

ORIGINAL ARTICLE



Factors associated with the use of health websites and apps among students in medicine and sports

✉ Tatjana Gazibara¹, Milica Cakić¹, Jelena Cakić¹, Redžeb Zejnelagić², Aleksandra Popović³, Anita Grgurević¹

¹University of Belgrade, Faculty of Medicine, Institute of Epidemiology, Belgrade, Serbia

²Community Health Center “Nikšić”, Nikšić, Montenegro

³University of Belgrade, Faculty of Sport and Physical Education, Belgrade, Serbia

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✉ Correspondence to:

Tatjana Gazibara

Institute of Epidemiology

26A Visegradska Street

11000 Belgrade, Serbia

Email: tatjanagazibara@yahoo.com;

tatjana.gazibara@med.bg.ac.rs

Summary

Introduction/Aim: The global digital network allows a fast exchange of information. Students of sports and medicine will be the future promoters of healthy behaviors. The study aim was to examine the use of health-related websites and apps among students of sports and medicine in their final undergraduate study year.

Method: This cross-sectional study was conducted at the Faculty of Sports and Physical Education and the Faculty of Medicine, University of Belgrade, Serbia, in the period April-October 2017. A total of 390 students (89 in sports and 301 in medicine) were recruited. Data were collected using an anonymous questionnaire.

Results: Students did not differ in terms of frequency of use of health-related websites (79.8% sport vs. 77.7% medicine; $\chi^2=0.167$, $p=0.771$) and apps (39.3% sport vs. 49.2% medicine; $\chi^2=2.672$, $p=0.116$). Fitness and diet were the most common topics that all students sought. A stronger influence of online health information on students' health-related decision-making was associated with the use of health-related websites in both groups of students. Additionally, medical students who used the Internet more often were also more likely to read health-related websites. In terms of apps, being female and using the Internet from a younger age was associated with the use of health apps among sports and medical students, respectively.

Conclusion: Students of sports and medicine equally used health-related websites and smartphone apps. However, health-related websites were much more used compared to health-related apps. Of all health-related topics, they were most interested in fitness and diet.

Keywords: health, internet, apps, students, sports, medicine

INTRODUCTION

The global digital network allows access to virtually infinite amount of data that are readily available and affordable. This enables fast communication and exchange of information. As a result, health-related information is not any more limited to the conventional sources of information (such as medical books and health care workers), but can be accessible to anyone with the Internet access.

Young adults, including university students, account for the majority of Internet users (1). While some university students have chronic diseases and need specific care (2), most university students are in good health. Empirical data suggest that college students prefer online help rather than physical consultation with a health care professional when they manage their health issues, such as emotional distress (3), as there are numerous websites, health forums and blogs offering helpful information (4). The same holds true for smartphone apps, that can be a useful tool in the efforts to promote healthy lifestyles (5-7).

Although some studies suggested that users of health-related apps were more likely younger people, who are overall in good health and have a higher level of education and higher income (8), few studies explored differences in the field of study and the likelihood of using online health information. For example, a study including French university students suggested that those individuals who study literature/social sciences and life/health sciences read health-related websites and have health-related apps more often than students in technology or law and economy (9). While more frequent use of health-related websites and apps among students of health sciences is obvious and expected, there has been no comparison of use of health-related websites and apps between students who study different aspects of health, such as students of sports and students of medicine.

Theoretical considerations

Several theoretical frameworks and models are applicable to the context of the effective health information communication to optimize health status. These include Social Cognitive Theory, Theory of Reasoned Action/Theory of Planned Behavior, Transtheoretical Model of Change and Health Belief Model. These models take into account individual, relational, communal and societal factors.

The Social Cognitive Theory is based on three essential elements: behavior, intrinsic (personal) factors and extrinsic (outside, environmental) events (10). It highlights that having knowledge (i.e. attention, retention and reproduction) does not necessarily lead to a change in behavior. In fact, it needs to include the intrinsic motivation for change as well as the confidence in one's skills to accomplish that change. In the context of health education, delivery of accurate information is the baseline upon which individuals should further develop their skills through practice that has to be self-driven.

