

Assessment of Digital Health Literacy among University Students: Influence of Course Type and Online Health Information Seeking

ABSTRACT

Background and Objectives: E-health literacy involves the ability to search for, find, estimate and evaluate information about health and/or health services. Online sources of health information are now a privileged way of accessing information, especially among students. The aim of this study was to assess the level of e-health literacy in a sample of Portuguese university students; and to relate the level of e-health literacy with sociodemographic characteristics; analyze differences between health and non-health students and with the use of online health information.

Materials and Methods: An observational cross-sectional study was conducted on Portuguese university students. All students completed a questionnaire consisting of social-demographic characteristics, and sources of health online information used. The digital health literacy score was assessed by the eHEALS scale validated for the Portuguese population. Descriptive and inferential analysis was applied, as well as multivariate regression models.

Results: In this study, 534 university students participated; the median age was 21.0. The level of e-health literacy was 28.8 (5.6). Health-sciences students had higher digital health literacy scores than students from other fields. Most students considered the internet to be useful and very useful in making health decisions. Students' use of health online information sources such as official health websites (OR= 2.6; CI 95%= 1.5; 4.3) and professional health websites (OR= 2.3; CI95%= 1.4; 3.8) increased their likelihood of having a sufficient level of e-health literacy. While the use of information sources such as social networks (OR= 0.5; 95%CI: 0.3; 0.9) decreases the likelihood of having a sufficient level of e-health literacy.

Conclusion: Health students showed higher levels of health literacy, demonstrating the importance of including health education in the curricula of other areas. As a practical implication, there is a need to include health education, health campaigns, and the promotion of healthy lifestyles in curricula in order to increase health literacy in university.

Paper Type: Research Article

Keywords: literacy, health; digital health literacy; students, university.

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Introduction

Health literacy is currently very important in promoting people's health, and it is a research topic that has seen important developments in recent years. Studies show that low levels of health literacy are associated with negative impacts on the health and well-being of populations (1–3).

With the use of information technologies to improve health and health services, the concepts of e-health and e-literacy in health (e-LH) have emerged. Health e-literacy requires the ability to search, find, estimate and evaluate, integrate and apply the gains obtained from the electronic environment to solve health problems (4). Internet use, including opportunities, internet access, gender and age influence individuals' level of health literacy (5, 6).

The concept of e-literacy in health was introduced by Norman and Skinner (2006) to express the ability to search for health information using electronic sources and to apply this information to solve a health problem. In the model proposed by the authors when designing the e-health scale (7), e-HL is constituted of six skills: 1) traditional literacy; 2) information literacy; 3) scientific literacy; 4) media literacy; 5) computer literacy; and 6) health literacy.

Previous studies have shown the importance and relevance of research into health literacy and its relationship with health promotion and quality of care. The international European Health Literacy Survey (HLS-EU), in which several European countries participated, provided a concerted understanding of people's ability to access, understand, analyze and use health information in the areas of healthcare use,

health promotion and disease prevention (8). The HLS-EU found that 12% of participants had an insufficient level of health literacy and 47% had limited health literacy (insufficient or problematic). These European results and those of other studies show the importance of developing educational programs and health policies that promote health literacy.

Health literacy, defined as the ability to obtain, process, and understand basic health information necessary to make appropriate health decisions, is particularly relevant in the university context. University students represent a unique population group: they have privileged access to educational and technological resources, and they often face significant difficulties in effectively using these tools for health-related issues (9, 10). Although they are a group that is somewhat privileged in terms of access to information, they have difficulties in its practical use; they are in a transitional phase, with changes in their lifestyle, academic pressures, and access to different sources of health information (4,9).

In light of these challenges, there is a need to develop and validate specific assessment tools that can capture the various domains of health literacy in this population.

In the Portuguese context, there are still few studies on health literacy in university students. A study carried out on Portuguese university students showed that 53.9% of the students had a sufficient level of overall literacy, but in all the domains of the literacy questionnaire most students had a sufficient or problematic level of health literacy (11). The university students are considered one of the most vulnerable populations to adopt risk behaviours, because entering university is a

phase of life marked by several changes (12). In Portugal, there are few studies on health literacy and digital health literacy and their determinants in university students, hence the need to develop studies that explore differences in access and use of health literacy resources.

