JBACHS
Journal of Basic and Clinical Health Sciences

J Basic Clin Health Sci 2024; 8: 380-389
https://doi.org/10.30621/jbachs.1339191
RESEARCH ARTICLE

COMPARISON OF E-HEALTH LITERACY, DIGITAL HEALTH AND PHYSICAL ACTIVITY LEVELS OF UNIVERSITY STUDENTS IN DIFFERENT FIELDS

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Received: 15.08.2023; **Accepted:** 20.01.2024; **Available Online Date:** 31.05.2024

Cite this article as: Acar AK. Savci S. Kahraman BO. Tanriverdi A. Comparison of E-Health Literacy, Digital Health and Physical Activity Levels of University Students in Different Fields. J Basic Clin Health Sci 2024; 8: 380-389.

ABSTRACT

Purpose: This study aimed to compare the health literacy, e-health literacy, digital health, and physical activity levels of undergraduate students in different departments.
Material and Methods: Undergraduate students 307 of whom were studying in the Physiotherapy department (PT), and 228 in the Faculty of Economics and Administrative Sciences (FEAS) participated in the study. Health literacy (HL) (European Health Literacy Scale), e-health literacy (E-Health Literacy Scale), digital literacy (Digital Literacy Scale), and physical activity level (International Physical Activity Questionnaire-Short Form (IPAQ-SF)) were assessed. Scales were applied to the participants electronically via Google Forms.
Results: There was no difference between the e-HL, digital, and HL levels of both department students($p>0.05$). 70.1% of all students did not have enough HL. PT department students' IPAQ-SF total score, severe physical activity, and walking activities were lower than FEAS students($p<0.05$). There was no difference between the moderate levels of physical activity and daily sitting times of the students of both departments($p>0.05$). 79.6% of all students did not have sufficient physical activity levels (PALs).
Conclusion: This study showed that HL and PALs were low in the majority of university students. HL education programs for university students before graduation and awareness studies to develop healthy behavior habits should be included in undergraduate education programs.

Keywords: Digital health, eHealth, health literacy, physical activity

INTRODUCTION

Health literacy (HL) is defined that individuals' sufficient motivation levels, social and cognitive skills to access, understand and use the information to improve and protect their health by the World Health Organization (WHO) (1). E-health literacy is "the capacity to access, understand, evaluate and implement information obtained from electronic sources to solve a health problem" and is evaluated under the scope of health literacy (2).

Thanks to the advancement of technology and its easy accessibility by all segments of society, the diversity of information sources is also increasing (3). There are many of uncontrollable data on the internet about health and considering the effect of the acquired data on human health, the importance of

digital literacy competence emerges (4). Within this framework of this competence, the individual is expected to have the skills to reach, produce and share accurate information by using technology appropriately (5).

Recently, digital health focuses on health literacy, lifestyle changes, preventive and individualized care approaches of many e-health applications (6). While digital health initiatives authorize individuals to monitor, manage and develop their quality of life and health, it is also considered that they will provide more individuality, higher efficiency, and usability in health service delivery at a lower cost (5), (6). Thus, it enables the active participation of the individual in terms of self-management in health (5).

With the widespread usage of the internet and technological improvements, it is thought that the continuation of some daily activities (use of virtual market, food orders, payments, social relations, etc.) in digital environments triggers an inactive attitude development (7).

Although physical inactivity is not contagious, it has been described as a pandemic because it affects the whole World. Among the causes of morbidity and mortality figures that the physical inactivity pandemic is one of the top important risk factors, and it also causes a great economic burden around the World (8).

It has been stated that if physical activity does orderly it can help to treat and prevent noncommunicable diseases. Besides, this is also an important step in preventive health services (9). WHO aims to decrease physical inactivity by 10% by 2025 and 15% by 2030 (8).

Health professionals' health literacy level is critical in effective communication with the patient and also contributes to the patient's health literacy (10). International studies indicated that there are major gaps in knowledge, awareness, and clinical identification among health professionals because of low health literacy levels (11).