The Theory of Planned Behavior (11), which stems from the Theory of Reasoned Action (12), is related to the notion that behaviors cannot be changed unless there is an intention to change them. However, the intention to change is influenced by individual norms (i.e. acceptance of specific behavior as a preventive strategy), attitudes toward that specific behavior (i.e. how this behavior influences the process of achieving desired outcomes) and behavioral control (i.e. not practicing certain behaviors to reduce the exposure to risk factors). These factors combined lead to the desired behavior through the behavioral intention.

The Transtheoretical Model of Change i.e. Stages of Change Model (13) consists of several sequences, pertaining to both cognitive and emotional mechanisms that are necessary to push behavioral changes forward and keep the new behaviors consistent. These sequences include pre-contemplation (e.g. having an idea what behaviors may be desirable), contemplation (e.g. having the intention to engage in certain behavior), preparation (e.g. allocating time, effort and resources), action (e.g. engaging in certain behavior) and maintenance (e.g. adoption and consistency in behavior in future). This model assumes that the action involves building skills to successfully negotiate health risks and benefits.

The Health Belief Model (14) is based on individual perception of severity of the problem, susceptibility to this issue, perceived benefits and perceived barriers. Through this model, it is possible to define factors which encourage young people to engage in health-promoting behaviors.

Because of the importance and value of years spent in good health, students of sports and medicine will be future promoters of healthy behaviors. We hypothesized that students do not differ in terms of use of health-related websites and apps. The aim of this study was to examine the use of health-related websites and apps, and assess factors associated with its use among students of sports and medicine in their final study year.

METHODS

This cross-sectional study was organized at the Faculty of Sports and Physical Education and the Faculty of Medicine, University of Belgrade, in the period April-October 2017. We recruited students who were in the last year of undergraduate schooling (4th year at the Faculty of Sports and 6th year at the Faculty of Medicine).

The sample size was calculated when the following data were considered: the target population size of 4,000 (approximately 3,500 students in medicine and 500 students in sports), prevalence of health websites use of 50%, margin of error of 5% and confidence interval of 95%. The minimum sample size was 351 students.

The recruitment of students from both faculties was performed as follows: at the Faculty of Sports and Physi-

cal Education, all 4th year students were divided in five groups, with each group having classroom seminar once a week. Three of the five groups, with approximately 30 students, were randomly selected for distribution of questionnaires. At the Faculty of Medicine, all 6th year students were divided to five classrooms, all five days of the working week. Three out of the five classrooms were randomly selected each day. There were approximately 20 students per classroom. The questionnaire was filled in at the beginning of the classes. All the students who were offered to fill in the questionnaire agreed to participate in the study, however, 2 students handed in invalid questionnaires (response rate 99.3%). Ethical approval for the study was obtained from the Institutional Review Board of the Faculty of Medicine, University of Belgrade. The consent for participation was implied by handing in the completed questionnaire.

Instrument

Anonymous questionnaire was used to collect data. The first segment of the questionnaire examined the participants' socio-demographic characteristics (gender, age, parental marital status, parental highest education attainment, household monthly income, residence prior to entering university, grade point average-GPA, age at the time when they first used the Internet).

Students were asked whether or not they used the Internet and how frequently. We also asked the students whether or not they used health-related websites. A total of 12 most common health topics was listed, based on previous studies (15-17) (fitness and sports, nutrition and diet, sexually transmitted diseases, alcohol and drugs, mental health, partner violence, cancer, sex, cigarettes and tobacco, medications, family violence and bullying). Students were able to choose as many topics as they liked. Additionally, we asked them to report on the most frequently used online resources when searching for health-related content as previously reported (17) (Google, websites run by doctors, Wikipedia, Health portals, health forums and communities, health columns of online media, social networks, websites of health institutions, health blogs, YouTube, Website of Ministry of Health).

We asked the students whether or not they used smartphones and health-related apps, such as fitness/sports, diet/food, water intake, menstrual cycle or other. Lastly, we asked the students to what degree the pieces of health-related information that they find online influenced their health-related decision making.

