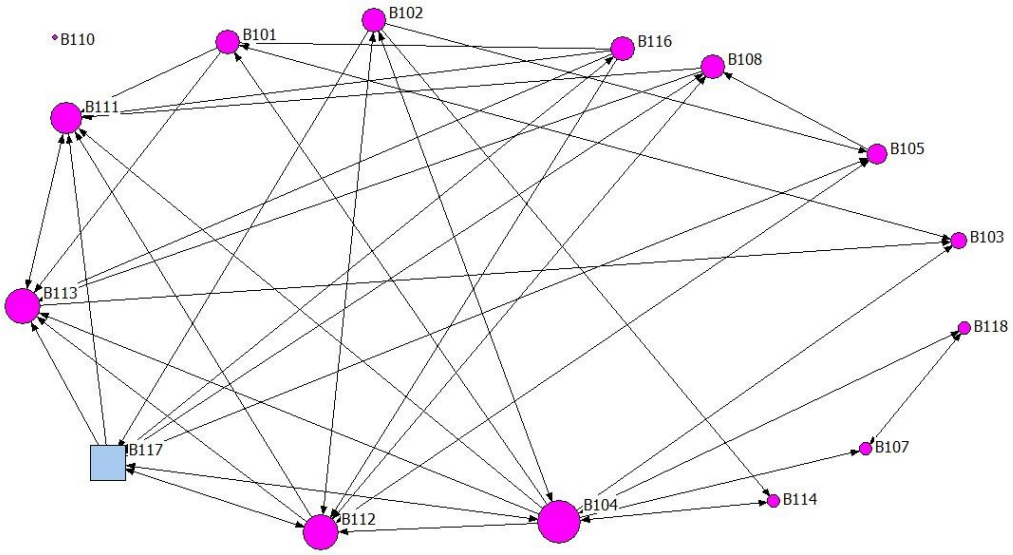
The second year of the nursing course presented the highest density measure for the friendship network when compared to other networks, and the third-year networks presented the lowest density measures.

This analysis of table 4 confirms the results of Fernández-Martínez *et al.* (2017) and López-Alonso *et al.* (2016), who observed a drop in indicators that measure friendship over time, given that there is a shortage of time due to the resulting academic responsibilities. It is important to note that the density of the support network decreased, but without the same intensity as the friendship network (-42.50% and -50.84% when comparing the third year with the first year).

Figure 1 corresponds to the first year's friendship network and Figure 2 to the same year's support network, where the circular shape indicates women and the square shape

indicates men. The higher the form, the more the student has friends or support (measure of degree centrality).

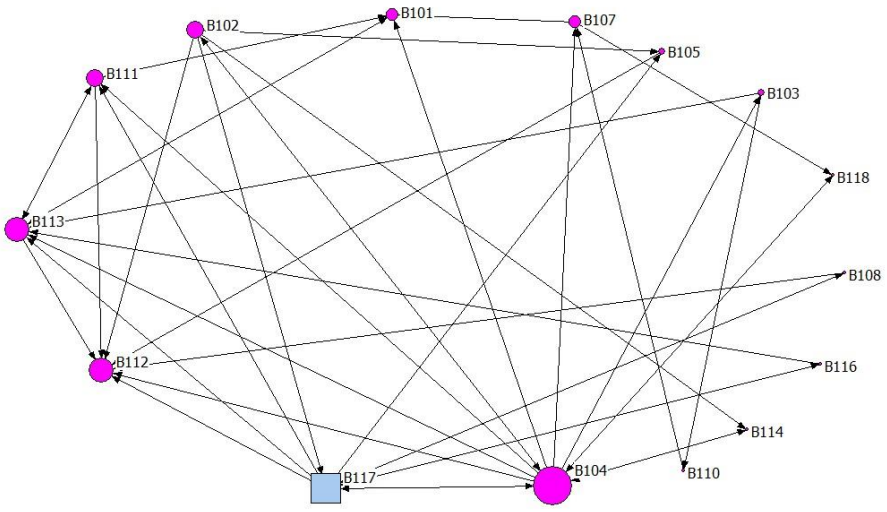
Figure 1 – Friendship network among first-year nursing students.