In this context, there were limited studies on the health literacy of university students studying in different fields in our country (12), (13), and there is no research on university students who studied physiotherapy and social sciences evaluating the relationship between physical activity and health literacy in the electronic environment during the Covid-19 pandemic period. Therefore, the aim study was to compare university students studying in health and non-health departments of digital health, e-health literacy, and physical activity levels.

MATERIAL AND METHODS

Participants

The study's population consists of undergraduate students from two universities, the School of Physical Therapy and Rehabilitation at Dokuz Eylul University and the Department of Physiotherapy and the Faculty of Health Sciences and the Faculty of Economics and Administrative Sciences at Izmir Kâtip Celebi University.

Inclusion criteria were to be 18-25, volunteering to participate in research, and being literate in Turkish. Exclusion criteria were determined for individuals with the presence of vision-hearing problems and the presence of diagnosed chronic disease in the study.

According to a similar study comparing e-health literacy levels measured by the e-health literacy scale of university students with and without previous education in the field of health (14). the effect size was found as 0.58. The probability of type I error and the statistical power was deemed as 0.05 and 0.95, respectively. The minimum sample size of our study was estimated as at least 154 participants, 77 per group using G*Power Software (ver.3.1.9.2).

Design of the Study

The study was accepted by Dokuz Eylul University University Non-Interventional Clinical Research Ethics Committee (Decision Date: 05.10.2020, Number: 2020/24-17). The research is a cross-sectional study. The study collected descriptive data from students using a questionnaire based on relevant literature (15), (16). Participants were asked to provide their consent and complete validated scales to assess various parameters, all of which were administered electronically through Google Forms. The relevant links were shared with students through pre-existing WhatsApp groups for their respective classes.

Instruments

European Health Literacy Survey Questionnaire (HLS-EU-Q47), which has a Turkish version and whose validity-reliability study was performed by Abacıgil et al.(α: 0.95). It was prepared using a Likert scale and the scale includes a total of 47 items. The total score is in the range of 0-50 (16), (17).

E-Health Literacy Scale (eHEALS), involves 2 sections. A 5-point Likert-type rating was used.

Table 1. Descriptive characteristics of university students by department (n=535)

		PT (n=307)		FEAS (n=228)		Statistical Value	
Descriptive Characteristics		**n**	**%**	**n**	**%**	**χ2**	**p**
Gender	Female Male	259 48	84.4 15.6	142 86	62.3 37.7	33.989	0.01*
Age	Median(IQR): 20.00 (19.00-21.00) (min.=18;max=25)			Median(IQR): 20.00 (19.00-22.00) (min.=18;max=25)			0.010* z= -2.579
BMI (kg/m^2)	Median(IQR): 21.10 (19.28-23.45) (min.=10.13;max=44.28)			Median(IQR): 21.72 (19.48-24.60) (min.=16.13;max=44.58)			0.010* z= -1.601
Grade	1st Class 2nd Class 3rd grade 4th grade	109 71 61 66	35.523.1 19.9 21.5	93 57 37 41	40.8 25.0 16.2 18.0	2.915	0.40
Exercise Habit	Yes No	144 163	46.9 53.1	134 94	58.8 41.2	7.381	0.007*
Breakfast Habit	Yes No	272 35	88.6 11.4	190 38	83.3 16.7	3.079	0.079
Daily Sleep Time	Less than 6 Hours 7-8 Hours Over 9 Hours	25 258 24	8.1 84.0 7.8	29 170 29	12.7 74.6 12.7	7.356	0.025*
Cigarette	Yes No Give up	126 170 11	41.0 55.4 3.6	130 87 11	57.0 38.2 4.8	15.541	<0.001*
Alcohol	Yes No	131 171	42.7 57.3	124 104	54.4 45.6	7.198	0.007*
Access to Health Information Resource	Newspaper/ Magazine Radio/Television Book/ Brochure Health Worker (Doctor etc.) Social media Scientific Publication/ Article	1 7 11 34 76 178	3 2.3 3.6 11.1 24.8 58	0 10 1 42 23 152	0 4.4 4 18.4 10.1 66.7	30.118	0.01*
First Institution to Apply for a Health Problem	Community Health Center Public Hospital University Hospital Private Hospital Private Practice	113 152 21 18 3	36.8 49.5 6.8 5.9 1.0	64 125 12 26 1.0	28.1 54.8 5.3 11.4 4.0	9.651	0.04*

