



## Correlation between Electronic Health Literacy and Health Promoting Behaviors in Elderly

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### ABSTRACT

**Aims** Health-promoting behaviors are considered the most basic health criteria for the elderly. This study aimed to identify the correlation between Electronic Health Literacy and health-promoting behaviors among the elderly.

**Participants & Methods** This cross-sectional study was carried out on 300 subjects aged 60 years and older referred to Tehran retirement center in 2018. Convenient sampling was used for selecting the subjects. The data were collected by health-promoting questionnaire and Electronic Health Literacy questionnaire. Independent t-test and ANOVA, Pearson correlation coefficient were used. The data were analyzed through SPSS 19.

**Findings** The mean and standard deviation of health-promoting behaviors and Electronic Health Literacy were  $146.95 \pm 30.31$  and  $27.19 \pm 6.99$ . The subjects with higher literacy obtained higher scores in health-promoting behaviors and its component. The Pearson correlation coefficient between health-promoting behaviors and Electronic Health Literacy was positive and significant ( $r=0.408$ ,  $p<0.001$ ). Also, correlation between Electronic Health Literacy and health responsibility ( $r=0.408$ ,  $p<0.001$ ), nutrition ( $r=0.329$ ,  $p<0.001$ ) and interpersonal relationships ( $r=0.413$ ,  $p<0.001$ ) was positive and significant.

**Conclusion** Electronic Health Literacy has a moderate positive correlation with health-promoting behaviors and components among the elderly. Therefore, improving Electronic Health Literacy should be considered a necessary subject for promoting the health behaviors of the elderly.

**Keywords** Health Behaviors; Elderly; Electronic Health Literacy

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## Introduction

As the body ages, older adults' health and functioning decline, prone to developing chronic diseases [1]. However, the problem of elderly health promotion and their activation during old age is of special importance. Health-promoting behaviors (HPB) and quality of life in older people are highly significant [2]. In addition, reducing the level of physical activity, suffering from mental, living status, Education level and physical diseases, improper and inadequate care, low income, and other general demographic data probably guide the elderly toward reducing health behaviors [3]. However, it is difficult to design and implement relevant interventions because these socio-demographic characteristics are difficult to change. As a result, people have begun to look for those factors that can be changed, and health literacy has come into focus [4].

Health literacy refers to an individual's ability to acquire, process, and understand basic health information and services and use them to make appropriate health decisions [5]. A systematic review showed that low health literacy is associated with poor health outcomes [6] and refers to the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to address or solve a health problem [7]. It should be noted the concept of Electronic Health Literacy (EHL) is derived from health literacy, and Previous studies found that the correlation between health literacy and EHL is moderate [8], and EHL is affected by a higher level of health literacy [9]. Therefore, health literacy and EHL need to be distinguished in research. Unlike health literacy, EHL emphasizes obtaining and using relevant health information through electronic media. In other words, individuals with low health literacy can still benefit from their health if they can use electronic media to search for and understand online health information. Given the rapid development of electronic communication technology, improving EHL may help improve the health status of older adults with low health literacy [10].

With the development of Internet information technology, much health information can be transmitted through the Internet. China's statistical report on Internet development showed that Internet users among Chinese older adults are increasing, with the number of Internet users aged 50 and above rising from 7.3% [11] to 13.6% [12]. On the other hand, the results of other studies considered electronic literacy as one of the most influential factors in HPB [13]. Electronic behaviors such as the Internet lead to positive healthcare behaviors [14]. Further, acquiring e-health information can have the advantages of user empowerment, less anxiety, more sense of security, health management, and conscious health decisions

[15]. EHL refers to people's ability to achieve, understand, and evaluate the basic information on web-based sources [16] and has some disadvantages such as complex information search, lack of judgment on the content regarding information accuracy, correctness, and instability [17]. However, there are some concerns about the reliability, accuracy, and quality of health-related information on the Internet [18].

In general, the systematic investigations indicated that using the Internet leads to positive effects on behaviors, including physical activities, smoking, nutrition, etc. [19]. Portnoy *et al.* showed that computer-delivered interventions improved behavioral health outcomes [19]. Also, in another study, computer-based interventions to increase EHL significantly improved health care outcomes in the participants [20].

Research on EHL and health outcomes is clearly in its early stages [21]. Thus, understanding the EHL of the elderly for health promotion and health behaviors is among the research priorities. The present study aimed to investigate the relationship and correlation between HPB and EHL among the elderly.

## Instrument and Methods

This cross-sectional study was carried out on 300 subjects aged 60 years and older referred to Tehran retirement center in 2018. Centers with the more attending retirements were selected in Tehran. Convenient sampling was used for selecting the subjects. Considering 5% alpha and an average estimation error of 0.8 for e-literacy (mean: 27.19) and 3.5 for health promotion behaviors (mean: 146.95), 300 subjects were selected as sample size using the following formula:

$$n = \frac{\frac{z^2}{4d^2}}{1 + \frac{1}{N}(\frac{z^2}{4d^2} - 1)}, \quad n \text{ is sample size, } z=1.96, d=.05 \text{ is}$$

acceptable sample error and  $N=1400$  is the population size. By putting this values in the formula, we can obtain  $n \approx 300$  which is a conservative sample size for the research. Inclusion criteria were being retired, being familiar with the Internet, and having physical and mental health to answer the questions and the subjects who were not qualified were excluded from the study.