The present study aimed to assess the level of digital health literacy in a sample of Portuguese university students, relate it to sociodemographic characteristics, and analyse differences between health-sciences and non-health sciences students.

Material and Methods

A quantitative cross-sectional study was carried out on a sample of university students, attending the University Católica Portuguesa, a private university. The Catholic University of Portugal is a reference institution in Portugal, with high level research and strongly connected to society. It has four Campi (Lisbon, Porto, Braga and Viseu) and offers 35 undergraduate degrees, 66 masters' degrees, and 25 doctoral degrees programs.

The students were attending the university and data collection occurred from October 2022 to February 2023. The inclusion criteria for the study participation was: being a student in an undergraduate or graduate program at the university; being over 18 years of age; understanding the Portuguese language.

All eligible students were invited to participate in the survey, through the institutional email system. The questionnaire took approximately 10–20 min to complete.

A non-probabilistic convenience sample was used. The sample size was calculated considering the number of values needed to

carry out factor analysis. Since the eHEALS scale is made up of 10 variables, the minimum size was set at 15 times the number of items, so a total of (15*10 items) 150 students would be needed.

The questionnaire used consisted of three parts: questions of a sociodemographic nature (such as gender, age, academic year, course attended, daily internet use, income); the e-literacy health scale (eHEALS), and questions about the use of online health information. For the proposed analyses, the courses were grouped into health area courses (medicine, dental medicine, nursing, nutrition, and biomedical science and psychology courses) and non-health area courses (economy, financial sciences, law and humanities courses).

E- Health Literacy Scale assessment

The e-health literacy in the university students were access by the scale e-Health Literacy Scale – eHEALS (13) the eHEALS has already been validated for the Portuguese population by Tomás et al. (2014) in a sample of Portuguese adolescents (13). This scale assesses an individual's combined knowledge, comfort, and perceived skill in finding, evaluating, and applying their knowledge to improve health issue (7). The eHEALS consists of 8 Likert-type items, with five options, ranging from “totally disagree” to “totally agree” (scores from 1 to 5). Items 1 to 5 assess perceived knowledge, items 6–7 assess skills, and item 8 assesses confidence in finding health information from electronic sources and applying it to the management of health problems. Items 1 and 2 are not part of the scale but complement the information. The scale ranges from 0 to 40. Higher values indicate a better level of digital health

literacy. For the eHEALS scale, we also calculated the total average score and the frequency of each item in the sample. Previous psychometric testing of eHEALS indicates that it is a valid and reliable instrument (Tomás et al., 2014). We carried out an internal consistency analysis in our study for the eHEALS scale. The Cronbach's alpha was 0.90, indicating a very good internal consistency.

Sources of online health information

In order to assess the sources of health online information used by the students; students were asked how often they had used them in recent months, namely: official websites (Directorate-General for Health, World Health Organization, Ministry of Health), professional health websites (e.g. website of the Order of Physicians), social networks (Facebook, Instagram), general search sites (e.g. Google, Yahoo), Wikipedia and other online encyclopedias, and websites and blogs. The response options were collected on a Likert-type scale with the following options: never, rarely, sometimes and often. For the analysis purpose, the response options were merged into two categories: "never and rarely" and "sometimes and many times".

Ethics

The study protocol was evaluated and approved by the Ethics Committee of University (number 107; approved in May 2022). In this research, we followed the principles of the Declaration of Helsinki and the Oviedo Convention on the protection of human rights in biomedical research.

Statistical analysis

Descriptive analysis was carried out to describe the characteristics of the sample.

Quantitative variables were described by mean or median (according to whether their distribution is normal or not), and standard deviation; qualitative variables were described by absolute frequency (n) and relative frequency (%).

The association between categorical variables was assessed using the chi-square test. Student's t-test for independent groups was used to compare means between two independent groups; the homogeneity of variances was analyzed using Levene's test.