Data analysis

We used mean values and percentages to describe the study sample. To test the differences between categorical variables, such as the use of health-related websites and apps, we used the Pearson's Chi-square test. To examine

factors associated with the use of health-related websites and health-related apps in sports students and medical students, we tested two multivariate logistic regression models. In one model the dependent variable was the use of health-related websites (yes/no) and in the other model the dependent variable was the use of health-related apps (yes/no). In both models, the independent variables (risk factors) were: gender, age, GPA, parental marital status, parental education level, household monthly income, residence prior to studying at the University, age at the time when they first used the Internet, frequency of Internet use and extent to which online health information influences students' decision making.

Statistical significant level was considered that of $p < 0.05$. Statistical analysis was performed in SPSS 20.0 statistical software package (SPSS Inc, Chicago, IL, U.S.A.).

RESULTS

A total of 390 University students were included in our study: 89 from the Faculty of Sports and 301 from the Faculty of Medicine. All participants used the Internet. Demographic characteristics as well as patterns of digital health information use are presented in **Table 1**. Students of the two faculties did not differ in frequency of the use of health-related websites (79.8% among sports students and 77.7% among medical students; $\chi^2 = 0.167$, $p = 0.771$) and apps (39.3% among sports students and 49.2% among medical students; $\chi^2 = 2.672$, $p = 0.116$).

The interest in health topics slightly differed between the two groups of students (**Figure 1**). However, in both groups, students were most commonly interested in fitness and diet. Students of sports did not browse the Internet in search of topics such as partner violence, bullying and tobacco. The distribution of health information sources for our students is presented in **Figure 2**. Students of sports did not report the use of health blogs and websites run by health institutions. Compared to medical students, students of sports more often used health forums and YouTube.

The vast majority of students had smartphones (370, 94.9%). Of those, 183 (49.5%) used health apps. The use of fitness ($\chi^2 = 0.240$, $p = 0.624$), diet ($\chi^2 = 3.520$, $p = 0.061$) and water intake ($\chi^2 = 0.918$, $p = 0.338$) apps did not differ according to the type of faculty. Of female sport students who had smartphones, 41.4% (12/28 students) used menstrual apps and of female medical students 31.0% (62/190 students) used this app ($\chi^2 = 1.247$, $p = 0.264$).

Regression models

After testing the multivariate logistic regression models among sports students and among medical students, we observed several factors associated with the use of

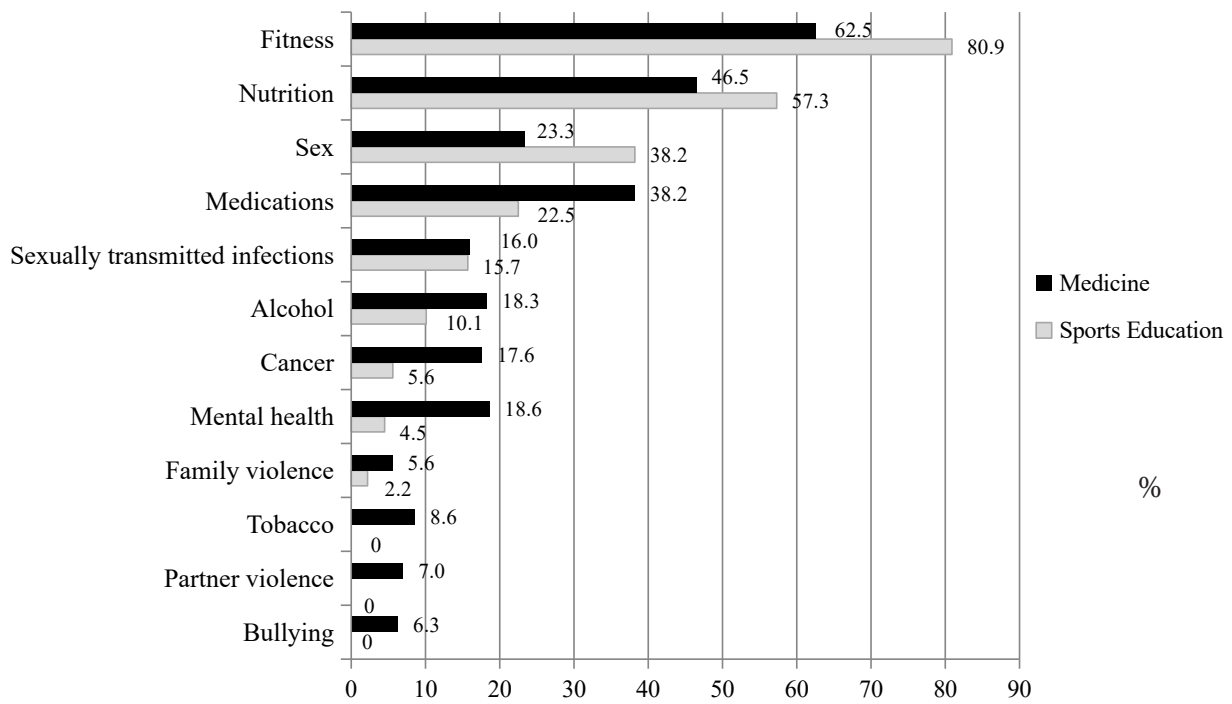
Table 1. Characteristics of the study sample according to the use of health-related websites (N=390)