Three questionnaire were used as follow:

The demographic variables were age, marital status, employment status, Living status, lifestyle, spouse's surviving status, educational level, time duration of using the internet, membership of social media, type of disease in elderly, number of children, and time duration of disease.

**Health Promoting Lifestyle Profile-II Questionnaire (HPLP-II):** This 52-item questionnaire was designed by Walker *et al.* for the frequency of health-promoting behaviors in six

dimensions, including health accountability, physical activity, nutrition, spiritual growth, stress management, and interpersonal relationships. The range of the total score for promoting behaviors was 52-208, and its classification was as weak (score: 52-91), moderate (score: 91-130), good (score: 130-169), and perfect (score: 169-208) [22]. Validity and reliability of HPLP-II were conducted by Taheri *et al.* among the Iranian elderly. Cronbach's alpha of the revised HPLP-II was 0.78, and their subscales were in the range of 0.67–0.84. Intraclass correlation coefficient was 0.79 (95% CI: 0.59–0.86,  $p < 0.001$ ) [23].

**EHL Questionnaire:** This questionnaire included eight items measuring the skill and self-confidence of subjects who use the Internet to collect data on health. The questions were the 5-point Likert, and their reliability and validity were confirmed by Norman & Skinner [7]. The final score of each answer varied from 8 to 40, and the higher scores indicated the higher EHL. Item analysis was performed on the 8-item scale at baseline, producing a tight-fitting scale with  $\alpha = 0.88$ . Item-scale correlations ranged from 0.51 to 0.76. Test-retest reliability showed suitable stability over time from baseline to 6-month follow-up ( $r = 0.4$  to  $0.68$ ) [7]. Also, the validity and reliability of this questionnaire were studied by Bazm *et al.* in Iran. The internal consistency of the scale was sufficient ( $\alpha = 0.88$ ,  $p < 0.001$ ), and the test-retest coefficients for the items were reliable ( $r = 0.96$ ,  $p < 0.001$ ) [24].

This study was approved by the AJA University of Medical Sciences. The objectives, details of the study, and confidentiality of results were explained to the elderly, and an informed consent letter was received from each subject. Participation in the study was completely voluntary. The lack of tendency to participate in the study did not deprive them of the routine services from the Tehran retirement center. The face-to-face interview was performed by trained researchers. On average, filling the required questionnaires took 25-35 minutes.

SPSS 19 was used to describe the variables, scores of the health-promoting lifestyle, the EHL, and their components as a mean and standard deviation to analyze the data. Pearson correlation test was used to assess the correlation between the two-questionnaire used. By independent t-test for marital status and living spouse variables and ANOVA methods for the other categorical demographic variables, the difference of demographic variables on the components of a health-promoting lifestyle has been considered.

## Findings

The mean age of the participants was  $66.00 \pm 5.00$  years (60-84 years). The mean time duration for suffering from diseases in individuals was  $8.00 \pm 3.00$  years (Table 1).

**Table 1)** Results of demographic characteristics of the participants (n=300)

Variable		Number	Percent
<b>Marital status</b>	Married	262	87.33
	Single	38	12.67
<b>Employment status</b>	Employed	73	24.33
	Unemployed	227	75.67
<b>Economic status</b>	Weak	53	17.66
	Moderate	139	46.33
	Good	93	31.00
	Perfect	15	5.00
<b>Living status</b>	Alone	47	15.66
	With spouse	227	75.66
	With children or relatives	26	8.68
<b>Education level</b>	Associate degree	84	28.00
	Diploma	121	40.00
	Bachelor	69	23.00
	Master and higher degrees	26	9.00
<b>Use of social media</b>	Sorush	93	31.00
	Whatsapp	79	26.33
	Instagram	21	7.00
	Telegram	107	35.66
<b>Time net (Hour)</b>	1	112	37.30
	2	83	27.70
	3	72	24.00
	4 and more	33	11.00
<b>Comorbidity</b>	Hypertension	115	38.33
	Arthritis	45	15.00
	Diabetes type 2	54	18.00
	Osteoporosis	25	8.33
	Depression	18	6.00
	Heart attacks and stroke	3	1.00
	Other	40	13.33
<b>Number of children</b>	0	20	7.00
	1	8	3.00
	2	60	20.00
	3	67	22.00
	4	73	24.00
	More than 4	72	24.00

The mean score of HPB and EHL was  $146.95 \pm 30.31$  and  $27.19 \pm 6.99$ , respectively. Results of the mean scores showed in Table 2.

