

ORIGINAL ARTICLE

Exploring e-health literacy among students of sports vs. medical students

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Summary

Introduction/Aim: Data about electronic health (eHealth) literacy and potential differences in eHealth literacy between university students are lacking. The aim of this study was to evaluate eHealth literacy in students of sports and medicine and to assess the factors associated with better eHealth literacy.

Material and Methods: This cross-sectional study was carried out from April to October 2017 among final year students of the Faculty of Sports and Physical Education and the Faculty of Medicine, University of Belgrade, Serbia. A total of 89 sports students and 301 medical students were included. The eHealth Literacy Scale (eHEALS) was used to evaluate eHealth literacy.

Results: Compared with sports students, medical students had higher median eHEALS score (27 vs. 30, respectively, $p=0.008$). Medical students were twice as confident as sports students in their efforts to locate helpful online health resources and use online health information. A significant hierarchical linear regression model was not obtained in the sample of sports students regarding predictors of better eHealth literacy. In the sample of medical students, the following was associated with better self-perceived eHealth literacy: being female, residing outside of the capital before becoming a student, younger age at the time of the first Internet use, the use of health-related websites and smartphone apps as well as lower influence of online health-related information on decision making regarding health.

Conclusion: Medical students were more confident in perceiving their eHealth literacy skills compared to sports students. The factors associated with better eHealth literacy may depend on the fields of study.

Keywords: eHealth, literacy, medicine, sports, students.

INTRODUCTION

Over the past years, the online health (eHealth) literacy has become increasingly relevant to successfully navigating health-related content on the Internet (1). Since various online platforms are continuously being developed, health-related information is readily available to the users with Internet access (2). As such, online health information may have a strong influence on their consumers. However, not all online health-related content is reliable. In fact, to navigate through online content, consumers need to have optimal eHealth literacy skills. The eHealth literacy entails uncovering, comprehension and evaluation of online health in order to make knowledgeable decisions regarding health (3). This skill is particularly important for people who are studying or working in the health care realm.

A previous study suggested that factors such as being a medical major in college and being more concerned about health were strongly associated with being eHealth literate (4), which is not surprising, because a greater knowledge level enables people to make conscious health-related decisions. Similar findings were reported by Hsu et al. in Taiwan (5), where better individual health status and greater concern for health were major predictors of better eHealth literacy and positive health-related behavior. Health issues such as balanced nutrition, exercise, safe sexual practice and immunization have been reported as the core health topics of interest in the college population (6).

Although the levels of eHealth literacy among undergraduate students differ across cultures (7, 8) and fields of study (4), there is a gap in understanding potential differences in eHealth literacy among students who study health science using diverse perspectives, such as medicine and sports science. It is expected that both medical students and students of sports have the highest level of eHealth literacy in the University student population, because they will be the future leaders in health promotion. We hypothesized that students of sports and medicine do not differ in terms of eHealth literacy. The aim of this study was to evaluate eHealth literacy in students of sports and medical students and to assess the factors associated with better eHealth literacy.

METHODS

A cross-sectional study was carried out at the Faculty of Sports and Physical Education and the Faculty of Medicine, University of Belgrade. The study was conducted from April to October 2017. Students from the final year of their undergraduate studies (i.e. the 4th year at the Faculty of Sports and the 6th year at the Faculty of Medicine) were recruited.

The selection of a convenience sample of students from both faculties was performed in the following way: at the Faculty of Sports, students were divided into five groups, with each group having a compulsory classroom

seminar once a week. Three out of five groups, with approximately 30 students, were randomly selected and invited to fill in the questionnaire. At the Faculty of Medicine, students were divided into five groups all five days of the week. Three classes were randomly selected each day, with approximately 20 students per class. The questionnaire was filled in at the beginning of those classes. All the students who were offered to fill in the questionnaire agreed to participate in the study, however, two students returned invalid questionnaires (response rate 99.3%). The approval for conducting the study was obtained from the Institutional Review Board of the Faculty of Medicine, University of Belgrade. The consent for participation was implied by filling in the questionnaire.