Variable	Count	Percentage
Gender		
Male	161	41.3
Female	229	58.7
Age (years)*	23.9	1.0
Type of Faculty		
Sports	89	22.8
Medicine	301	77.2
Grade point average*	8.8	0.7
Parental marital status		
Married	327	83.8
Other	63	16.2
Highest education attainment of the mothers		
Primary	11	2.8
Secondary	150	38.5
University	229	58.7
Highest education attainment of the fathers		
Primary	3	0.8
Secondary	160	41.0
University	227	58.2
Household monthly income (Euros)		
< 405	100	25.6
405-810	146	37.4
>810	137	35.1
Missing	7	1.8
Residence prior to University		
Capital city	161	41.3
Outside of capital city	229	58.7
Age at first internet use (years)*	13.0	2.8
Frequency of internet use		
Rarely	3	0.8
Once a week	1	0.3
Multiple times per week	10	2.6
Multiple times per day	376	96.4
Use of health-related websites		
Yes	305	78.2
No	85	21.8
Use of smartphone health-related apps		
Yes	183	46.9
No	207	53.1
Extent to which online health-related information influences decision making		
Not at all		
A little	35	9.6
Partially	114	31.7
A lot	193	52.9
Quite a lot	16	4.4
Missing	5	1.4
	27	6.9

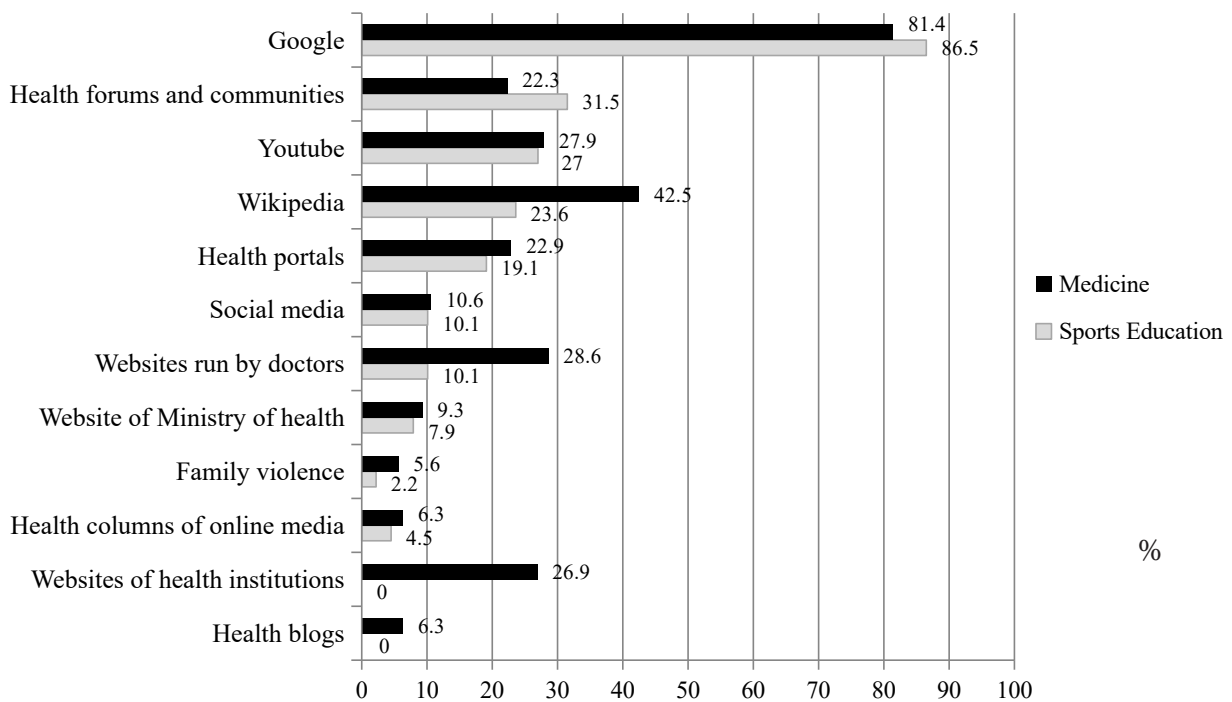
Legend: *Mean value with corresponding standard deviation in brackets; Grade point average range 6.0-10.0

