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Assessment of digital health literacy among undergraduate health students using the eHEALS-Br

Avaliação do letramento digital em saúde de estudantes de graduação da área da saúde com a eHEALS-Br

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ABSTRACT

Introduction: Digital health literacy has become an essential competency in health professional education due to the rapid digitalization of health information, increased use of technology in clinical practice, and growing exposure to online misinformation. Despite this context, national studies assessing digital health literacy among undergraduate health students and associated factors remain limited.

Objective: To assess the level of digital health literacy among undergraduate health students using the Brazilian version of the eHealth Literacy Scale (eHEALS-Br) and to investigate associated sociodemographic factors.

Methods: A cross-sectional, observational study with a quantitative approach was conducted with 91 undergraduate students from Biomedicine, Nursing, Pharmacy, Medicine, and Psychology programs at a private higher education institution in southern Brazil. Data were collected through an online questionnaire including sociodemographic variables and the eHEALS-Br. Descriptive statistics, univariate analyses, multiple linear regression, and Principal Component Analysis (PCA) were performed.

Results: Participants had a mean age of 22 ± 4 years, with a predominance of females (83.5%). The mean overall eHEALS-Br score was 32.66 ± 4.54. According to national cutoff points, 52.7% of students presented a high level of digital health literacy, 42.9% a moderate level, and 4.4% a low level. Multiple linear regression identified proficiency in a second language ($\beta = 2.17$; $p = 0.043$) and receipt of a scholarship ($\beta = 1.81$; $p = 0.061$) as independent predictors of the score. PCA revealed two main dimensions while preserving the scale's unidimensional structure. The lowest mean scores were observed for confidence in using online health information for decision-making.

Conclusion: Students perceive themselves as having high digital health literacy, particularly in accessing and evaluating online information; however, uncertainty remains regarding its practical application. Second-language proficiency and institutional financial support appear to facilitate digital health competencies, suggesting that curricular internationalization and equity-oriented educational policies may enhance digital health literacy in undergraduate health education.

Keywords: Health literacy; Computer Literacy; Health education.

RESUMO

Introdução: *O letramento digital em saúde tornou-se uma competência essencial na formação de profissionais da saúde, diante da crescente digitalização do acesso à informação, da incorporação de tecnologias na prática clínica e do aumento da exposição à desinformação on-line. Apesar desse cenário, ainda são escassos os estudos nacionais que avaliam o nível dessa competência entre estudantes de graduação da área da saúde e os fatores associados.*

Objetivo: *Este estudo teve como objetivos avaliar o nível de letramento digital em saúde de estudantes de graduação da área da saúde utilizando a versão brasileira da eHealth Literacy Scale (eHEALS-Br) e investigar a associação com variáveis sociodemográficas.*

Método: *Trata-se de um estudo observacional, transversal, de abordagem quantitativa, realizado com 91 estudantes dos cursos de Biomedicina, Enfermagem, Farmácia, Medicina e Psicologia de uma instituição privada do Sul do Brasil. Os dados foram coletados por meio de questionário on-line contendo informações sociodemográficas e a eHEALS-Br. Realizaram-se análises estatísticas descritivas, testes univariados, regressão linear múltipla e análise de componentes principais (PCA).*

Resultado: *A amostra apresentou idade média de 22 ± 4 anos, com predominância do sexo feminino (83,5%). O escore médio global da eHEALS-Br foi de 32,66 ± 4,54 pontos. De acordo com pontos de corte nacionais, 52,7% dos estudantes apresentaram nível alto de letramento digital em saúde; 42,9%, moderado; e 4,4%, baixo. A regressão linear múltipla identificou o domínio de uma segunda língua ($\beta = 2,17$; $p = 0,043$) e o recebimento de bolsa de estudos ($\beta = 1,81$; $p = 0,061$) como preditores independentes do escore. A PCA revelou duas dimensões principais, preservando a estrutura unidimensional do instrumento. O item relacionado à confiança para uso das informações on-line na tomada de decisão apresentou a menor média.*

Conclusão: *Os estudantes demonstram elevado letramento digital em saúde para localizar e avaliar informações on-line, porém persistem incertezas quanto à aplicação prática dessas informações. O domínio de outra língua e o apoio institucional emergem como fatores facilitadores, indicando que estratégias de internacionalização curricular e políticas de equidade podem fortalecer competências digitais em saúde na graduação.*

Palavras-chave: *Letramento em Saúde; Alfabetização Digital; Educação em Saúde.*

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INTRODUCTION

In recent years, access to health information has rapidly shifted to digital platforms, driven by the widespread use of the internet and new communication technologies. This change has expanded the range of resources available to patients and healthcare professionals, but it has also highlighted the need for these users to be able to locate, interpret and critically evaluate online content – a skill known as eHealth literacy. The World Health Organisation points out that inadequate levels of this competency can compromise clinical decision-making and adherence to treatment, particularly among individuals with lower levels of education, income or technological literacy.