Instrument

A short anonymous questionnaire was administered to collect data. The first part of the questionnaire covered socio-demographic characteristics of the participants (gender, age, parental marital status, parental highest educational attainment, household monthly income, residence prior to entering University, grade point average-GPA, age at the time of the first use of internet).

In the next section, students were asked whether they used the Internet and how frequently as well as whether they used health-related websites (about fitness, diet etc) and smartphone apps (calorie counting, exercise and performance etc). Additionally, students were asked about the extent to which health-related information online influenced their decision-making regarding health (graded from “a little” to “a lot”).

The e-health literacy was assessed by the eHEALS questionnaire (9). The eHEALS has 8 items that rank the level of confidence at finding, assessing, and using online health information in order to make informed health-related decisions (9). Answers are graded on a 5-point Likert scale from grade 1 (strong disagreement) to grade 5 (strong agreement). The total eHEALS score represents the sum of the scores for each item. This means that the total eHEALS score ranges from 8 to 40. A higher score represents a higher level of perceived eHealth literacy. The eHEALS was previously translated and validated in the Serbian language (10). The internal consistency of the Serbian version of eHEALS was 0.849 (10).

Data analysis

To assess differences between the categorical variables Pearson's Chi-square test (for variables with 2 categories such as gender, high school program) and Chi square linear-by-linear association (for variables with 3 or 4 categories, such as parental marital status, parental education level, household monthly income, frequency of internet use, extent to which online health-related information influences decision making). After determining that the dis-

tribution of eHEALS scores by means of the Kolmogorov Smirnov test was not normal, we applied non-parametric Mann-Whitney test to assess differences in scores between the two groups of students. The Spearman's test was used to investigate correlations between the selected variables.

To examine the effect measure for each eHEALS item relative to the type of Faculty, we performed the univariate logistic regression. In this model, we used the type of Faculty (sports vs. medicine) as the dependent variable. The independent variables were the perceptions of each eHEALS item categorized as positive (marked 4-agree or 5-strongly agree on Likert scale) or other (marked 1-strongly disagree, 2-disagree and 3-undecisive on Likert scale).

To determine the factors associated with a higher level of eHealth literacy, we performed the hierarchical multi-

ple linear regression analysis. This analysis was performed separately for the subgroup of sport students and the subgroup of medical students, because it was found that the total eHEALS score significantly differed between the two groups of students. The independent variables were classified according to three models. The first model included basic demographic characteristics: gender, age and GPA. The second model included additional socio-demographic variables such as: household monthly income and residence before entering University. Finally, the third model took into account the patterns of Internet use: age at the time of the first internet use, the use of health-related websites and apps and the extent to which online health-related information influenced students' decision-making regarding health.

Table 1. Characteristics of the study sample according to the use of health-related websites (N=390)

Variable	Type of Faculty		p
	Sports N=89 Count (%)	Medicine N=301 Count (%)	
Gender			
Male	60 (67.4)	101 (33.6)	0.001
Female	29 (32.6)	200 (66.4)	
Age (years)*	22.9 (1.1)	24.1 (0.9)	0.018
Grade point average*	8.4 (0.5)	8.9 (0.7)	0.003
Household monthly income (Euros)			
< 405	32 (36.0)	68 (23.1)	0.002
405-810	36 (40.4)	110 (37.4)	
>810	21 (23.6)	116 (39.5)	
Missing answers	0 (0.0)	7 (2.3)	
Residence prior to studies			
Capital city	36 (40.4)	125 (41.5)	0.856
Outside of the capital	53 (59.6)	176 (58.5)	
Use of internet			
Yes	89 (100.0)	301 (100.0)	n/a
No	0 (0.0)	0 (0.0)	
Age at the time of the first internet use in years*	13.7 (2.4)	12.8 (3.0)	0.100
Frequency of internet use			0.327
Rarely	0 (0.0)	3 (1.0)	
Once a week	0 (0.0)	1 (0.3)	
Multiple times per week	2 (2.2)	8 (2.7)	
Multiple times per day	87 (97.8)	289 (96.0)	
Use of health-related websites			
Yes	71 (79.8)	234 (77.7)	0.771
No	18 (20.2)	67 (22.3)	
Use of health-related apps			
Yes	35 (39.3)	148 (49.2)	0.116
No	54 (60.7)	153 (50.8)	
Extent to which online health-related information influences decision making			
Not at all	7 (7.9)	28 (9.3)	
A little	20 (22.5)	94 (31.1)	
Partially	53 (59.6)	140 (46.4)	0.001
A lot	8 (9.0)	9 (3.0)	
Quite a lot	1 (1.1)	4 (1.3)	
Missing answers	0	27 (9.0)	