Health literacy scores were categorized into three levels: inadequate, problematic, and sufficient, based on previous studies. For inferential analysis, health literacy was recoded into two categories, low (inadequate + problematic) and sufficient.

To identify the factors associated with a sufficient level of e-health literacy, a binary logistic model was made (with the dependent variable sufficient vs insufficient level of e-health literacy). Multivariate analysis considered adjustments for age, sex, and academic level. The results are presented in odds ratio (OR) and respective 95% confidence interval.

All tests were performed for a 5% significance level. The data was analyzed using the software Statistical Package for the Social Sciences (SPSS, version 28.0, IBM, and Chicago, IL, USA).

Results

In this study, 534 university students participate, the majority were female (77.1%); the mean age was 24.0, (Table 1). Around 47.0% of the students were from health courses and 53.0% from non-health courses. About the day-to-day use of the Internet by students in their search for

information, 15.0% use it an average of two hours a day and 84.1% said they use the Internet more than two hours a day. Regarding the students' economic position, 83.7% said that it allowed them to live comfortably and only 13.7 per cent said that it was difficult to live on that income.

The sociodemographic characteristics of health sciences and non-health sciences students (n = 534) displayed some differences (Table 1). The mean age was similar (23.8 years) in both groups. The mean score of

digital health literacy score was higher in health courses than in non-health-related courses (30.3 vs 27.6). In both areas of study, the percentage of female students was higher. Students in health-sciences courses had a higher percentage of sufficient e-health literacy (80.1%) than students in non-health-sciences (66.1%). No significant differences were observed between household income and the number of hours spent on the internet between the two groups.

Table 1. Descriptive characteristics of the sample of university students (n = 534)

Parameter	All sample		Health sciences		Non health sciences		p
	N	%	N	%	N	%	
Age (mean, SD)	24,0 (7.3)		23,8 (7.0)		24,2 (7.5)		0.575
e-health score (mean; SD)	28.8 (5.6)		30.3 (5.4)		27.6 (5.4)		0,001
E-health literacy							
Inadequate	45	8.4%	14	5,6%	31	11,0%	0,001
Problematic	101	18.9%	36	14,3%	65	23,0%	
Sufficient	388	72.7%	201	80,1%	187	66,1%	
Sex							
Men	122	22.9%	46	18,4%	76	27,0%	0,019
Woman	410	77.1%	204	81,6%	206	73,0%	
Year attended							
1º year	101	18.9%	33	13,1%	68	24,0%	
2º year	125	23.4%	83	33,1%	42	14,8%	
3º year	88	16.5%	49	19,5%	39	13,8%	0,001
4º year	44	8.2%	17	6,8%	27	9,5%	
Master	133	24.9%	49	19,5%	84	29,7%	
PhD	43	8.1%	20	8,0%	23	8,1%	
Nº of hours use the internet/day							
Less than 1 your	5	0.9%	2	0,8%	3	1,1%	
1 - 2 hours/day	80	15.0%	42	16,7%	38	13,4%	0,545
> 2 hours/day	449	84.1%	207	82,5%	242	85,5%	
Income							
The current income allows us to live comfortably	447	83.7%	204	81,3%	243	85,9%	
It is difficult to live on current income	73	13.7%	42	16,7%	31	11,0%	0,116
Cannot judge/would rather not answer	14	2.6%	5	2,0%	9	3,2%	

For the eHEALS scale, the mean values of the items ranged from 3.1 to 3.8 in our study (table 2); the item “I can distinguish between high quality and low-quality Internet health resources” had the highest average score in the study and the item “I feel confident using information from the Internet to make health decisions” had the lowest average. More than fifty percent of the students sample believes that the Internet is important in making health decisions and that Internet health resources are important or very important.

In addition to the academic field, Table 3 shows the distribution of health literacy levels across age, year of study, sex, and health

information seeking in the university students. The association between e-health literacy levels and gender was not significant, although the percentage of students with sufficient health literacy was higher among females than males (77.0% vs.23.0%). The year attended at university, age group and income were not associated with the level of e-health literacy among students. On the other hand, the search for health information online in official media (e.g. General Directorate of Health; World Health Organization) and in health professional websites was higher among students with a higher level of e-health literacy (<0.001).