Various tools have been developed to measure this construct; among them, the eHealth Literacy Scale (eHEALS)[1] has established itself as the most widely used internationally, the scale assesses people's perceptions of their ability to seek and use health information online and has already been adapted and validated for the Brazilian context (eHEALS-Br)[2]. Despite the increasing digitalisation of health education, few studies have investigated the level of digital health literacy among undergraduate students in Brazil and the associated sociodemographic factors. This gap makes it difficult to align curriculum guidelines with teaching practice. This article therefore seeks to answer the question: "What is the level of eHealth literacy among undergraduate students in the health sector, and which sociodemographic factors influence this competency?"

METHOD

Type of study

A quantitative, observational, cross-sectional and descriptive-analytical study.

Purpose

To assess the level of digital health literacy among students on healthcare courses at a higher education institution in the state of Paraná, Brazil.

Study participants

The study involved 91 student volunteers from the Biomedicine, Nursing, Pharmacy, Medicine and Psychology programmes, all of whom were currently enrolled at a private university. The inclusion criteria were age 18 or over, active enrolment in any term of the courses mentioned, and access to the internet. There were no exclusions based on preconceived criteria.

Study Location

The study was conducted at a private higher education institution located in the state of Paraná, which does not formally offer compulsory courses in computer science or digital literacy as part of its curriculum. The data was collected online between November 2024 and April 2025 via an electronic questionnaire.

Regarding the 'scholarship' variable, it is worth noting that the institution offers a range of support options. In addition to the University for All Programme (ProUni)[3], the institution offers institutional scholarships based on academic merit, teaching assistantships, family ties, staff and faculty development, partnerships, talent development programmes and specific policies such as the Entrance Exam Scholarship, Experience Scholarship (for students over 50), the Transfer Scholarship and the Graduate Scholarship. Therefore, the group of scholarship recipients in the sample is not homogeneous, representing different mechanisms of social inclusion and academic support.

Research Tool

The main tool used in this study was the eHEALS, developed by Norman and Skinner[1] in 2006 with the aim of measuring individuals' perceptions of their ability to find, evaluate and apply health information available on the internet. The scale was developed based on the theoretical guidelines known as the Lily Model, which defines digital health literacy as a skill comprising six fundamental literacies: traditional, information, health, scientific, media and computational.

The eHEALS is a self-administered questionnaire consisting of eight items, as shown in Table 1, answered on a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"), with a total score ranging from 8 to 40 points. Higher scores indicate a greater perception of eHealth literacy.

Table 1. eHEALS-Br Questionnaire[2]

Item 1	I know what health-related content is available online.
Item 2	I know where to find useful health-related content online.
Item 3	I know how to find useful health-related content online.
Item 4	I know how to use the internet to find answers to my health-related questions.
Item 5	I know how to use the health information I find online to help myself.
Item 6	I am able to assess the health-related content I find online.
Item 7	I can tell the difference between reliable and dubious health-related content found online.
Item 8	I feel confident using information from the internet to make decisions about my health.

Source: Barros et al.[2]

The items assess skills relating to finding health information online, distinguishing between high-quality and low-quality information, applying that information to one's own health, and making decisions based on that information.

Although it measures subjective perceptions of Web 1.0 and does not directly test skills, eHEALS has proven to be a practical tool that is easy to apply and adaptable to different population contexts, as suggested by subsequent studies involving adults, the elderly, students and populations with chronic conditions[4], as well as being the most widely used questionnaire internationally, allowing for comparison across more than two dozen countries[5]. In Brazil, the scale was translated, adapted and validated by Maschio and Silva[6] in 2019 and by Barros et al.[2] in 2022, maintaining good internal consistency and a unifactorial structure. For this study, we opted for the version adapted and validated by Barros et al., published in a peer-reviewed scientific journal, as it provides more robust psychometric evidence and adheres methodologically to international guidelines for instrument validation.

It is worth noting that the previous version of the scale, translated and administered by Maschio and Silva[6], involved a slightly larger sample (n = 514). However, this is a final coursework, which has not been published in a scientific journal and is limited in its presentation of the stages of cross-cultural adaptation; it does not include essential methodological elements such as confirmatory factor analysis, content validity coefficient (CVC), or the use of a multidisciplinary expert panel – criteria required by good psychometric practice in accordance with COSMIN (Consensus-based Standards for the Selection of Health Measurement Instruments). The version validated by Barros et al., on the other hand, followed rigorous cross-cultural adaptation protocols, including translation, back-translation, review by a panel of 10 experts, assessment of the CVC (0.86), and administration to 431 participants, with exploratory and confirmatory factor analyses, verification of internal consistency (Cronbach's alpha = 0.90) and of convergent, concurrent and structural validity. These procedures lend greater reliability to this Brazilian version of the scale. Therefore, the choice of this version is based not only on its technical rigour and statistical robustness, but also on its recognised validity in scientific publications, which ensures greater reliability of the data produced in this study and comparability with the international literature.

In addition, a second structured questionnaire was administered to collect sociodemographic data, covering the following variables: degree programme and semester of study, age, gender, proficiency in a second language, receipt of a scholarship, and average daily time spent on the internet. These variables made it possible to examine potential associations with the scores obtained on the eHEALS, as recommended in international studies that link eHealth literacy to various sociodemographic factors.