Source: Prepared by the authors

Students with the highest grades are B104, B112, B117, B113, B111 and B102, which means they have more friends in the classroom.

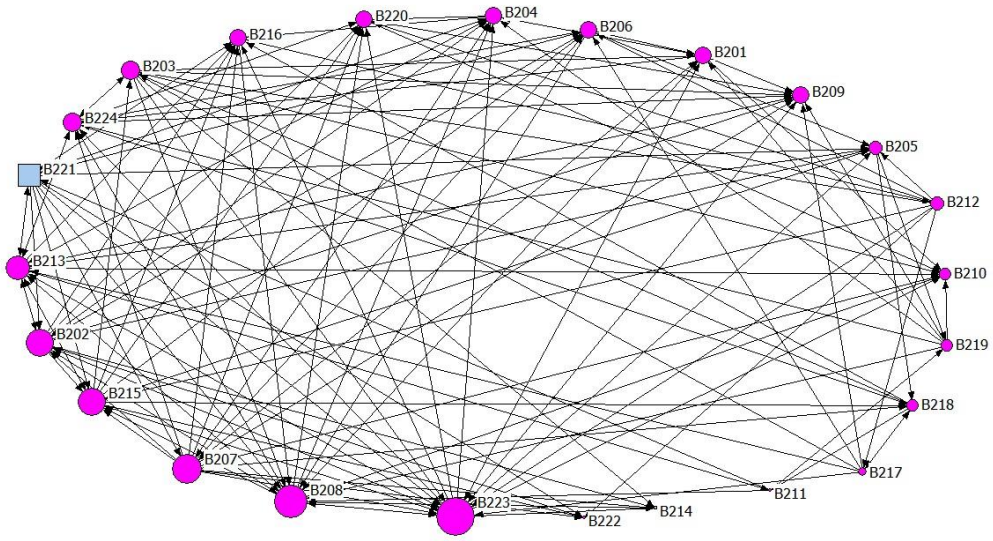
Figure 2 – Support network among first-year nursing students



Source: Prepared by the authors

Students with a higher degree, that is, students who request or give more support are: B104, B112, B117, B113, B111 and B102, which coincides with students with a higher degree in the friendship network, except B102. The support network has a lower density than the friendship network (Table 4). Figure 3 corresponds to the Friendship Network of the second year and Figure 4 to the Support Network of the same year.

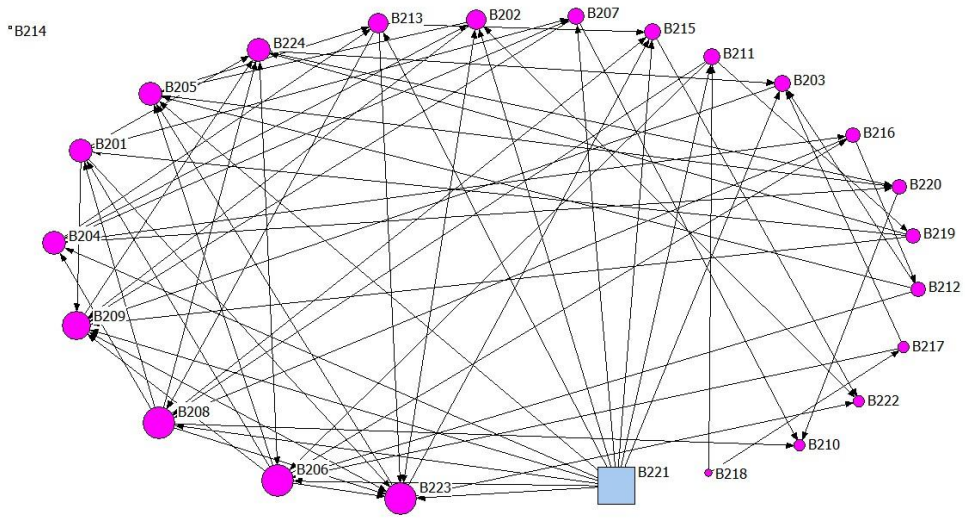
Figure 3 – Friendship network among second-year nursing students.