Table 2. The e-health literacy scores in university students – scale eHEALS

Parameter	Totally useless	Useless	Not sure	Useful	Very useful	
1. How useful is the internet in helping you make decisions about your health?	2.2%	9.0%	17.6%	56.9%	14.2%	
	Nothing important	Not important	Not sure	Important	Very important	
2. How important do you consider it to have access to health resources available on the Internet?	0.6%	2.4%	6.7%	51.7%	38.6%	
	Strongly disagree	Disagree	I am not sure	Agree	Strongly agree	Mean
3. I know what health resources are available on the Internet.	1.5%	9.4%	30.7%	49.1%	9.4%	3.55
4. I know where to find useful health pages on the Internet.	1.7%	9.6%	17.8%	56.6%	14.4%	3.72
5. I know how to find useful health resources on the internet.	1.9%	8.8%	18.4%	56.4%	14.6%	3.73
6. I know how to use the internet to answer my health questions.	2.2%	8.8%	22.7%	52.4%	13.9%	3.67
7. I know how to use the health information I find on the internet to help me.	1.7%	6.9%	21.7%	55.8%	13.9%	3.73
8. I can evaluate the health resources I find on the Internet.	2.1%	11.0%	23.2%	51.9%	11.8%	3.60

Parameter	Totally useless	Useless	Not sure	Useful	Very useful	Parameter
9. I can distinguish between high quality and low-quality health resources on the Internet.	2.1%	7.9%	21.2%	49.1%	19.9%	3.77
10. I feel confident using information from the internet to make health decisions.	8.2%	23.8%	30.1%	29.8%	8.1%	3.06

Table 3. E-health literacy score by students' characteristics and sources of health online information

Parameter	Inadequate E-health literacy		Problematic E-health literacy		Sufficient E-health literacy		p
	N	%	N	%	N	%	
Sex							
Male	9	20,0	24	24,0	89	23,0	0,867
Female	36	80,0	76	76,0	298	77,0	
Year attended							
1 ^o year	15	33,3	24	23,8	62	16,0	
2 ^o year	9	20,0	28	27,7	88	22,7	
3 ^o year	9	20,0	12	11,9	67	17,3	0,106
4 ^o year	3	6,7	7	6,9	34	8,8	
Master	7	15,6	25	24,8	101	26,0	
PhD	2	4,4	5	5,0	36	9,3	
Age group							
< 25 years	37	82.2	83	83.8	272	71,2	0.065
26 - 40 years	6	13.3	9	9.1	74	19,4	
more than 40	2	4.4	7	7.1	36	9,4	
Income							
The current income allows us to live comfortably	36	80.0	86	85.1	325	83,8	0.718
It is difficult to live on current income	8	17.8	11	10.9	54	13,9	
Cannot judge	1	2.2	4	4.0	9	2,3	
Official media							
Never/rarely	10	25.6	11	11.6	9	2,5	< 0.001
Sometimes/many times	29	74.4	84	88.4	357	97,5	
Health professional websites							
Never/rarely	20	51.3	33	34.7	53	14,5	< 0.001
Sometimes/many times	19	48.7	62	65.3	313	85,5	
Social networks							
Never/rarely	26	66.7	39	41.1	172	47,0	0.025
Sometimes/many times	13	33.3	56	58.9	194	53,0	
Search engines (e.g Google, Yahoo)							
Never/rarely	29	74.4	49	51.6	154	42,1	
Sometimes/many times	10	25.6	46	48.4	212	57,9	<0.001

Figure 1, shows e-Health literacy scores according to field of study. Health-sciences students had significantly higher literacy scores than students in other fields (80.1% vs. 66.1%). Non-health sciences students had higher scores in the insufficient literacy category than students for health courses.