Data analysis

Power analysis

The GPower[7] software was used and found that the sample of 91 individuals achieved a statistical power of 0.804, assuming an F-distribution for linear models with 7 predictor variables, with a Type I error of 0.05 and an average effect size of 0.15.

Univariate analysis, multivariate analysis and principal component analysis (PCA)

Univariate analyses were conducted to investigate the association between the total score on the instrument (dependent variable) and each of the study variables individually. With the aim of developing a more comprehensive explanatory model, multivariate analysis using multiple linear regression was conducted, initially including all the independent variables mentioned. It was therefore possible to assess the combined effect of the independent variables on the outcome. The normality of the data was assessed using the Shapiro-Wilk test. The non-significant variables were then eliminated through backwards stepwise progression, fitting the reduced models, in order to assess the statistical behaviour and the quality of the subsequent fits.

To explore the underlying patterns in the responses to the eight questions in the questionnaire, a principal component analysis (PCA) was performed, with the variables standardised, using the PCA function from the "FactoMineR" package. The suitability of the data matrix for factor analysis was assessed using the Kaiser-Meyer-Olkin (KMO) test, implemented using the "psych" package.

PCA was applied using two separate approaches: The first variable classified participants according to whether they spoke a second language ('Yes' or 'No'); the second variable classified participants according to whether they were scholarship recipients ('Yes' or 'No'). The individuals' scores on the first two principal dimensions (Dim1 and Dim2) were used for comparative analyses between the groups.

Visualisation and supplementary statistical tests

Biplots with confidence ellipses (95% confidence level) were generated using the fviz_pca_biplot function (from the "factoextra" package), showing the distribution of individuals according to the clusters. To assess differences in the factor loadings extracted from each group across the principal dimensions of the PCA, means and standard errors

were calculated (using the "Rmisc" package). Subsequently, comparisons between the groups were performed using Student's t-tests (two-tailed or one-tailed, depending on the hypothesis), following verification of normality (Shapiro-Wilk test) and homogeneity of variances (F-test). The graphical visualisations were created using the "ggplot2" package.

All analyses were performed using the R software[8] , with a significance level of 0.05 applied across all analyses.

Ethical Aspects

The research was approved by the Research Ethics Committee of Faculdade Pequeno Príncipe under approval number 7.204.171 on November 4 in 2024 (CAAE: 83103224.5.0000.5580), in accordance with the principles of the National Health Council, as set out in Resolution No. 466/2012[9]. Participants were informed about the aims and procedures of the study and only proceeded after signing the Informed Consent Form (ICF), which was provided in digital format. The data collected was anonymised and stored securely, in accordance with the provisions of the LGPD[10] (General Data Protection Law – Law No. 13.709/2018).

RESULTS

Characterisation of the sample

The sample consisted predominantly of female university students (83.5%) studying Medicine (54.9%) and Nursing (29.7%), with the majority in the early semesters of their degree programmes, as shown in Table 2.

Participants perceived internet use for accessing health information

The results show that participants reported high levels of perceived competence regarding the use of the internet for health-related purposes (mean = 32.66; SD = 4.54), as shown in Table 3, indicating a high perception particularly regarding the ability to use the internet to access and apply health information, with the exception of the dimension related to confidence in decision-making, where the lowest mean was observed.

Univariate analyses

None of the variables showed a statistically significant effect ($p < 0.05$), although two showed a trend towards significance:

- ***Undergraduate Course***: F(4.85)=1.26, p=0.294
- ***Semester of study***: F(1.88)=1.42, p=0.237
- ***Gender:*** F(1.88)=2.00, p=0.161
- ***Proficiency in a second language***: F(1.87)=2.89, p=0.093
- ***Scholarship recipient***: F(1.88)=2.82, p=0.097
- ***Age:*** F(1.88)=1.85, p=0.177
- ***Daily internet usage time***: F(1.86)=0.085, p=0.771

Multivariate model

Since the individual predictor variables showed no statistical significance, we decided to construct multivariate models to assess the combined effect of these sociodemographic variables.

The initial multiple linear regression model, which included all explanatory variables, failed to yield a significant fit: F(10.76)=1.01, p=0.443, with R^2=0.117.

Table 2. Descriptive statistics for characterisation of the sample.

Variables	Statistics
Age (mean ± SD)	22 ± 4
Undergraduate Course (n, %)	
Biomedicine	11 (12.1%)
Nursing	27 (29.7%)
Pharmacy	1 (1.1%)
Medicine	50 (54.9%)
Psychology	2 (2.2%)
Semester of study (n, %)	
1st	14 (15.4%)
2nd	3 (3.3%)
3rd	11 (12.1%)
4th	36 (39.6%)
5th	8 (8.8%)
6th	5 (5.5%)
7th	7 (7.7%)
8th	3 (3.3%)
9th	2 (2.2%)
10th	1 (1.1%)
12th	1 (1.1%)
Gender (n, %)	
Female	76 (83.5%)
Male	15 (16.5%)
Proficiency in a second language (n, %)	
No	26 (28.6%)
Yes	64 (70.3%)
missing data	1 (1.1%)
Scholarship recipient (n, %)	
No	49 (53.8%)
Yes	42 (46.2%)
Minutes spent on the internet per day	309 ± 189

Source: Research data.