χ2: Chi-Square value. z: Mann-Whitney U test. p<0.05* PT: Department of Physiotherapy and Rehabilitation; FEAS: Faculty of Economics and Administrative Sciences. BMI: Body Mass Index

Between the 8 and 40 points are taken from the scale. A high score corresponds to a high level of health literacy (18). There is Turkish validity and reliability of this scale(α: 0.78) (19). Digital Literacy Scale (DLS), consists of four dimensions and 17 items, and seven sub-dimensions. It is a 5 points Likert-type rating type scale (20) Turkish validity and reliability study for this scale was carried out(α: 0.90) (21).

International Physical Activity Questionnaire Short Form (IPAQ-SF), consists of 4 separate parts and 7

questions developed for adults. The questions ask about the different activities done in the last week and the time spent in these activities. The time spent sitting daily is questioned in the last question (22). Turkish validity and reliability study was carried out by Saglam et al. (α: 0.69) (9).

Statistical analysis

Analyzes were made with the help of IBM SPSS 23.0. Kolmogorov Smirnov test and histograms were used to check the normality of distribution. As a result of the Kolmogorov-Smirnov test and histograms, it was determined that the data were not normally distributed ($p<0.05$). Categorical variables were expressed as numbers (n) and percentages (%) and were analyzed using the chi-squared test. Continuous variables were reported as median and interquartile range (IQR) because of their non-normal distributions. Differences between groups were specified by Mann–Whitney U test according to variable distributions. Spearman correlation analysis was used to evaluate the relationship between the scales. The effect size was calculated as follows: $z/\sqrt{N}$ (23). In all analyses, $p<0.05$ was considered statistically significant.

RESULTS

A total of 535 volunteers, including undergraduate students, studying at the School of Physical Therapy and Rehabilitation at Dokuz Eylul University and the Department of Physiotherapy and the Faculty of Health Sciences, and the Faculty of Economics and

Table 2. Comparison of internet-media time, e-Health, digital health and health literacy of students studying in different fields

	PT (n=307)			**FEAS (n=228)**			**Statistical Value**		
Findings	**Median(IQR)**	**Min**	**Max**	**Median(IQR)**	**Min**	**Max**	**z**	**p**	***effect size***
Internet Time (min.)	240.00 (180.00-360.00)	20	1200	200.00 (120.00-300.00)	0	1440	-3.862	0.000*	-0.170
Social Media Time (min.)	120.00 (60.00-180.00)	0	1440	120.00 (60.00-180.00)	0	780	-1.999	0.04*	-0.086
eHeals	29.00 (26.00-31.00)	8	40	29.00 (24.00-32.00)	8	40	-0.412	0.68	-0.018
DLS	63.00 (56.00-68.00)	17	85	64.00 (55.25-71.00)	17	85	-1.242	0.21	-0.054
HL	30.46 (24.79-34.05)	0	50	31.45 (25.49-35.41)	0	50	-1.054	0.29	-0.045

	PT (n=307)		**FEAS (n=228)**		**Statistical Value**	
HL Categorized Classification	**n**	**%**	**n**	**%**	**χ^2**	**p**
Inadequate HL (0-25)	85	27.7	57	25	1.682	0.64
Problematic HL (> 25-33)	133	43.3	100	43.9		
Sufficient HL (>33-42)	61	19.9	43	18.9		
Excellent HL (>42-50)	28	9.1	28	12.3		

Mann-Whitney U test.*$p<0.05$.
PT: Department of Physiotherapy and Rehabilitation; FEAS: Faculty of Economics and Administrative Sciences
Min.: Minute
eHeals: E-Health Literacy Scale; DLS: Digital Literacy Scale; HL:Health Literacy

Administrative Sciences at Izmir Kâtip Celebi University.

The descriptive characteristics of the students are given in Table 1. The median age of PT students was 20.00(19.00-21.00) years, and the median age of FEAS students was 20.00(19.00- 22.00) years. There was a significant difference in the mean age between the two groups ($p<0.05$, Table 1). A significant difference was found between the two groups in terms of gender, and BMI (kg/m2) ($p<0.05$, Table 1). When the health-related lifestyle behaviors of the students were evaluated, a significant difference was found between the students of both departments ($p<0.05$, Table 1).