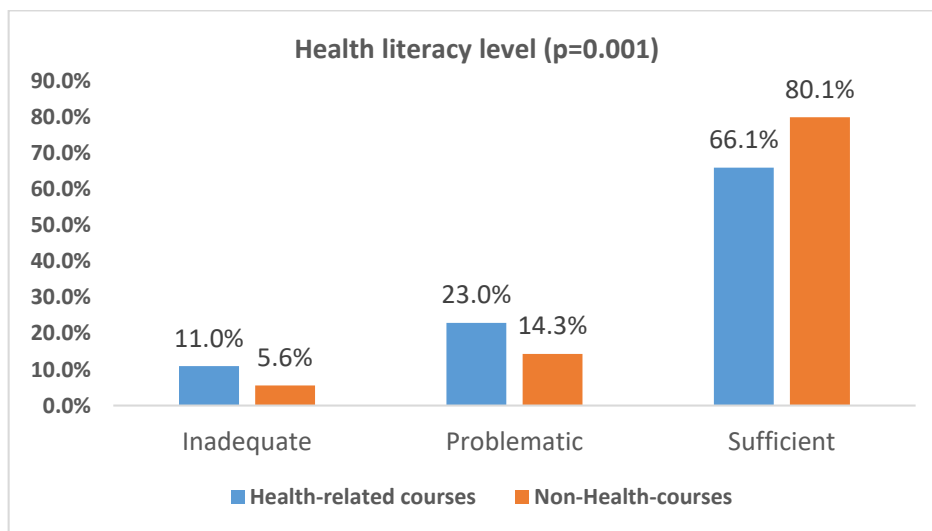


Figure 1. E-health literacy scores according to field of study

Online health information sources

Regarding the use of online health information by the students in our study, the official media (e.g. General Directorate of Health; World Health Organization; Ministry of Health) were the most frequently used source of information by the students (35.8%)

(Figure 2). Health professional websites were used by students often (56.8%) and 22.0% many times. Wikipedia/other online encyclopedias and social networks were the sources of health information least used by the university students in the study.

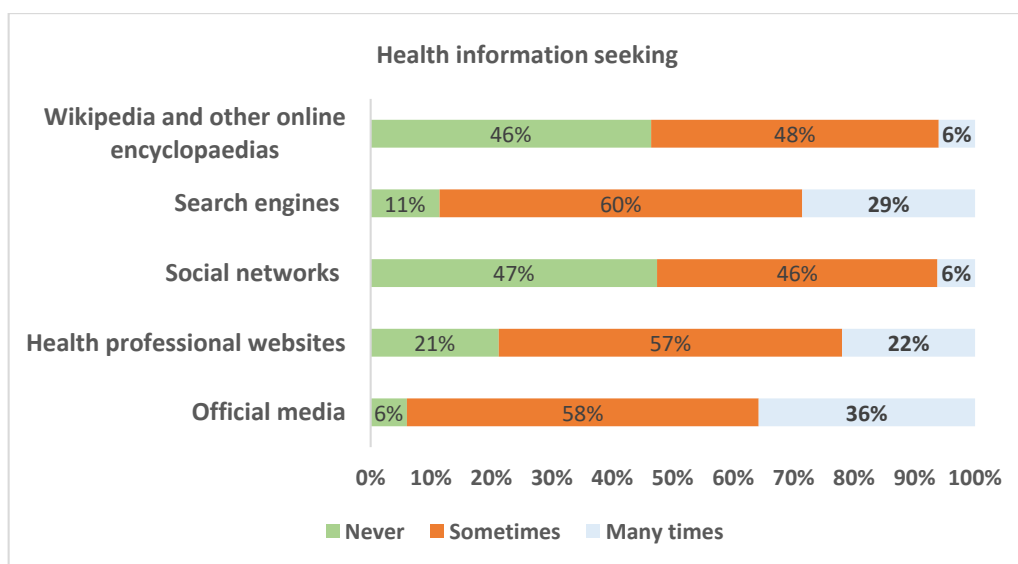


Figure 2. Sources of health information seeking by the university students

Regarding the online health information sources used by students when searching for online health information (Figure 3), we observed that official media and professional health sources were related to the type of courses (health vs. non-health) taken by

students. Thus, health students used official sources and health professional websites more frequently than non-health students. The use of social networks, general search engines, and websites was not significantly associated with the type of course.