Table 3. Descriptive statistics on the response categories for the questions in the eHEALS-Br questionnaire, based on data from 91 students on health-related courses.

Issues	Categories	n	%	Average + SD
I know what health-related content is available online.	Totally disagree	0	0	4.04 ± 0, 79
	I partly disagree	1	1.1	
	I'm not sure	23	25.3	
	I partly agree	38	41.8	
	Totally agree	29	31.9	
I know where to find useful health-related content online	Totally disagree	0	0	4.21 ± 0.75
	I partly disagree	0	0	
	I'm not sure	18	19.8	
	I partly agree	36	39.6	
	Totally agree	37	40.7	
I know how to find useful health-related content online	Totally disagree	0	0	4.27 ± 0.78
	I partly disagree	1	1.1	
	I'm not sure	15	16.7	
	I partly agree	33	36.7	
	Totally agree	41	45.6	
I know how to use the internet to find answers to my health-related questions.	Totally disagree	1	1.1	4.19 ± 0.84
	I partly disagree	1	1.1	
	I'm not sure	16	17.6	
	I partly agree	35	38.5	
	Totally agree	38	41.8	
I know how to use the health information I find online to help myself	Totally disagree	0	0	4.22 ± 0.70
	I partly disagree	1	1.1	
	I'm not sure	11	12.1	
	I partly agree	46	50.5	
	Totally agree	33	36.3	
I am able to assess the health-related content I find online.	Totally disagree	1	1.1	4.10 ± 0.90
	I partly disagree	3	3.3	
	I'm not sure	17	18.7	
	I partly agree	35	38.5	
	Totally agree	35	38.5	
I can tell the difference between reliable and dubious health-related content found online.	Totally disagree	0	0	4.10 ± 0.86
	I partly disagree	5	5.5	
	I'm not sure	14	15.4	
	I partly agree	39	42.9	
	Totally agree	33	36.3	
I feel confident using information from the internet to make decisions about my health.	Totally disagree	2	2.2	3.58 ± 0.99
	I partly disagree	10	11.0	
	I'm not sure	29	31.9	
	I partly agree	33	36.3	
	Totally agree	17	18.7	
Total				32 ± 4. 54

Source: Research data.

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Subsequent reduced models were tested by progressively excluding non-significant variables. The model that performed best was the one that retained only two variables: proficiency in a second language and receipt of a scholarship, showing a significant effect or trend for both:

- Proficiency in a second language: β=2.17, p=0.043
- Scholarship recipient: β=1.81, p=0.061

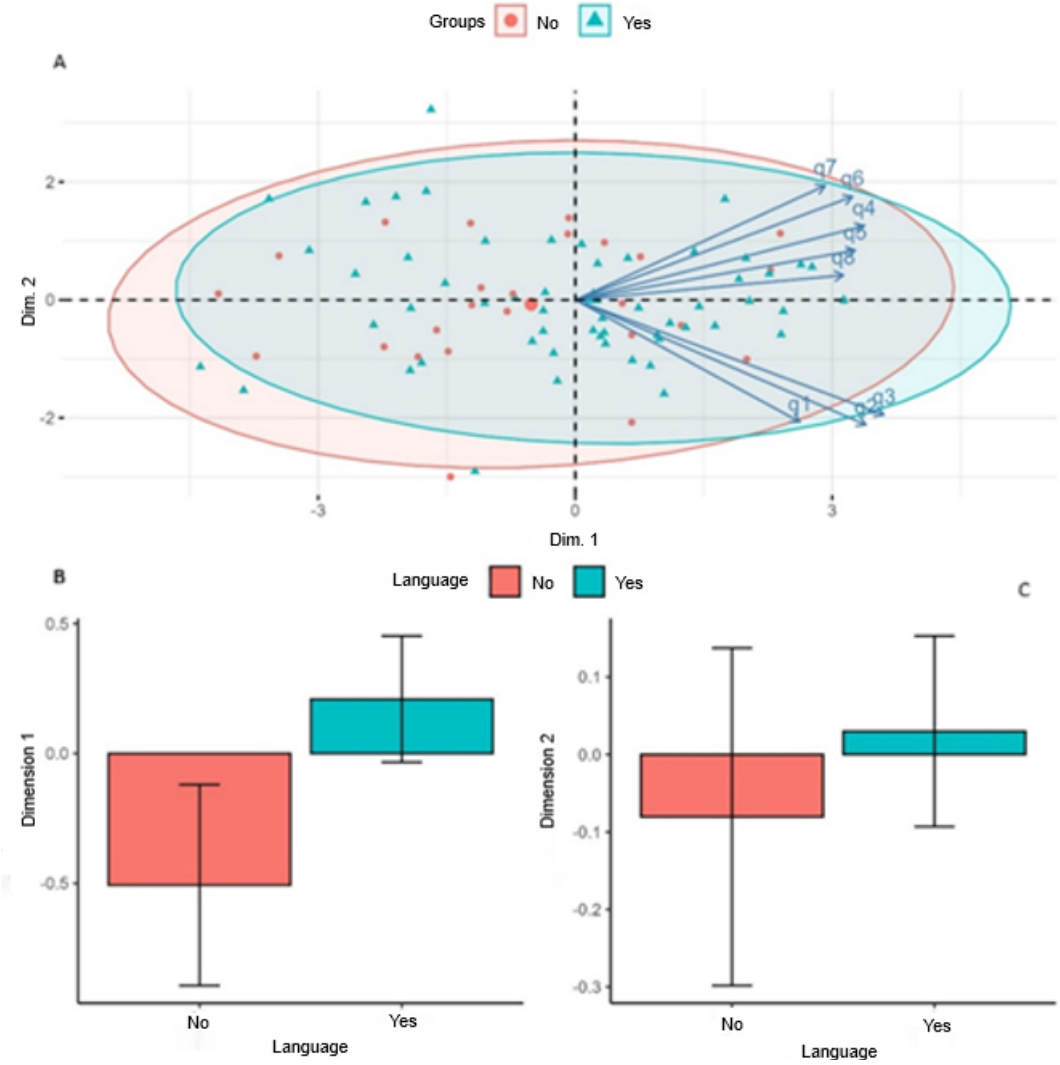
This final model yielded F(2.86)=3.28, p=0.042, with R^2=0.071, and a normal distribution of the residuals (p=0.153). Accordingly, these two predictive variables were then used to examine the association with the results of all the items in the questionnaire.