Legend: *Mean value with corresponding standard deviation in brackets; Grade point average range 6.0-10.0; Bold values denote statistically significant variables.

Overall, there were few missing answers. The missing answers were excluded from the analyses. Probability level of $p < 0.05$ was considered statistically significant. Statistical analysis was performed in Statistical Package for Social Sciences 20.0 (SPSS Inc, Chicago, IL, USA).

RESULTS

The study sample consisted of 390 University students: 89 from the Faculty of Sport and Physical Education and 301 from the Faculty of Medicine. Demographic characteristics as well as the patterns of digital behavior are presented in **Table 1**. Students differed in terms of demographic characteristics, but not in terms of the Internet use and digital behavior.

Median eHEALS score was 27 for sports students and 30 for medical students out of a maximum of 40 points (Mann Whitney 10906.00, $p = 0.008$). Students' positive perception of their eHealth literacy is presented as proportions in **Table 2**. Also, Table 2 describes the measure of differences in eHEALS scores. Compared to sports students, medical students scored significantly higher in the majority of eHEALS items. When it comes to sports students, none of the investigated variables was correlated with the total eHEALS score. In the subgroup of medical students, eHEALS score was positively correlated with the use of health-related smartphone apps ($\rho = 0.154$, $p = 0.007$). A higher eHEALS score correlated with younger age at the time of the first Internet use ($\rho = -0.168$, $p = 0.004$).

In the subgroup of sports students, the hierarchical multiple linear models showed that none of the investigated variables in the three models was associated with better eHealth literacy (**Table 3**).

In the subgroup of medical students, the hierarchical multiple linear model no. 3 showed that being female, residing outside the capital before studying at the University, younger age at the time of the first Internet use, the use of health-related websites and smartphone apps as well as lower influence of online health-related information on decision making regarding health were associated with better self-perceived eHealth literacy (**Table 4**).

DISCUSSION

In this study we sought to examine eHealth literacy among students of sports and medical students. Given our initial hypothesis, the study findings indicate that perceived eHealth literacy differs between the students of sports and medical students. Thus, our hypothesis has been refuted. While a number of studies explored eHealth literacy in general undergraduate college populations (4, 11, 12), some studies were focused on more specific groups such as nursing students (7, 13-15) or students of health professions (8, 16, 17). Nevertheless, to date, sports students have not been included in the eHealth literacy assessment.