The findings of students' internet media times, e-health, DLS scores, and health literacy characteristics are given in Table 2. A significant difference was found between the internet time, and the social media time of PT and FEAS students ($p<0.05$, Table 2). There was no significant difference between the e-health, and DLS scores of the students in both groups ($p>0.05$, Table 2). There was no significant difference between the groups' HLS-EU-Q47 scores ($p>0.05$, Table 2). 70.1% of all students did not have enough HL.

A statistically significant difference was found between the students of both departments in terms of walking, vigorous physical activity, and total physical activity values ($p<0.05$, Table 3). There was no significant difference between IPAQ-SF moderate-intensity physical activity and sitting times of PT and FEAS students ($p>0.05$, Table 3). A significant difference was found between the low, moderate, and high physical activity levels of the students from both departments ($p<0.05$, Table 3). The activity level of the students of the FEAS department was statistically significantly higher ($p<0.05$). 79.6% of all students did not have sufficient physical activity levels (PALs).

The evaluation of the correlations between the scales in all students is given in Table 4. There was a positive correlation between the e-HEALS with the HLS-EU-Q47 (rho=0.351, $p<0.001$) and DLS (rho=0.476, $p<0.001$). A significant correlation was found between the HLS-EU-Q47 and DLS (rho=0.288, $p<0.001$). There was a positive correlation between IPAQ-SF with the HLS-EU-Q47 (rho=0.104, $p=0.016$) and DLS (rho=0.111, $p=0.010$). No correlation was found between the IPAQ-SF and e-HEALS.

DISCUSSION

This study found that university students studying in health and social fields had lower levels of e-health literacy and physical activity compared to the normal population. However, the physical activity levels of Physical Therapy (PT) students were higher than those of students in non-health fields.

PT students also had lower BMI compared to other health fields and non-health fields. Similarly, the mean BMI of the students from the health-related department was found to be lower among university students studying in Italy than those from the non-health department (15). In addition, the participation of FEAS students more than male students may explain the high BMI values. In terms of smoking and alcohol habits, students of the Faculty of Education and Applied Sciences (FEAS) department reported higher rates of use than PT students. However, according to another study in the literature, health science students expressed more smoking habits than social science students (24). According to the results of studies run with university students in different countries, the rate of physical activity for more than 4 hours a week is stated as 33% in the USA, 69.6% in Spain, and 55% in Turkey (25). In this study, 52% of the students had regular exercise habits and FEAS department students reported higher exercise habits than PT department students. The choice of healthy lifestyle behaviors may vary depending on the individual's sociocultural support and characteristics, and available resources (26). Health-related behaviors that continue in adulthood become more permanent when acquired during university years (27).

According to a study conducted in Turkey in 2017, the average daily internet time was found to be 2-3 hours (28). With the development of technology and the formation of pandemic conditions, the time people spend on the internet and social media has increased. During the pandemic period, the average time allocated by university students on social media and the internet is stated as 4-6 hours (29). In our study, the internet use of university students was found to be over 4 hours per day.

The digital literacy levels of university students studying in 10 different departments in South Korea in 2019 were compared, and it was stated that there was no significant difference (30). In our study, it was

specified that the DLS scores of the students studying outside the field of health and health were similar due to their close age in terms of both department and class levels and due to the electronic systems they met at an early age.

We determined that the average e-health literacy scores of university students, which we evaluated with E-HEALS, were found to be 27.78. In a study sample conducted in our country, no difference was observed between the e-health literacy levels

Table 3. Categorized classification of IPAQ-SF and IPAQ-SF scores of students studying in different fields