Principal component analysis (PCA)

PCA was carried out using the scores from eight questions relating to digital health literacy. The KMO index was adequate (MSA = 0.81), indicating that PCA was suitable for application (graphic 1A and graphic 2A). The first two dimensions accounted for the largest proportion of the total variance, consisting mainly of the following variables:

- ***Dimension 1*** (46.9%): the largest contribution came from q4, q5 and q8, relating to the use of the internet for health-related activities;
- ***Dimension 2*** (12.5%): the highest contribution comes from q2, q1, q3, q7 and q6, relating to the Recognition and Understanding of Digital Health Resources.

Graphic 1. Principal component analysis (PCA) of responses to questions on eHealth literacy, according to second-language proficiency.



Source: Prepared by the author.
(1-A) PCA biplot with 95% confidence ellipses, showing the distribution of participants across the first two principal dimensions (Dim.1 and Dim.2), coloured according to whether or not they speak a second language. The arrows indicate the contributions of the original variables (q1 to q8) to the composition of the axes. (1-B) Means and standard errors for Dimension 1, by group. There is a trend towards a difference between the groups (one-tailed t-test, p = 0.061).
(1-C) Means and standard errors for Dimension 2, with no significant difference between the groups (p = 0.323).

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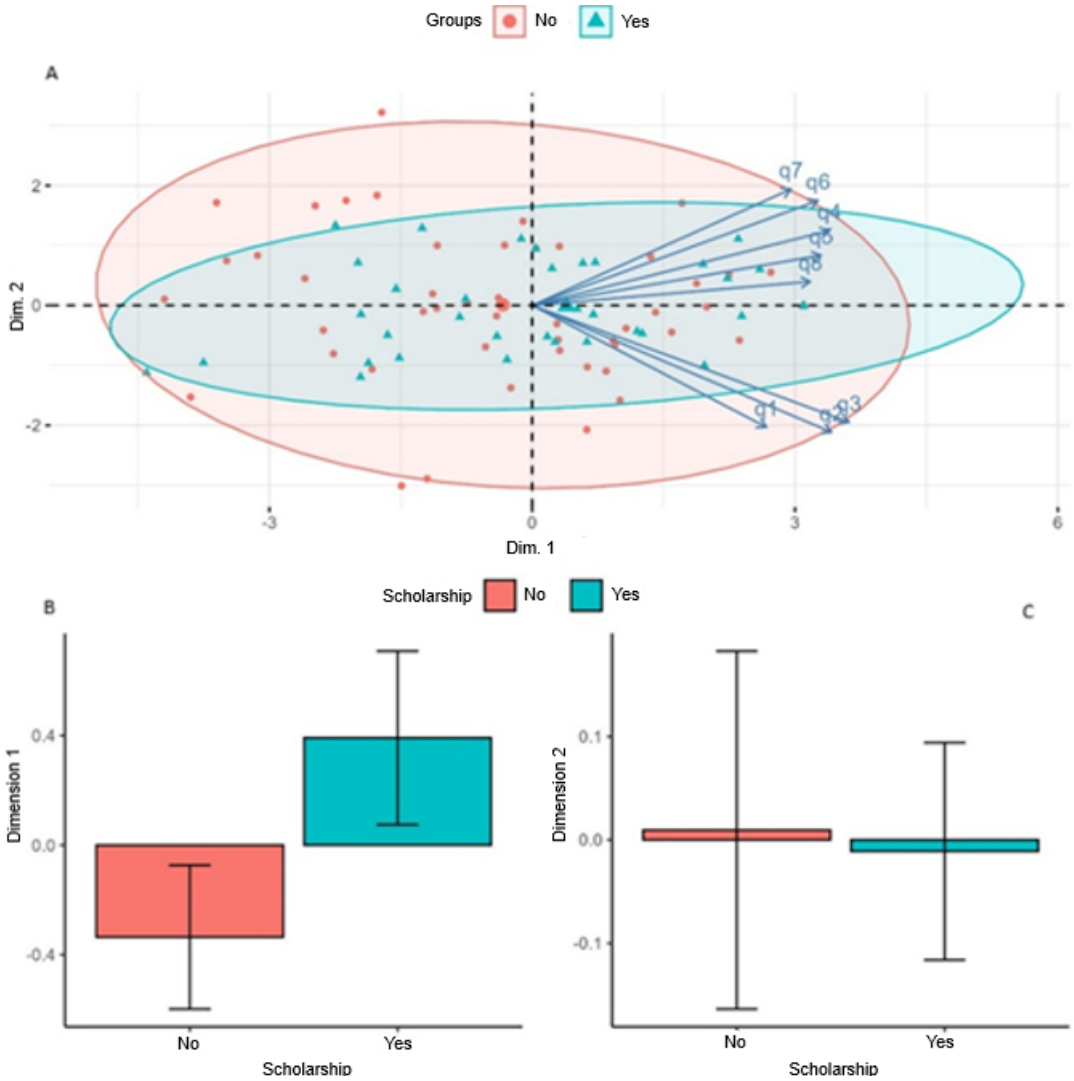
Graphic 2. Principal Component Analysis (PCA) of responses to questions on eHealth literacy, by scholarship recipient status.