We found that medical students had higher levels of overall self-perceived eHealth literacy compared to

Table 2. Percentage of students who either agreed or strongly agreed with eHEALS items over total number of respondents according to type of Faculty

eHEALS items	Faculty		OR (95%CI)	p
	Sports	Medicine		
	N_p/N_{tot} (%)	N_p/N_{tot} (%)		
#1 I know what health resources are available on the Internet	17/89 (19.1)	61/301 (20.3)	1.08 (0.59-1.97)	0.799
#2 I know where to find helpful health resources on the Internet	47/89 (52.8)	210/301 (70.0)	2.08 (1.28-3.38)	0.003
#3 I know how to use the health information I find on the Internet to help me	53/89 (59.6)	225/301 (75.3)	2.06 (1.25-3.40)	0.004
#4 I know how to find helpful health resources on the Internet	56/89 (62.9)	223/301 (74.6)	1.73 (1.05-2.86)	0.033
#5 I have the skills I need to evaluate the health resources I find on the Internet	50/89 (56.2)	202/301 (67.6)	1.62 (1.01-2.63)	0.049
#6 I know how to use the Internet to answer my questions about health	50/89 (56.2)	213/301 (71.0)	1.91 (1.17-3.11)	0.009
#7 I can tell high quality health resources from low quality health resources on the Internet	58/89 (65.2)	227/301 (75.7)	1.66 (0.99-2.77)	0.051
#8 I feel confident in using information from the Internet to make health decisions	40/89 (44.9)	142/301 (47.3)	1.10 (0.68-1.77)	0.692

Legend: N_p - number of students who expressed agreement or strong agreement with a given item; N_{tot} - total number of respondents; OR - odds ratio; CI - confidence interval; Bold values denote statistically significant variables

Table 3. The hierarchical regression model with variables associated with a higher eHEALS score among sports students

Variable	Model 1			Model 2			Model 3		
	B	95% CI	p	B	95% CI	p	B	95% CI	p
Gender	1.10	-1.65, 3.86	0.427	0.820	-2.02, 3.66	0.568	0.742	-2.43, 3.92	0.643
Age	0.37	-0.82, 1.55	0.261	0.430	-76, 1.62	0.475	0.391	-0.88, 1.66	0.541
Grade point average	-0.48	-2.86, 1.90	0.691	-0.742	-3.18, 1.69	0.546	-0.862	-3.45, 1.72	0.508
Household monthly income				0.965	-0.78, 2.71	0.275	0.978	-0.87, 2.82	0.294
Residence prior to University				-0.308	-2.99, 2.38	0.820	-0.284	-3.11, 2.54	0.842
Age at the time of the first internet use							-0.126	-0.70, 0.45	0.664
Frequency of internet use							0.566	-3.89, 5.02	0.801
Use of health-related websites							0.852	-2.66, 4.36	0.630
Use of health-related apps							-0.034	-2.97, 2.90	0.982
Extent to which online health-related information influences decision making							-0.296	-2.09, 1.50	0.744
R²		0.018			0.035			0.420	
Probability level of F for change in R²		0.687			0.506			0.991	

Legend: B - unstandardized coefficient; CI - confidence interval; p - probability level

sports students. In terms of specific items, the largest difference (more than two-fold) was observed for confidence in locating helpful online health resources and using online health information to help them with various queries. Contrary to this, both sports and medical students were least confident with regards to being familiar with possible online health resources as well as regarding the use of online information to make health decisions. Pokharel et al. (8) reported a similar low confidence level among medical and dentistry students in relation with the influence of online health information on individual decision-making. However, this study reported a high level of confidence in knowing the available online resources of health information (8). One study that included female college students in health sciences suggested that students could have basic, intermediate or proficient level of eHealth literacy (16). The differences

in the levels of eHealth literacy were based on the use of several sources of health information vs. the use of the Internet browsers only (16). Additionally, students who were labeled as proficient in eHealth literacy sought support from other people, such as librarians, whereas intermediate and basic eHealth literate students relied on the independent searches (16). Based on the results of this study, both sports and medical students could benefit from guidance and the instruction as to what available and reliable online health information sources are and how to implement health information to make conscious health decisions. Previous attempts to improve eHealth skills among college students have included stronger appreciation of digital technologies (18).