Source: Prepared by the authors

Students with the highest grade are B223, B208, B207, B215, B202, B221 and B213, which means they have more friends in the classroom (Figure 3).

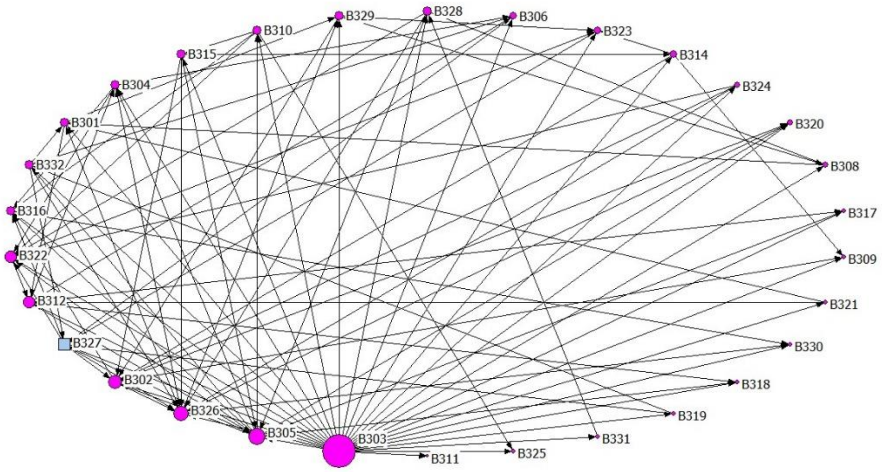
Figure 4 – Support network for second-year nursing students



Source: Prepared by the authors.

Students with a higher degree measure, that is, the students who request or give more support are: B221, B223, B206, B208, B209, and only some of them coincide with students with a higher degree in the friendship network; It is worth mentioning that the friendship network has a density measure almost double the density of the support network (Figure 4). Figure 5 shows the friendship network between third-year students and Figure 6 shows the support network of the same class.

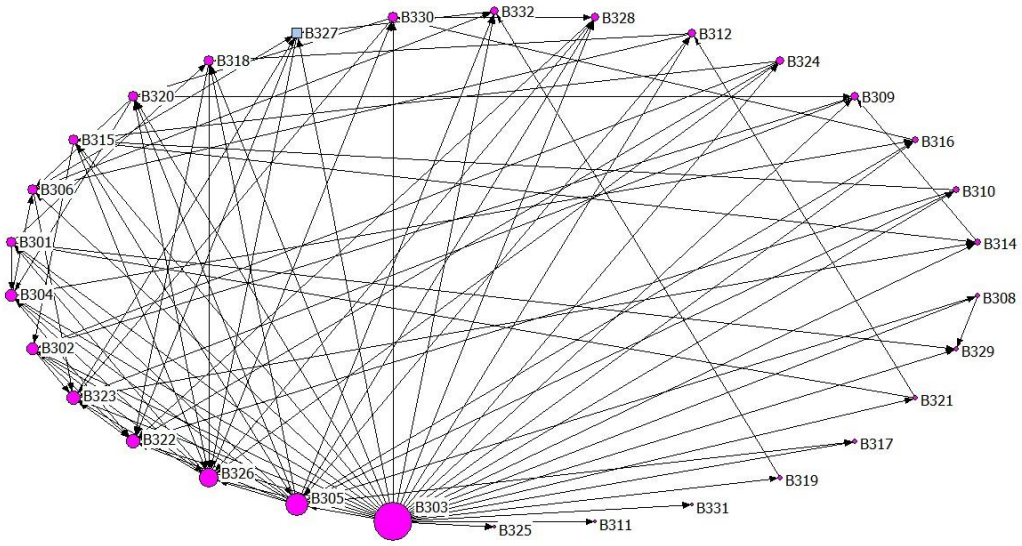
Figure 5 – Friendship network among third-year nursing students



Source: Prepared by the authors

Students with the highest degree are B303, B305, B326, B302, B312, B327, which means they have more friends (Figure 5).

Figure 6 – Corresponds to the support network among third-year students.



Source: Prepared by the authors.