	PT (n=307)			FEAS (n=228)			Statistical Value		
IPAQ- SF Scores	**Median (IQR)**	**Min**	**Max**	**Median (IQR)**	**Min**	**Max**	**z**	**p**	**Effect size**
IPAQ-Vigorous activity (MET a week)	0.00 (0.00-480.00)	0	6720	240.00 (0.00-1440.00)	0	8640	-4.232	<0.001	-0.183
IPAQ Moderate activity (MET min. a week)	160.00 (0.00-480.00)	0	4200	200.00 (0.00-690.00)	0	4200	-1.279	0.20	-0.055
IPAQ Walking (MET min a week)	495.00 (198.00-800.00)	0	4158	693.00 (297.00-1386.00)	0	4158	-3.817	<0.001*	-0.165
IPAQ Total (MET min. a week	980.00 (495.00-1884.00)	0	9439	1784.50 (658.75-4142.25)	0	11250	-4.749	<0.001*	-0.205
Sitting time (min.)	450.00 (300.00-600.00)	40	900	450.00 (240.00-600.00)	30	900	-1.183	0.23	-0.051

	PT (n=307)		FEAS (n=228)		Statistical Value	
IPAQ-SF Categorized Classification	**n**	**%**	**n**	**%**	**χ2**	**p**
Low PA (<600 MET-minutes per week)	98	31.9	55	24.1		
Moderate PA (600-3000 MET-minutes per week)	174	56.7	99	43.4	35.758	<0.001*
High PA (>3000 MET-minutes per week)	35	11.4	74	32.5		

*χ2: Chi-Square value. Mann-Whitney U test.*p<0.05. PT: Department of Physiotherapy and Rehabilitation; FEAS: Faculty of Economics and Administrative Sciences. PA: Physical Activity. IPAQ-SF: International Physical Activity Questionnaire Short Form*

Table 4. Correlations between the scales of students studying in different fields

Scales		**E-Heals**	**HLS-EU-Q-47**	**DLS**	**IPAQ-SF**
E-Heals	rho	-	0.351*	0.476*	0.040
	p	-	<0.001	<0.001	0.352
HLS-EU-Q-47	rho		-	0.288*	0.104*
	p		-	<0.001	0.016
DLS	rho			-	0.111*
	p			-	0.010

E-Heals: E-Health Literacy Scale, HLS-EUQ47: European Health Literacy Scale. DLS: Digital Literacy Scale, IPAQ-SF: International Physical Activity Questionnaire Short Form. rho: Spearman correlation coefficient. *p<0.05

evaluated by E-HEALS among students studying in health and non-health fields. And the mean E-HEALS score of all students was expressed as 25.5 (12). In our study, there was no significant difference between the PT department students in the health field and the non-health FEAS department students, in line with this study. Unlike our study, there are studies in the literature that state that students studying in the field of health have higher e-health literacy. As an example, it was stated that the average E-HEALS score in Japan and the mean score of the 12-item e-health literacy scale in Taiwan were higher in health department students (14). When our findings are compared with the studies conducted on the students of the Faculty of Health Sciences in our country, the e-health scores are below the stated average (28). These data show that university students studying especially in the field of health in Turkey do not have a sufficient level of knowledge on the subject. Differences in the results of studies conducted between countries may be due to the scales used in the assessment and the different socio-demographic and cultural characteristics of the populations taken. It is recommended that university students be given the training to increase their level of literacy in the field of computer and e-health, encouraging them to read periodicals and articles about health, and informing them about the accuracy/reliability of the information they obtain from the internet (12). It is also important for public health that students studying in the field of health have sufficient e-health literacy levels (31).

According to the results of the research that compared the levels of HL between departments; a study using the Health Literacy Questionnaire (HLQ) scale in Australia showed that medical school students had the highest mean score when comparing allied health, nursing, and medical school students (32). In a study in Italy in which Newest Vital Sign (NVS) and Health Literacy Assessment Tool (HLAT-8) scales were used, it was stated that the HL level was higher in nursing department students than in movement sciences and economics departments (15), and in the study in which the HLQ was used in Denmark, the students studying in the field of public health had a higher level of HL than the students of molecular biomedicine. In another study using the HLS-EU-Q16 scale, while the adequate HL level of social science students varies between 25-30%, this range of 70% of the students studying in the nursing department (33). In another study conducted in Turkey using EHLS, it was stated that university students had similar results (34). There was no significant difference between the HL total score and sub-dimensions of the students included in our study and studying outside the field of health and health. The reason for this can be thought that the behavior of university students seeking and accessing health-related information is similar to the effect of the epidemic process we are in. The difference between the results in studies evaluating HL is remarkable. The results may vary depending on the differences between the measurement methods used in the studies and the socio-cultural and demographic characteristics of the population. Despite this, the fact that university students mostly have insufficient health literacy levels, together with the literatüre, is an issue that should also be taken into consideration.