The hierarchical linear regression showed a significant model only in the subgroup of medical students and this was not the case with sports students. This finding

Table 4. The hierarchical regression model of variables associated with a higher eHEALS score among medical students

Variable	Model 1			Model 2			Model 3		
	B	95% CI	p	B	95% CI	p	B	95% CI	p
Gender	-1.42	-3.08, 0.23	0.090	-1.63	-3.29, 0.02	0.053	-2.08	-3.67, -0.49	0.010
Age	-0.47	-1.40, 0.45	0.312	-0.42	-1.34, 0.50	0.366	-0.09	-0.98, 0.81	0.850
Grade point average	-0.58	-1.79, 0.63	0.344	-0.29	-1.53, 0.94	0.639	-0.44	-1.63, 0.75	0.469
Household monthly income				0.42	-0.62, 1.45	0.426	-0.29	-1.33, 0.74	0.579
Residence prior to University				1.95	0.27, 3.62	0.023	1.98	0.38, 3.58	0.015
Age at the time of the first internet use							-0.52	-0.81, 0.23	0.001
Frequency of internet use							-0.41	-2.18, 1.37	0.651
Use of health-related websites							2.97	1.01, 4.93	0.003
Use of health-related apps							1.684	0.17, 3.19	0.029
Extent to which online health-related information influences decision making							-1.208	-2.17, 0.25	0.014
R²		0.019			0.039			0.150	
Probability level of F for change in R²		0.172			0.073			0.001	

Legend: B - unstandardized coefficient; CI - confidence interval; p - probability level; Bold values denote statistically significant variables

suggests that there may be other factors beyond socio-demographic characteristics and digital consumer behaviors that were not taken into account, which needs to be acknowledged as a study limitation. On the other hand, this analysis showed a wide spectrum of factors associated with a higher level of eHealth literacy among medical students, outlined only in the final, full model that included both socio-demographic variables and patterns of online behavior.

Of socio-demographic variables, being female and residing outside of the capital were associated with a higher level of eHealth literacy. Female gender has been consistently associated with better eHealth literacy across age-specific populations (9, 19), thus, our results support the previous literature data. This gender pattern can be linked to the gender gap in the use of health services (20). Specifically, women tend to use more primary and specialized care compared to men, except hospitalization (20). Similar issue likely applies to the use of digital technologies. Moreover, it is possible that this gender gap also stems from observations that women are more likely to seek health advice compared to men (21). Following gender, medical students who lived outside of the capital were more likely to have better eHealth literacy. Residence could be considered as proxy of students' current living arrangement, suggesting that these students live independently (either in student dormitories or in rented apartments) away from their immediate family, as they moved to the capital to study. Thus, it is reasonable to assume that such students need to rely more on their own capacity to support their health and well-being compared to their peers who continue living with their parents over the course of undergraduate schooling.

When it comes to digital behavior characteristics, younger age when starting to use the Internet and more frequent use of Internet were associated with better eHealth literacy of medical students. These results could be explained by the fact that people who have used the Internet for a longer time and more frequently tend to be more digitally versatile and resourceful when browsing the online health-related content. Moreover, medical students who used health-related websites and smartphone apps had a higher likelihood of having better eHealth literacy. This finding is well expected, given that exploration of digital health-related information enables users to be savvier on whether specific sources are credible and reliable. In fact, it has been noticed that the use of apps promotes a healthier lifestyle (such as an increased intake of fruits and vegetables) and motivates weight loss and engagement in physical activity (22). While the use of health-related websites and apps holds promising results in terms of health promotion, most students believe that these media outlets cannot substitute for conventional face-to-face consultations with a health care provider (23). Finally, a lower influence of online health-related information on medical students' decision making was

also a predictor of better health literacy in our hierarchical linear regression model. This finding was also expected in the subgroup of medical students, as they are seemingly critical towards the online health information and supportive of evidence-based data. It is possible that, on these occasions, students tend to refer to other sources (16) to make sure their health-related decisions are appropriate.