Source: Prepared by the author.
(2-A) PCA biplot with 95% confidence ellipses, showing the distribution of individuals across the first two principal dimensions (Dim. 1 and Dim. 2), according to scholarship status. The arrows indicate the contributions of the original variables (q1 to q8) to the components. (2-B) Means and standard errors for Dimension 1 by group. Participants who received a scholarship scored significantly higher than those who did not (one-tailed t-test, p = 0.039). (2-C) Means and standard errors for Dimension 2 by group. No statistically significant difference was found between the groups (p = 0.540).

Comparison by second language domain

The data relating to the PCA factor loadings showed a partial separation between the "Yes" and "No" groups. The average score for Dimension 1 was higher in the group that reported proficiency in a second language ($\bar{X} \pm EP$ = 0.21 ± 0.24) compared to the group without a second language ($\bar{X} \pm EP$ = -0.51 ± 0.39), with a trend towards significance in the one-tailed t-test (t=−1.56, p=0.061). This result suggests that students who reported proficiency in a second language demonstrate higher levels of eHealth literacy than those who did not report such proficiency (graphic 1B). In Dimension 2, there was no statistically significant difference between the groups (p=0.323; graphic 1C).

Comparison by scholarship receipt

For Dimension 1, scholarship recipients had higher mean scores ($\bar{X} \pm EP = 0.39 \pm 0.32$) compared to non-recipients ($\bar{X} \pm EP$ = -0.34 ± 0.26), with statistical significance (t=−1.78, p=0.039). This finding suggests that students who reported receiving scholarships have higher levels of eHealth literacy than those who reported not receiving them (Figure 2B).

No significant differences were observed in Dimension 2 between the groups (p=0.540; graphic 2C).

DISCUSSION

Interpretative summary of the results

The results of this study show that the participating healthcare students generally had a high level of confidence in their ability to find, understand and apply health information

available on the internet. This pattern is consistent with other studies conducted in Brazil[11,12] and in countries such as Iran, Canada and Sweden[13-15], which have also shown high scores among health students, particularly about the recognition of and access to information sources.

However, an item-by-item analysis of the eHEALS-Br revealed a significant asymmetry: whilst items such as 'finding' and 'using' the content scored the highest means, item 8: "I feel confident using information from the internet to make decisions about my health" had the lowest average score. This discrepancy suggests that, although students appear familiar with navigating and consuming digital health content, there is uncertainty regarding the practical application and decision-making based on this content, which may be related to doubts about the reliability of sources, a lack of clinical validation, or a fear of liability. This trend is a recurring theme in the literature and reflects an often-overlooked aspect of eHealth literacy: the critical assessment of information quality[16,17].

Statistical analysis indicated that, taken individually, none of the sociodemographic variables showed a statistically significant association with the total eHEALS score. However, when considering the combined effect of multiple factors, the multiple linear regression model identified two significant predictors: proficiency in a second language and receipt of a scholarship. These findings were corroborated by Principal Component Analysis (PCA), in which both groups scored higher on Dimension 1, which included items relating to the use of the internet to find and apply health information. The difference was statistically significant for scholarship students ($p = 0.039$) and showed a trend towards second-language proficiency ($p = 0.061$).

The positive impact of proficiency in a second language is likely linked to greater access to relevant sources of information that are not available in Portuguese, such as databases, international journals, and educational content in video or text format, most of which is provided in English. Although there are as yet no international studies that directly compare eHealth literacy among bilingual groups, there is evidence from studies in the United States indicating that immigrants with limited English proficiency have significantly lower levels of eHealth literacy[18,19]. Thus, Archanjo, in revealing that bilingualism – a rare trait among the Brazilian population[20] – is associated with better eHealth literacy, this dissertation, as well as the curriculum guidelines for health courses[21-23] , reinforces the need for institutional strategies that combine digital literacy and language teaching, particularly English.