We determined that 28.6% of the students were found to be inactive, only 20.4% of students have sufficient activity levels and the sitting time was 445 minutes. In Portugal, 70% of the young population follows the recommended 30 minutes of moderate or vigorous-intensity physical activity daily. According to studies conducted with university students are sufficient activity levels; 44.7% of 4193 university students in Germany (35), and 62.9% in Switzerland (36). The average residence time of university students is 44% over 8 hours in Germany (35), 420 minutes in Switzerland (36) 525 minutes in Italy (37)

Similar to the literature, it is noteworthy that most of the students have insufficient physical activity levels and an increase in the time they spend inactive. The restrictions we have encountered with the Covid-19 pandemic in the current period have increased the effects of the physical inactivity pandemic, which is already a problem, to an alarming level (38). In our study, the fact that students continue their education process remotely may be another reason for the increase in sitting time. While technological developments make our lives easier, the disadvantages of our activity levels and the isolation measures taken within the scope of the pandemic conditions we are in also lay the groundwork for an inactive lifestyle (36).

Having a sufficient level of health literacy can provide to individuals make conscious choices regarding their physical activities and thus contribute to the prevention of many non-communicable chronic diseases. According to the systematic review, 15 of 19 study contents showed a positive relationship between health literacy and physical activity level in adults (39). In a study conducted with university

students, it is stated that a higher level of e-health literacy enables them to adopt more than one behavior that is positive for their health, including physical activity (40). In our study, in line with the literature, a significant relationship was found between all students' digital literacy, physical activity, and health literacy levels. As the level of physical activity increases, both digital and health literacy levels increase. We think that pandemic conditions and distance education process may also affect this situation.

A positive correlation was found between the HLS-EU-Q47, DLS, and E-HEALS scales used in our study. A moderate correlation was found between the E-HEALS score averages of all students and DLS and HLS-EU-Q47 and a low correlation between HLS-EU-Q47 and DLS. There are a very limited number of correlational studies between the related scales in the literature. To reach a clear view, studies that examine the relation between the scales in different populations with larger sample groups are needed in the future.

The strength of our study is that it is the first study to investigate the relationship between e-health literacy and physical activity level in PT students. The limitation of this study is that our study was conducted during the Covid period and it creates a disadvantage in terms of PALs. On the other hand, it may have provided an advantage in terms of evaluation of e-health.

CONCLUSION

Consequently, the study found that e-health literacy and physical activity levels of university students in health and social fields were similarly low. There was a positive correlation between e-HEALS with DLS and HL, and a significant correlation was found between HL and DLS. The study highlights the need for education and training programs to increase health literacy and physical activity levels in higher education. It is suggested that appropriate environments should be created in universities to address this issue. Additionally, identifying the level of health literacy and physical activity of physiotherapists is important for improving the quality of service they provide to patients and society. The results of this study can ensure insight for future research on evaluating methods for improving health literacy in university students.

Acknowledgments: Thank you to all volunteer university students who participated.

Author contribution: Conception: Sema Savci, Ayse Kardelen Acar. Design: Sema Savci, Ayse Kardelen Acar, Buse Ozcan Kahraman, Aylin Tanriverdi. Supervision: Sema Savci. Data collection: Ayse Kardelen Acar. Analysis: Sema Savci, Ayse Kardelen Acar, Buse Ozcan Kahraman, Aylin Tanriverdi. Writing: Ayse Kardelen Acar. Critical review: Sema Savci, Buse Ozcan Kahraman, Aylin Tanriverdi.

Conflict of interests: The authors declare that they have no conflict of interest.

Ethical approval: The study was accepted by Dokuz Eylul University University Non-Interventional Clinical Research Ethics Committee (Decision Date: 05.10.2020, Number: 2020/24-17).

Funding: The authors declare that they have no conflict of interest.

Peer-review: Externally peer-reviewed.

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