health-related websites and apps. The stronger influence of online health information on students' health-related decision making was associated with the use of health-related websites among both groups of students (Tables 2 and 3). Additionally, medical students who used the Internet more frequently were also more likely to read health-related websites (Table 3).

In terms of apps, being a female was the predictor of health apps use in the group of sports students (Table 2), but this was not observed among medical students. In fact, the only predictor of health apps use among medical students was being younger when they began using the Internet (Table 3).



Graph 1. Distribution of health topics of interest to students according to faculty



Graph 2. Distribution of health information resources for adolescents who visit health-related websites

DISCUSSION

Our findings supported the hypothesis that sport students and medical students did not differ in terms of health websites and apps use. Moreover, their interests in health-related topics were similar. More than three quarters of students in our study reported seeking health

information on the Internet. Similar prevalence was observed worldwide, such as among college student in the United States (18), university students in Ireland (19) or Ghana (20). Use of health-related websites was quite high among French University students, accounting for 94.8% in the past year (9).

In our study, both students of sports and medicine were interested in healthy lifestyles, such as fitness and

Table 2. Factors associated with the use of health-related websites and apps among students of sports and physical education in Belgrade, Serbia

Variable	Use of health-related websites		Use of health-related apps	
	OR (95% CI)	p-value	OR (95% CI)	p-value
Gender Female vs. male*	0.61 (0.15-2.38)	0.472	0.26 (0.09-0.79)	0.018
Age range (years)	1.60 (0.74-3.44)	0.230	1.31 (0.80-2.14)	0.287
Grade point average	1.63 (0.54-4.88)	0.382	1.10 (0.44-2.77)	0.934
Parental marital status Married* vs. other	0.59 (0.12-2.95)	0.511	1.10 (0.31-3.95)	0.879
Highest education attainment of the mothers	0.70 (1.95-2.48)	0.576	0.46 (0.15-1.42)	0.178
Highest education attainment of the fathers	0.80 (0.24-2.70)	0.719	2.00 (0.64-6.20)	0.230
Household monthly income	0.57 (0.235-1.36)	0.317	1.11 (0.54-2.24)	0.778
Residence prior to studies Capital city* vs. outside	0.33 (0.08-1.36)	0.124	0.64 (0.22-1.89)	0.423
Age at first internet use	1.03 (0.79-1.33)	0.882	1.12 (0.90-1.41)	0.311
Frequency of internet use	n/a	n/a	n/a	n/a
Extent to which online health-related information influences decision making	2.52 (1.17-5.44)	0.019	0.74 (0.40-1.39)	0.356

Legend: OR-odds ratio; CI - Confidence interval; n/a - not applicable; *reference categories; Bold values refer to variables that were associated with the use of health-related websites and apps

nutrition, as expected. A similar pattern was observed among other university students worldwide (9, 21-23). Aside from diet, students in France were most interested in pain and illnesses and mental health (9). Medical students in our study also sought information on medications, which could reflect their field of study, especially drug interactions. A study from the United States reported that 81.3 % of students from the University of Illinois reported seeking information on medical treatment, aside from topics on healthy lifestyle (21). It has been observed that the focus on more specific health topics emerges when the perception of individual's own risk increases, such as the case of compliance to seasonal flu vaccination among medical students (22). Finally, the discrepancy in topics of interest between sports and medical students was observed for partner violence, bullying and tobacco, as none of the sport students reported browsing these themes. This may be due to the content worked through in classes, but also due to personal experiences.