The positive correlation between receiving a scholarship and having greater eHealth literacy, however, deserves particular attention. At first glance, the result seems paradoxical, as Brazilian[2,12] and international[24,25] studies show that low income has a negative correlation with eHealth literacy. However, this finding can be understood in the following context: Approximately 25% of the students who enrolled at the institution in 2024 were recipients of the University for All Programme (ProUni)[3] 100%, according to data provided by the institution, demonstrating an active policy of social inclusion. This programme, established in 2005, awards scholarships to students who must meet income criteria and undergo a selection process based on academic merit, which entails greater commitment and responsibility. Free access to the university's physical and digital facilities – such as high-speed internet, a virtual library and educational platforms – can compensate for any limitations in technological resources at home, increasing exposure to digital health tools and encouraging more frequent use of the internet for problem-solving. Therefore, scholarship status, far from being a marker of disadvantage, appears in this context to serve as an indicator of engagement, academic resilience and positive institutional support.

It is important to note that the literature on the 'scholarship recipient' variable is still limited. None of the national surveys on eHealth literacy stratified their results according to this variable. As such, this study is one of the first to highlight student finance as a powerful driver of digital literacy.

International comparisons and the Brazilian context

This sample achieved an overall mean score of 32.66 ± 4.54 on the eHEALS-Br. Applying the national cut-off points for university students (low ≤ 24; moderate 25–32; high 33–40) proposed by Mialhe et al.[26], 52.7% of our participants fall into the 'high' category, 42.9% into the 'moderate' category and 4.4% into the 'low' category. Using the Swedish dichotomisation (limited ≤ 26; sufficient ≥ 27) by Wångdahl et al.[27], the proportion rises to 92.3% at the "sufficient" level and 7.7% at the "limited" level. This sample therefore ranks higher than most international studies and those previously described in Brazil that used a similar methodology, as shown in Table 4:

We therefore found that the students scored up to 7.5 points higher than other Brazilian adults and up to 3.6 points higher than comparable foreign populations, suggesting a favourable institutional ecosystem (unlimited internet access, virtual libraries, digital tutoring practices). However, an item-by-item analysis reveals weaknesses consistent with the international literature: a lower mean score on item 8 of the eHEALS questionnaire (3.58 ± 0.99), which represents the assessment and application of evidence, as identified by Park and Min[14] in Canadian students (mean of 3.5) and by Puspita et al.[30] among pharmacy students in Indonesia (mean of 3.7). This

Table 4. Comparisons with international and Brazilian studies.

Country	Year	Authors	eHEALS global mean	Sample
Brazil	2022	Macedo et al.[12]	31.6 ± 4.4	Undergraduate students in Medicine and Nursing
Brazil	2024	Barbosa et al.[28]	28.0	Teenagers from state schools
Brazil	2022	Mialhe et al.[11]	25.1	Adults in primary care
Canada	2020	Park et al[14]	31.1 ± 4.4	Pharmacy undergraduates
Spain	2018	Del Giudice et al.[29]	31.9 ± 5.9	Healthcare university students
Spain	2018	Del Giudice et al.[29]	26.7 ± 5.6	Students from other fields
Indonesia	2024	Puspita et al.[30]	32.4	Pharmacy undergraduates
Jordan	2016	Tubaishat and Habiballah[31]	29.0	Nursing undergraduates

Source: Prepared by the author.

confirms that the challenge today no longer lies in the practical aspects of information retrieval, but rather in filtering and applying that information – a shortcoming that persists even in technological environments and across healthcare courses, calling for curricula that emphasise scientific reasoning, source verification and digital ethics.

In the case of Brazil, it is noteworthy that this analysis must also take into account the country's vast size and the profound regional inequalities in digital infrastructure and access to healthcare services. Unlike other smaller countries with more uniform health systems, Brazil faces the challenge of integrating digital health strategies across a vast territory characterised by great geographical distances and a concentration of resources in urban centres. Against this backdrop, telemedicine and other digital tools are not merely complementary resources, but strategic tools for expanding the coverage of the SUS (Unified Health System) and reducing inequalities in access. Therefore, when making international comparisons, it is essential to recognise that Brazil's results reflect the complexity of a country of continental dimensions, which calls for specific and scalable solutions.

Educational implications

We have identified a need to rethink teaching practices in higher education in the health sector, particularly about the development of eHealth health. The existence of inequalities linked to factors such as income, academic background and proficiency in a foreign language points to gaps in students' training when it comes to meeting the demands of an increasingly digitalised clinical practice.

The National Curriculum Guidelines (DCNs) for Medicine from 2014[22] and Nursing from 2018[21] already recognised the importance of incorporating technologies into the teaching. However, the 2025 update to the Medicine DCNs[23] further reinforces this approach, stipulating that courses must include, structurally, content on digital health, artificial intelligence and data security, in line with the needs of a clinical practice increasingly mediated by technology. However, studies such as that by Pantaleão et al.[32] show that the majority of students still do not feel prepared to use digital tools in clinical practice. They have underscored the urgent need to structurally incorporate topics such as the search for and critical evaluation of online evidence, ethics in digital information, infodemics, data security and the use of artificial intelligence in health.