Several limitations of our study need to be recognized. The size of our sample of sports students is somewhat small compared to the sample of medical students. This, however, reflects the size of student population in the respective Faculties, as there are more medical than sports students. Also, the study sample comprised students from one University that is located in the capital and represents the largest urban area in Serbia. Perhaps a more diverse sample of students from other Universities would potentially offer a different insight in eHealth literacy. We have not included the aspects of health behavior such as a balanced diet (number of fruit and vegetable portions per day) and regularity of having breakfast or the level of physical activity that could have differed between sports students and medical students. The inclusion of these factors could have potentially outlined statistically significant variables in the hierarchical linear regression model in the subgroup of sports students. Additionally, because of the cross-sectional study design, we could not make definite inferences between the examined socio-demographic variables and the outcomes of interest.

To conclude, medical students report being more confident in terms of their eHealth literacy skills compared to sports students. However, both groups of students report overall low confidence in knowing the available and reliable health-related sources on the Internet. Both socio-demographic features and digital behavior patterns influence eHealth literacy, but they are not consistent in the two groups of students and seem to depend on their field of study. Both sports and medical students would likely benefit from the enhancement of eHealth literacy skills in the undergraduate curricula. In the assessment of predictors contributing to better eHealth literacy, future studies should include a broad range of behavioral characteristics.

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Conflict of interest

The authors declare that they do not have conflict of interest.

Author contributions

TG contributed to study design, data collection, data analysis and interpretation and drafted the manuscript. JC, MC, RZ and AP contributed to study design, data collection, data analysis and interpretation and provided critical review of the intellectual content of the manuscript. AG contributed to study design, data analysis and interpretation and provided critical review of the intel-

lectual content of the manuscript. All authors approved the final version of the manuscript before submission.

Ethical approval

Ethical approval for the study was obtained from the Institutional Review Board of the Institute of Epidemiology, Faculty of Medicine, University of Belgrade.

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ISPITIVANJE ELEKTRONSKE ZDRAVSTVENE PISMENOSTI MEDJU STUDENTIMA SPORTA I STUDENTIMA MEDICINE

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Sažetak

Uvod/cilj: Podaci o elektronskoj zdravstvenoj pismenosti (EZP) i mogućim razlikama u EZP među studentima nisu dovoljno poznati. Cilj ovog istraživanja bio je da se analizira EZP kod studenata sporta i medicine i procene prediktori bolje EZP.

Materijal i metode: Ova studija preseka je sprovedena od aprila do oktobra 2017. godine među studentima završnih godina Fakulteta sporta i fizičkog vaspitanja i Medicinskog fakulteta Univerziteta u Beogradu, Srbija. Uključeno je ukupno 89 studenata sporta i 301 student medicine. Studenti su popunjavali skalu za procenu elektronske zdravstvene pismenost - eHEALS.

Rezultati: U poređenju sa studentima sporta, studenti medicine su imali značajno viši skor na eHEALS-u (27 prema 30, redom $p=0,008$). Studenti medicine su bili dva

puta sigurniji od studenata sporta u tome gde da pro-
nađu korisne onlajn izvore informacija o zdravlju i kako
da koriste onlajn zdravstvene informacije. Nije dobijen
značajan hijerarhijski model linearne regresije za predik-
tore bolje EZP među studentima sporta. Kod studenata
medicine zabeleženo je da su osobe ženskog pola, život
van glavnog grada pre studija, mlađi uzrast pri prvom
korišćenju interneta, korišćenje veb-sajtova u vezi sa
zdravljem i aplikacija za pametne telefone, kao i slabiji
uticaj onlajn informacija o zdravlju na donošenju odluka
o zdravlju bili povezani sa boljom ocenom EZP.

Zaključak: Studenti medicine su bili sigurniji u svoju
EZP u poređenju sa studentima sporta. Moguće je da
faktori koji utiču na bolju EZP zavise od vrste studija.

Ključne reči: elektronska zdravstvena pismenosti, studenti, medicina, sport, fizičko vaspitanje.

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