Google and Wikipedia were most common platforms browsed by medical students, while aside from Google, sports students used online health forums and online communities. Wikipedia and general health websites were most commonly reported among French university students, as well as the official websites of health institutions (9), which is in line with the reports of our medical students. While it has been argued that Wikipedia is not a credible source of information, a study of quality of its health content and referent sources suggested that Wikipedia offered accurate data which can be used in health care settings (23). Compelling data suggest that Wikipedia could be used as a reliable source of health-related information (24). In fact, a scoping review of literature documented that Wikipedia could be used by the general

population just as well as students or health professionals (25), because pieces of relevant information are well-organized, succinct and explained in comprehensible manner. Data from Wikipedia offer information on incidence and prevalence of diseases, risk factors and prevention, all of which are relevant for health education and decision-making regarding health (26). Although health-related content on social media accounted for 10% of users in our study, it has been proposed that social media in the so-called digital age represent an important medium for accessing health information among young adults (27). Furthermore, the increase in health knowledge has been observed after using social health networks for lay public as well (28).

We observed that a factor associated with the use of health-related websites among both sports and medical students was a stronger influence of online health-related information on individual's decision making relative to their health. This finding suggests that online content could play a crucial role in the efforts to increase knowledge on various health topics and provide possibility to better understand and improve personal health behaviors, which could, in turn, help future health professionals in their work with clients and patients. Additionally, in our study using the Internet more frequently was also associated with the use of health-related websites among medical students. Dobransky and Hargittai (21) also observed that students who spent more time on the Internet are more inclined to seek for health information online. This could be explained by being more skilled at browsing the online content after spending more hours on the Internet (21). A number of studies documented that being female was associated with using health-related websites (9, 22, 29), which was not the case among sports and medical students in our study. A potential explanation for not

Table 3. Factors associated with the use of health-related websites and apps among medical students in Belgrade, Serbia

Variable	Use of health-related websites		Use of health-related apps	
	OR (95% CI)	p-value	OR (95% CI)	p-value
Gender Female vs. male*	1.14 (0.56-2.33)	0.715	0.83 (0.48-1.45)	0.523
Age range (years)	0.69 (0.48-1.01)	0.055	1.22 (0.89-1.66)	0.211
Grade point average	0.71 (0.42-1.20)	0.205	1.11 (0.74-1.68)	0.615
Parental marital status Married* vs. other	1.10 (0.40-3.01)	0.853	0.75 (0.36-1.59)	0.458
Highest education attainment of the mothers	1.27 (0.65-2.50)	0.481	1.51 (0.89-2.56)	0.129
Highest education attainment of the fathers	1.52 (0.71-3.23)	0.276	0.77 (0.43-1.39)	0.390
Household monthly income	0.89 (0.51-1.55)	0.670	0.99 (0.65-1.52)	0.976
Residence prior to studies Capital city* vs. outside	0.65 (0.30-1.38)	0.261	0.99 (0.56-1.73)	0.966
Age at first internet use	1.00 (0.87-1.15)	0.995	0.86 (0.78-.95)	0.004
Frequency of internet use	2.57 (1.28-5.14)	0.008	0.76 (0.40-1.42)	0.383
Extent to which online health-related information influences decision making	1.82 (1.19-2.79)	0.006	1.07 (0.77-1.48)	0.683

Legend: OR-odds ratio; CI - Confidence interval; *reference categories; Bold values refer to variables that were associated with the use of health-related websites and apps

finding a gender difference in health-related websites use could be related to the field of study, as both sports science and medicine explore health from different aspects.