The students with the highest degree, that is, the students who ask for or give the most support are: B303, B305, B326, B322, B323, with only a few coinciding with the students with the highest degree in the friendship network (Figure 6). Both densities are approximately equal (Table 4). The fact that they are the same students with higher degrees in both networks allows us to infer that support and friendship relationships are related to each other.

Table 5 presents the main measures of centrality of the support and friendship networks of first, second- and third-year students. Measurements are expressed in percentages, making it possible to compare networks. Note the high values of standard deviations in relation to the averages, that is, there is great variation in the values of centrality measures in support and friendship networks among students.

The *out* and *in-degree measures* indicate higher values, on average, in the class of first-year students in the support network, that is, in relation to the size of the network, more students seek support or are sought out for support. The third-year class has the lowest values. The second-year class presents the network with the most friendships among students. It is important to highlight that the standard deviations only present high values when compared to the respective average.

Table 5 – Means and standard deviations of Brazilian students' support and friendship networks

Year	Network	*Outdegree*		*Indegree*		*inCloseness*		*outCloseness*		*Eigenvector*		*Betweenness*	
		Average	*σ*	*Average*	*σ*	*Average*	*σ*	*Average*	*σ*	*Average*	*σ*	*Average*	*σ*
First year	Support	20.00	18.30	20.00	13.35	20.06	11.54	33.66	22.02	32.42	16.81	7.03	10.67
	Friendship	23.81	19.28	23.81	14.44	20.27	10.29	26.15	13.62	31.95	17.68	4.87	7.64
Second year	Support	13.41	10.79	13.41	8.87	15.73	7.05	12.34	4.16	25.13	14.21	4.76	4.88
	Friendship	26.27	2.69	26.27	11.67	26.88	3.53	49.14	16.12	27.53	8.69	3.91	3.21
Third year	Support	11.49	18.94	11.49	7.52	8.35	4.28	9.92	16.95	22.44	12.78	2.61	4.03
	Friendship	11.72	17.91	11.72	7.1	10.64	3.77	13.34	16.49	22.60	12.38	3.89	5.52

Source: Prepared by the authors

Regarding proximity measures (*in-closeness* and *out-closeness*), first-year students have higher values in the support network, that is, they are closer to each other when providing support or seeking it. In relation to the friendship network, the second year presents greater proximity between students, compared to the other years.

The first year presents the highest values of eigenvectors (*eigenvectors*) in both networks (support and friendship), which means that students are closer to each other, that is, the first-year networks have a more centralized structure when compared to other years.

A similar result occurs in relation to the intermediation centrality measure: despite presenting small values, the support and friendship networks in the first year have more intermediary actors than in the other years. More students mediate among others when it comes to seeking support or friendship.

On the other hand, nursing practice is dynamic, continually evolving to meet the challenges of healthcare in a global environment (Walsh *et al*., 2020 p. 7). Therefore, support and friendship networks are also dynamic processes that involve a series of teaching and learning strategies, which can be affected by different factors during the course.

In addition to the centrality measures of each network, the correlation between networks was also analyzed using the Quadratic Assignment Procedure – QAP test, correlation test. The objective was to analyze whether the friendship relationship between two actors (students from the same year of the nursing course) also implies the existence of a supportive relationship between the same students. The statistical test of the hypothesis that the correlation measure between the support network and the friendship network is different from zero presented the following results (Table 6).

Table 6 – QAP correlation test between the support and friendship networks of students in the same year of the nursing course.