Recent evidence shows that structured interventions, such as face-to-face workshops, online courses and supervised practical activities, are effective in improving eHealth literacy scores. A meta-analysis of 11 experimental studies[33] identified average increases of 5.8 points on the eHEALS scale following the interventions, with more lasting gains when the strategies included theoretical exposure, practical activities and individualised feedback. These findings highlight the educational value of integrated, evidence-based approaches.

Promising educational strategies therefore involve the creation of specific courses or cross-disciplinary modules on digital skills, the incorporation of problem-based learning using international databases (such as PubMed and UpToDate), and the provision of practical English language activities focused on the critical reading of scientific articles. These strategies can reduce inequalities and increase autonomy. Furthermore, self-assessment tools such as eHEALS can provide ongoing support for diagnosis and educational planning.

Thus, integrating digital health education in a systematic and critical manner can not only strengthen students' technical skills, but also foster the development of professionals who are more confident, ethical and capable of guiding their patients in the safe and critical use of digital tools.

Implications for public policy and digital equity

Digital literacy in health has been gaining prominence in international strategies, such as the World Health Organisation's

Global Strategy on Digital Health 2020–2025 from the World Health Organisation[34], which aims to empower individuals to access and use digital information safely and independently. However, the findings of this dissertation confirm that there are factors that still limit the effective use of digital technologies, even among health students.

A key finding was the positive association between receiving a scholarship and higher eHealth literacy scores, suggesting that policies promoting access to higher education may act as a protective factor against digital inequalities. This finding reinforces the idea that digital equity depends not only on technical access to the internet, but also on structural measures that promote the meaningful use of health information.

Accordingly, public policies should provide for the inclusion of digital skills in the curriculum at all levels of education, as well as expanding access to devices, high-quality connectivity, and reliable and accessible digital content. Programmes such as PROUNI and social and racial quotas, when combined with digital literacy initiatives, can broaden the information literacy of students in vulnerable situations.

It is recommended that eHealth literacy indicators be incorporated into educational and health monitoring systems, thereby enabling the identification of inequalities and guiding targeted interventions. The digital transformation of healthcare could therefore be guided by principles of social justice, ensuring that technological innovation reduces, rather than exacerbates, existing inequalities[28,35,36].

In the Brazilian context, investment in digital skills within undergraduate health programmes can also have a direct impact on the quality of services provided by the SUS, improving the effectiveness of primary care, enhancing telehealth programmes and strengthening health education initiatives, in other words, educational policies that promote eHealth literacy translate into policies that strengthen the SUS.

Strengths and limitations of the study

One of its key strengths is the use of an internationally validated instrument (eHEALS-Br), which has already been adapted to the Brazilian context; this ensures methodological rigour and allows for comparisons with studies conducted both in Brazil and abroad. Furthermore, the research was conducted using a sample of students from various courses in the field of health, thereby providing a broader perspective on the situation.

Multivariate analysis enabled us to explore associations between eHealth literacy and sociodemographic variables, revealing significant patterns of information inequality. The proposal to use specific cut-off points also broadens the applicability of the results by allowing for a more objective interpretation.

On the other hand, some limitations should be considered. The main concern relates to the cross-sectional nature of the study and the fact that the tool is based on self-perception, which may lead to an overestimation of digital skills. The variable relating to bilingualism was also self-reported, with no proficiency tests or identification of the predominant language.

Another important limitation relates to the composition of the sample, which was drawn from a single institution; although students from different health-related degree programmes were included, there was low representation from the Pharmacy and Psychology courses, preventing specific inferences about these groups and hindering generalisation to other institutions or regions.

Furthermore, although eHEALS is widely used, it may not fully capture the latest developments in the digital health environment, such as interaction on social media, the use of mobile apps and artificial intelligence in health.

Outlook and recommendations for future research

Future studies should prioritise longitudinal designs, mixed-methods approaches and more diverse samples, with greater regional and socio-cultural representativeness. It is also important to explore alternatives to eHEALS and to evaluate educational interventions aimed at developing eHealth literacy at undergraduate level.

FINAL CONSIDERATIONS

This study used the eHEALS-Br tool to assess the eHealth literacy of health students. The results showed a generally high perception of competence, particularly about searching for and evaluating information online, but less confidence in applying this information to decision-making. Furthermore, proficiency in a second language and receiving a scholarship were found to be factors associated with better outcomes. Despite the limitations of the cross-sectional design, the single-institution sample and the use of self-reported data, the findings underscore the need to strengthen eHealth literacy at undergraduate level.

CONTRIBUTION OF THE AUTHORS

Luan Carlos Alves contributed to: conceptualisation, data curation, formal analysis, methodology, investigation, and writing (original draft, review and editing).

Roberto Zonato Esteves contributed to: conceptualisation, methodology, project administration, supervision and validation.

Edson Roberto Arpini Miguel and José Diniz Júnior contributed to: conceptualisation, methodology, writing (review and editing).

CONFLICT OF INTEREST

We declare no conflict of interest.

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STATEMENT OF DATA AVAILABILITY

Research data is available in the body of the document.

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