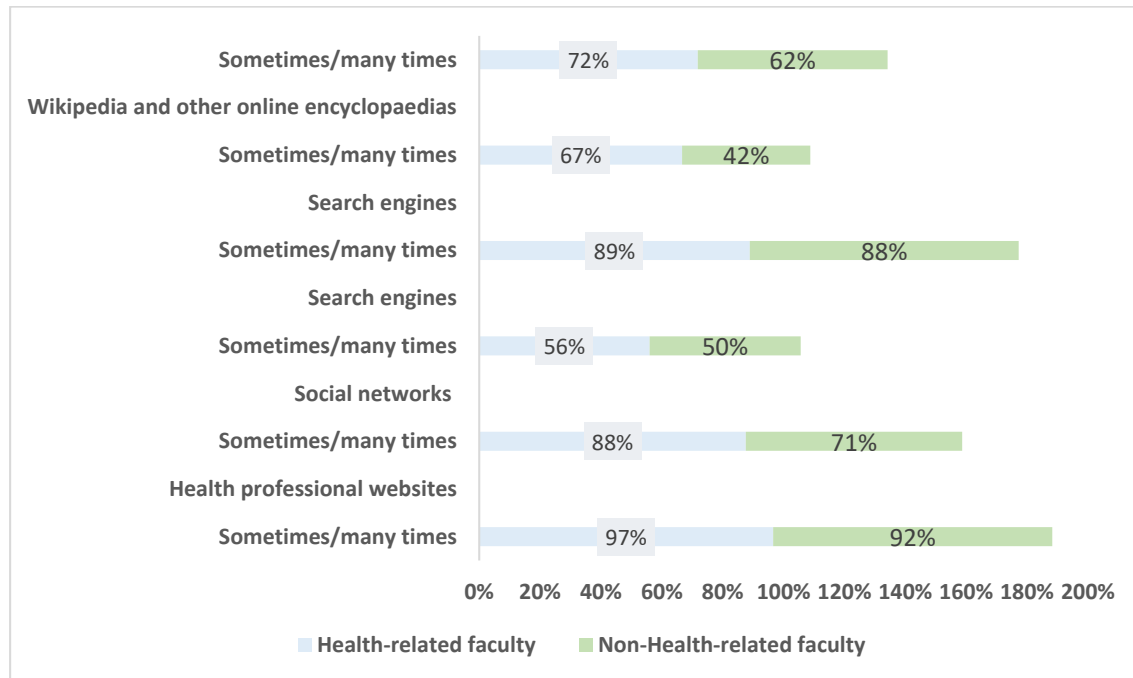


Figure 3. Sources of health information seeking by type of course – health sciences and non-health sciences courses.

Factors associated with e-health literacy level

In table 4, shows the results of the logistic regression model of factors associated with sufficient e-health literacy in university students. The multivariate logistic regression model showed that being a health-area student (OR= 1.8; 95%CI: 1.1; 2.9), using official sources of online health information (OR=2.6; 95%CI: 1.5; 4.3) and professional health websites (OR = 2.6; 95%CI: 1.5; 4.3) were significantly associated with the likelihood of having a sufficient level of e-health literacy. Students who used social

networks for online health information were 0.5 times less likely to have sufficient HL than those who did not use this source of information.

Discussion

Health literacy and health promotion influence people's health behaviors. Knowing the level of health literacy and digital health literacy in university populations is essential to improving health outcomes, since as future professionals they will be, will have a major impact on society.

The results of our study showed that university students consider the Internet to

be an important resource for health information, accounted for the highest scores in e-HEALS; but that they do not feel confident in the information they access for

health decision-making in internet which had the lowest score on the scale of e-health literacy.