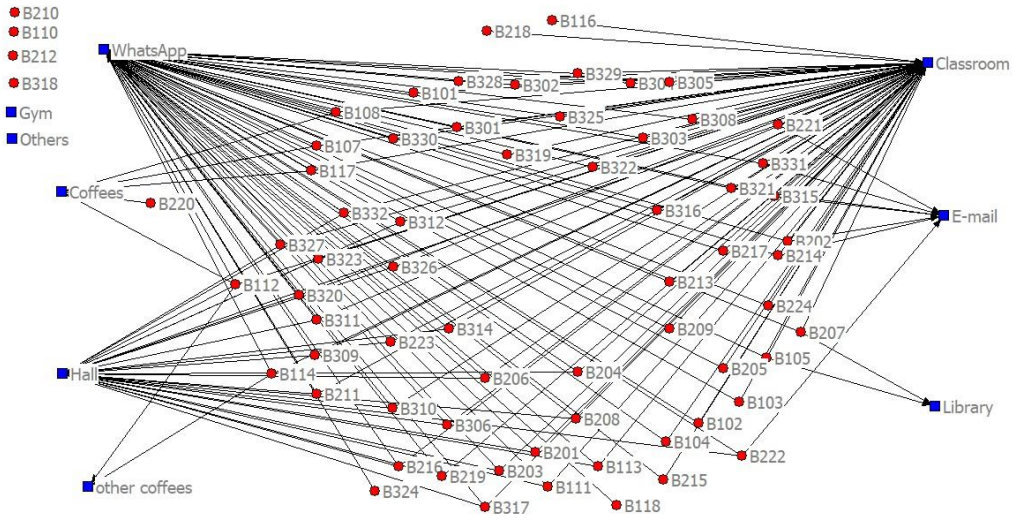
QAP correlation test of the friendship network versus the support network	**Pearson Correlation**	**P-value**
First year	0.67	0.00
Second year	0.54	0.00
Third year	0.73	0.00

Source: Prepared by the authors

All correlations were considered different from zero, which indicates that the friendship bond and the support bond between students are related to each other in the networks studied. More friendship ties imply more helping ties between students and vice versa.

Regarding the places and means of exchanging information between students, the results are presented in Figures 7 and 8.

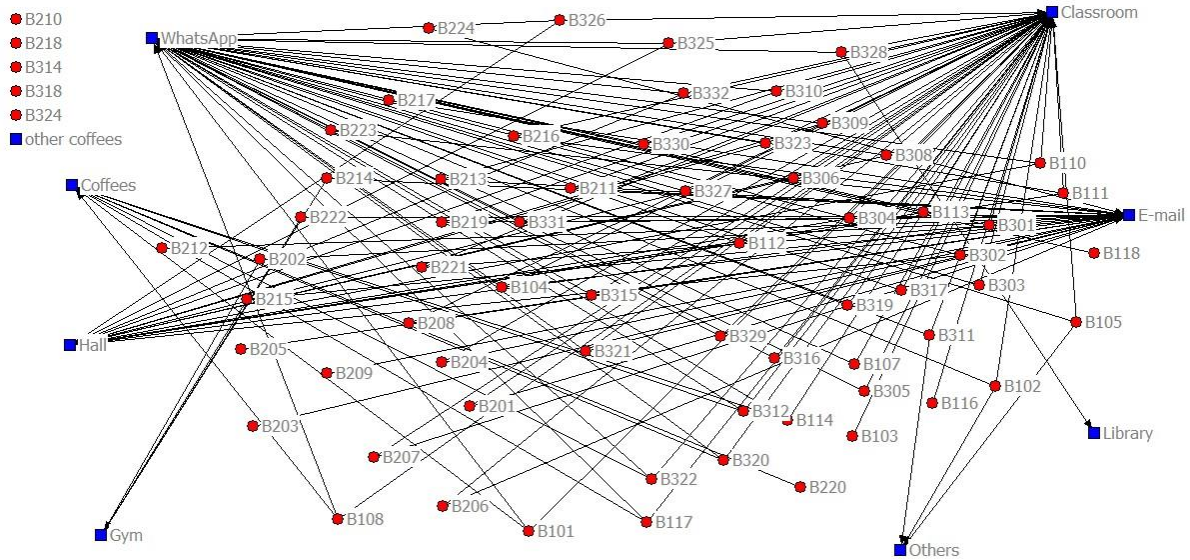
Figure 7 – *Two-mode* network exchanging personal information: places and means.



Source: Prepared by the authors

The square shapes (Figure 07) in blue indicate the places and means where personal information is exchanged between students. The circular shapes in red indicate the students. The network presents the links between students and the means of exchanging personal information. The classroom and the corridor are the places where most information is exchanged, and the exchange is also carried out mostly via WhatsApp.

Figure 8 – *Two- mode network* of places and means where academic information is shared.