Female gender, however, was observed as a factor associated with the use of health-related apps among sports students. It has been established that women tend to pay closer attention to their health compared to men (30). Moreover, some apps target women specifically, such as follow-up of one's menstrual cycle. Similar findings were observed among university students in France (9), but also in the general population aged 45-64 years (8). In a subset of medical students, the only factor associated with the use of health-related apps was being younger when using the Internet for the first time. This finding supports the notion that young adults who are 'digital natives' are likely to use various digital mediums in search of health-related content. The use of health apps has been reported to improve adults' lifestyle, i.e. it influences an increase in fruit and vegetable intake, and supports physical activity and weight loss (8). Nevertheless, the use of health-related apps among sports and medical students in our study was almost two times less common than the use of health websites. Our data suggest that, relative to digital health information, the use of health-related websites is prevailing compared to health-related apps.

Regarding study limitations, we have recruited students from one university, located in the capital city, which is the largest urban area in the country. The inclusion of other sports and medical faculties in the country could have yielded a larger sample size and an insight into whether the use of health-related websites and apps differed according to urban areas within the country. In the assessment of factors associated with the use of apps on fitness and diet, we have not incorporated students' body mass index, attitudes towards healthy eating habits, physical appearance or overall physical exercise,

which could particularly differ between these two groups of students. Inclusion of these characteristics could have helped determine more closely the students who actively used health apps. Additionally, we did not investigate a potential presence of chronic diseases, because adolescents who suffer from certain chronic conditions may be more likely to use apps that support personal management of their condition. Finally, because of a cross-sectional study design we could not make definite inferences between the examined socio-demographic variables and the outcomes of interest.

In conclusion, students of sports and medicine equally use health-related websites and smartphone apps. However, health-related websites were much more used compared to health-related apps. Of all health-related topics, the interest was highest in the fields of fitness and diet. Students whose decision-making was strongly influenced by online health information were more likely to use health-related websites. Female students of sports were more likely to use smartphone apps.

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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 intellectual 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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PREDIKTORI KORIŠĆENJA SAJTOVA I APLIKACIJA O ZDRAVLJU MEĐU STUDENTIMA MEDICINE I SPORTA

Bojana Pejušković^{1,2}

Sažetak

Uvod/cilj: Globalna digitalna mreža omogućava brzu razmenu informacija. Studenti sporta i medicine će biti lideri promocije zdravog ponašanja u budućnosti. Cilj ove studije bio je ispitivanje upotrebe veb sajtova i aplikacija o zdravlju među studentima sporta i medicine na završnoj godini studija.

Materijal i metode: Ova studija preseka sprovedena je na Fakultetu sporta i fizičkog vaspitanja i Medicinskom fakultetu Univerziteta u Beogradu u periodu april-oktobar 2017. godine. Ukupno 390 studenata (od toga 89 studenata sporta i fizičkog vaspitanja i 301 student medicine) je bilo uključeno u studiju. Podaci su prikupljeni korišćenjem anonimnog upitnika.

Rezultati: Ispitanici se nisu razlikovali u pogledu učestalosti korišćenja veb sajtova o zdravlju (79,8% sport prema 77,7% medicina; $\chi^2=0,167$, $p=0,771$) i aplikacija (39,3% sport prema 49,2% medicina; $\chi^2=2.672$, $p=0.116$). Fitnes i

ishrana su bile najčešće teme koje su svi učenici pretraživali na internetu. Jači uticaj zdravstvenih informacija sa interneta na donošenje odluka u vezi sa zdravljem bio je povezan sa korišćenjem veb sajtova o zdravlju u obe grupe ispitanika. Pored toga, studenti medicine koji su češće koristili internet takođe su češće čitali sadržaj veb sajtova o zdravlju. U pogledu aplikacija, ženski pol i započinjanje upotrebe interneta u mlađem uzrastu su bili prediktori upotrebe aplikacija u vezi sa zdravljem među studentima sporta i medicine, redom.

Zaključak: Studenti sporta i medicine podjednako su koristili veb sajtove vezane za zdravlje i aplikacije za pametne telefone. Međutim, veb sajtovi u vezi sa zdravljem su se mnogo češće koristili u poređenju sa aplikacijama. Od svih tema vezanih za zdravlje, najveće interesovanje je bilo za fitnes i ishranu.

Ključne reči: zdravlje, internet, aplikacije, studenti, sport, medicina.

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