Table 4. Multivariate logistic regression model of factors associated with sufficient level of e-health literacy

Parameter		OR	95% CI	p
Age		1.02	0.98; 1.06	0.310
Sex	Men	1		
	Woman	0.76	0.44; 1.30	0.315
Academic Level	1 - 4 th year	1		
	Post-graduate courses	1.24	0.70; 2.18	0.459
Health vs. non-health area	Non-health area	1		
	Health area	1.83	1.13; 2.97	0.015
Official media	Never/rarely	1		
	Sometimes/many times	2.55	1.51; 4.30	< 0.001
Health professional websites	Never/rarely	1		
	Sometimes/many times	2.30	1.41; 3.76	0.001
Social networks	Never/rarely	1		
	Sometimes/many times	0.54	0.32; 0.91	0.021
Search engines	Never/rarely	1		
	Sometimes/many times	1.70	1.00; 2.90	0.050
Wikipedia and other online encyclopaedias	Never/rarely	1		
	Sometimes/many times	1.04	0.57; 1.89	0.901
Sites, blogs	Never/rarely	1		
	Sometimes/many times	1.08	0.66; 1.78	0.746

OR – odds ratio; CI – confidence interval.

These results are in line with previous international studies, showing that student's confidence in searching for health resources on the Internet, does not equate to an ability to analyze the quality of information found or the search for credible information sources (4, 14, 15).

As the internet continues to be a very important source of access information, it is necessary to develop strategies and curricula that increase health literacy skills in this population group (4, 16–18). The results showed that health students have a better level of health literacy than non-health

students, in line with the results from previous studies (19–22).

This can be explained by the fact that these students already have health-related content in their curricula and conduct scientific research in the field of health, also they have greater exposure to health-related content. Health literacy is very important for disease prevention and improving habits and lifestyles, especially in this population that is at the beginning of adulthood. This highlights the need to integrate health education into the curricula of other areas. Specific health interventions are also recommended for

other non-health areas in order to increase their literacy.

The most preferred sources used by the students for online health information were official sites, professional sites and general search engines. Students who more frequently used official sources and professional websites to search for health information also had higher health literacy scores. These results were also observed in studies in other countries (2, 23).

Studies carried out during the COVID epidemic showed that official sources and professional websites, followed by generalist sources, were the online information sources most used by students when looking for information related to health issues (2, 16, 24).

The present study showed that students who searched more frequently on official institution websites and professional health sites were more likely to achieve a sufficient level of e-health literacy.

On the other hand, students who used social media often were less likely to have sufficient health literacy. Previous studies showed that the ability to determine the personal relevance of health information was positively associated with searching the websites of public bodies more often (24, 25). This indicates that searching on websites of official sources and health portals, besides the likelihood of achieving sufficient literacy skills, also leads to an advantage in relation to the more complex competences of appraising and applying information.

Study Limitations and Strengths: This study has some limitations. Firstly, it is a cross-sectional study, so we cannot establish causality between the variables; the second

limitation is that it does not allow the results to be generalized to the university population. Although, university students are considered highly educated, which limits the translation of these results to the general population. Despite these limitations, our study provides valuable insights about health literacy in university students in Portugal. We suggest conducting additional studies: with larger samples, with students from different universities, to access their e-health/digital health literacy skills.

This study also has important strengths. It is one of the few studies on digital literacy in Portuguese students exploring the differences between students from different courses; the authors used a validated instrument of health literacy; however, more studies in this population, with use of different instruments, and a focus on other dimensions of health literacy and health promotion are suggested.

Conclusion

In conclusion, the results of this study show that university students have a moderate level of health literacy, and the type of course influences the level of literacy.

Our results confirm that exposure to health-related content influences the level of health literacy among university students, particularly in terms of access and use of information.

This study supports the need for academia to include information on health literacy in its curricula, especially in non-health-related courses, which have the least exposure to this topic in their curricula.

To increase health literacy in students, it is essential to develop interventions that include health promotion (e.g. healthy

lifestyles) and disease prevention; and for university institutions to develop curricula that include health literacy and health promotion as a competence for their students.

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Consent for publication: Not applicable

Ethics Approval and Consent to Participate: This study was conducted in accordance with the Declaration of Helsinki; this study was approved by Ethical Committee of Universidade Católica Portuguesa (number 207; CES; May 2022).

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Authors' Contributions: SA and EP conceptualized and designed the study. SA collected the data, performed the analysis, interpreted the findings, and drafted the manuscript. All authors approved the final version for submission.

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