Source: Prepared by the authors

The same caption was used in Figure 08. Academic information occurs more in the classroom and in the *hall,* and via email and WhatsApp, while other places are less used for this.

The most cited place for sharing academic and personal information by students is the WhatsApp application, and is confirmed by the literature (Pimmer *et al*., 2018; Fernández-Martínez *et al*., 2017; Thomas; Revell, 2016; Grunspan; Wiggins; Goodreau, 2014). Nursing students used the instant messaging application during a multinational study project on the use of mobile social media in health professions education and facilitated communication between students and nurses, promoting social capital, professional identity, as well as reducing feelings of isolation in professional communities, and the main reason was the perceived ease of using these means (Pimmer *et al*., 2018).

The correlations between the dimensions of the concept of engagement (dedication, vigor and absorption) and the concept of resilience were analyzed, with measures of students' centrality in the support and friendship networks of the three years of the nursing course. Table 7 shows the statistically significant correlations:

Table 7 – Engagement and Resilience versus centrality measures – Correlations

Year	Network	**Engagement and Resilience**	**Centrality measures _**	**Correlation coefficient _**	**p-value < 0.05**
First year	Support	Resilience	*outcloseness*	0.548	0.034
First year	Support	Dedication	*betweenness*	0.587	0.021
First year	Support	Dedication	*outcloseness*	0.663	0.007
First year	Friendship	Dedication	*outcloseness*	0.562	0.029
Second year	Friendship	Resilience	*incloseness*	-0.442	0.030
Second year	Support	Force	*outdegree*	0.423	0.039
Second year	Support	Force	*outcloseness*	0.416	0.043
Second year	Friendship	Force	*outdegree*	0.634	0.001
Second year	Friendship	Force	*outcloseness*	0.579	0.003
Second year	Friendship	Absorption	*outdegree*	0.514	0.010
Third year	Support	Dedication	*incloseness*	0.437	0.016

Source: Elaborated by the authors

Table 7 indicates that correlations between centrality measures and measures of engagement (dedication, vigor and absorption) and resilience of support and friendship networks occur more in the first and second year. In the first year there were 4 significant correlations and in the second year there were 6 significant correlations. Only one significant correlation occurred in the third year. There is a negative correlation in the friendship network, in the second year, with the measure of proximity and the measure of resilience, that is, the greater the resilience, the less closeness between students. The other measures indicate the

opposite, that is, the greater the vigor, dedication or absorption and resilience, the closer or greater the search for support or friendship among students.

Proximity means that the student seeks support and the value of the measure indicates how much closer they are to other students. For example, in the first year the proximity measure is significantly correlated with Resilience, so the closer the student is to others, the more resilient they are and vice versa.

Outdegree means that the student seeks support and the value of the measure indicates how many students he asks for support. For example, in the second year, the *out-degree measure* is significantly correlated with the Vigor dimension, so the more students seek support, the more vigor they will have and vice versa.

As for Brazilian students, those who had higher measures in the three dimensions of engagement were not working at the time of the research. However, the first- and second-year students who obtained the lowest scores in the three dimensions were working during the research period. In the first year, 33.00% of respondents work, and the student with the lowest score in dedication and absorption is 22 years old and works, and the lowest score in effect is from a 21-year-old student who also works. The percentage of second- year students who work is the same as the first year, that is, 33.00%, and the lowest score in absorption, dedication and vigor comes from a 28-year-old student who works.

In relation to networks, the network density measure explains the total number of ties (links) between students. Thus, for the Brazilian sample, the highest density of friendship network was found in the second year of nursing students. Both networks (friendship and support) show a decrease from the first to the third year. In this case, the second year shows that friendship is more present and first year students ask for more support.

For the Brazilian sample, engagement levels were higher among students in the first year of the nursing course when compared to other years. In comparison with the research carried out in Spain by Fernández-Martínez *et al*. (2017), the sample of Brazilian nursing students presented superior measures, except for the third year and on the vigor dimension, although hypothesis tests did not show differences in engagement between students in the three years, except for the absorption dimension.

It may be that Brazilian students have their dedication compromised due to the performance of professional activities in conjunction with academic activities, and this may be a hypothesis to be tested in future research. Similar reasoning can be applied to other student attributes, such as gender and age.

Brazilian and Spanish first-year students obtained the highest average scores for resilience compared to the other years. The average total sum of resilience of the Brazilian sample was 27.64, lower when compared to the results of Ríos *et al.* (2016), with the sum of the means equal to 34.70, and with results from Fernández-Martínez *et al.* (2017), with a sum of means equal to 28.61.

However, for the Brazilian sample, the resilience significance test was calculated, with no difference in resilience between the years (first year in relation to the second and third year). As resilience is contextual and dynamic, there is an opportunity to develop educational strategies to increase the resilience of nursing students for the Brazilian sample.

It is necessary for the nursing course faculty to recognize the importance of the student being resilient, and this ability has to be understood as fundamental for the professional future, as resilience is directly related to the students' mental health, psychological well-being, commitment and quality of care when dealing with the patient (Turner; Holdsworth; Scott-Young, 2017; Ríos *et al*., 2016; Thomas; Revell, 2016).

Pimmer *et al.* (2018), Fernández-Martínez *et al*. (2017), Thomas and Revell (2016) and Grunspan; Wiggins and Goodreau (2014) highlight that the most cited means for sharing academic and personal information by students is WhatsApp, and this study confirmed the application theory as the most cited means for sharing academic and personal information based on the Brazilian sample, regardless of the year of schooling.

The results of the QAP correlation test indicate that the more stimuli there are for support between students, the more friendship ties there will be and vice versa, which can help students perform in the nursing course.

Final remarks

The objective of analyzing the differences between centrality measures, based on the analysis of social networks, engagement and resilience of students in the years of the nursing course was achieved.

The comparison of research carried out in Brazil and Spain indicated that nursing students in Brazil are more engaged and resilient, and the result signals future research to test through structural equations models that contemplate these scales, with the inclusion of other constructs, such as " professional nursing practice environment", "self-efficacy", "motivation

to achieve", as well as relationships and information exchange, where the country of origin could be a moderating variable to explain resilience and engagement.

The hypothesis tests indicated that there were no differences in the measure of resilience and engagement between the years of the nursing course. Only the absorption dimension showed a difference, indicating that students have a higher absorption measure in the first year when compared to the other years. The literature presents varied results, and therefore this question remains open for further research.

Regarding support and friendship networks, the measurements of the density of friendship and support networks were different when comparing the years of the nursing course and decreased when comparing the first to the third year, which also confirmed the academic literature researched.

The analysis of the centrality measures of the six networks indicated higher values in first-year students, mainly in the support network, and the exception occurred in the friendship network, that is, there were no higher centrality measures in a given year of the course. A possible explanation is the fact that students are little aware of the issue of friendship because they are in their first year, which does not happen in the search for support.

For each class, the correlation between networks was measured to assess whether students with more friendships also have more support and vice versa. The result of the test is that more friendship ties imply more supportive ties between students and fewer supportive ties imply less support.

Personal and academic information between students mostly happens in the classroom and in the corridors, and the most used medium is WhatsApp, which confirms the academic literature.

The correlation between various centrality measures with measures of resilience and engagement indicates the opportunity to strengthen friendship and support networks with the aim of making students more resilient and engaged. It is important to highlight that the results presented can also be researched in other courses and in the organizations in which the students will work.

Limitations and recommendation for future studies

The limitations of this study are especially worth noting: the relationship between engagement and resilience in academic performance was not verified and the sample consisted only of the first three years of the nursing course. Thus, the sample reflected a specific profile, meaning it is not possible to generalize to higher education as a whole. Networks are dynamic by nature and the study is just a snapshot of a specific moment.

As a future study, the authors of this work intend to use the same scales and the ARS tool, indicated in the present study, with application in the first year and in the last year for the same class of students, in order to compose a longitudinal study. Therefore, the authors of this work intend to compare new data with the results found so far. The longitudinal study will provide information to see if current second- and third-year students had lower resilience when they were in their first year.

Future studies should explore other factors that may impact the engagement and resilience of nursing students and verify the possible influence on students who work and study at the same time. We also suggest research into other courses in the health field, regarding their importance for students, professionals in the field and for society.

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