According to Table 3, marital status had no difference in physical activity, spiritual growth, and stress management scores. The occupation and economic status of the elderly had a significant difference in respect of all the components. Lifestyle as one of the variables, except physical activity, had a significant difference in respect of other components, which is the best mode of living with a spouse. The spouse's living had no significant difference regarding HR, PA, and nutrition and had significant differences regarding other items. The academic level of the elderly had a significant difference across all factors except health responsibility and stress management. The duration of the use of the internet per hour a day significantly affected all latent variables. The type of social media was the only variable having no significant difference for any health-promoting lifestyles. Finally, the type of disease had a significant difference for all health-promoting lifestyle components. Depression had the worst possible

status among all cases (Table 3). In continuous cases, there were three demographic variables; the number of children, duration of the disease, and age of the elderly. The Pearson correlation coefficients between these variables and all components in health-promoting lifestyle and their values have been computed. The correlation coefficient between the age of the elderly and the components is negative and small, so this variable weakly affected all the components (Table 3).

The Pearson correlation coefficient was used to survey the relationship between health-permeating

lifestyle components and electronic health literacy components. According to the results, the correlation coefficients between the components of health-promoting lifestyle were high, which strongly affected each other. By increasing one of them, the others were increased. Most of them were approximately 0.4, which was a moderate positive relationship between electronic health literacy and all the components of the health-promoting lifestyle. This implies that more scores in electronic health literacy lead to more scores in a health-promoting lifestyle (Table 4).

**Table 2)** The Mean±SD of the score related to each question in the EHL questionnaire and components of health-promoting lifestyle

EHL questionnaire	Mean ±SD
I know what health resources are available on the Internet	3.66±0.945
I know where to find helpful health resources on the Internet	3.66±0.935
I know how to find helpful health resources on the Internet	3.60±0.975
I know how to use the Internet to answer my questions about health	3.57±0.966
I know how to use the health information I find on the Internet to help me	3.487±1.05
I have the skills I need to evaluate the health resources I find on the Internet	2.97±1.12
I can tell high-quality health resources from low-quality health resources on the Internet	2.94±1.15
I feel confident in using information from the Internet to make health decisions	3.30±1.12
Total score	27.19±6.99
<b>Health Promoting Lifestyle Profile-II</b>	
Health Responsibility	24.86±5.56
Physical Activity	19.82±6.04
Nutrition	27.83±5.48
Spiritual Growth	25.77±5.96
Interpersonal Relations	26.69±6.03
Stress Management	21.97±5.14
Total scores	146.95±30.31

**Table 3)** The status of underlying variables on the component of the health-promoting lifestyle

Underlying Variables		Health Responsibility	Physical Activity	Nutrition	Spiritual Growth	Interpersonal Relations	Stress Management
<b>Discrete</b>							
Marital status		0.008	0.807	0.022	0.071	<0.001	0.359
Job		0.008	<0.001	0.008	<0.001	0.008	<0.001
Economic status		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lifestyle		0.003	0.248	<0.001	0.005	<0.001	0.006
Living spouse		0.177	0.411	0.090	0.013	0.004	0.025
Academic degree		0.187	0.002	<0.001	0.014	<0.001	0.076
Time duration of the Internet use		<0.001	0.026	<0.001	<0.001	<0.001	0.003
Membership on social media		0.644	0.188	0.083	0.787	0.453	0.619
Type of diseases in the elderly		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
<b>Continuous</b>							
Age	r	-0.185	-0.185	-0.208	-0.208	-0.188	-0.166
	p	<0.001	<0.001	<0.001	<0.001	<0.001	0.004
Number of children	r	0.025	-0.081	0.066	-0.057	0.096	-0.019
	p	0.660	0.164	0.254	0.322	0.096	0.745
Duration of disease	r	0.040	-0.061	0.065	-0.053	0.082	-0.040
	p	0.488	0.291	0.265	0.363	0.159	0.493

**Table 4)** Correlation coefficient between the components of HPL and EHL

Variable	7	6	5	4	3	2	1
1-Electronic Health Literacy	0.408	0.382	0.329	0.468	0.413	0.406	1.00
2-Stress Management	0.918	0.948	0.772	0.984	0.841	1.00	
3-Interpersonal Relations	0.886	0.654	0.934	0.914	1.00		
4-Spiritual Growth	0.876	0.836	0.782	1.00			
5-Nutrition	0.819	0.594	1.00				
6-Physical Activity	0.831	1.00					
7-Health Responsibility	1.00						

## Discussion

This study investigated the correlation between EHL and HPB among the elderly. Understanding the relationship between HPB and EHL and the related factors and identifying the predicting factors are considered significant issues for the decision-makers of health policy and health care.

The results of this study indicated that the mean score of HPB among the elderly is at a good level. Unlike the findings of Oh *et al.* [25], another study by Harooni *et al.* [26] was consistent with the present study. In this study, the elderly had a weak status respectively in physical activity, stress management, health responsibility, spiritual growth, interpersonal relationships, and nutrition, indicating the good behaviors of the elderly. Many studies indicated that the elderly were not appropriate regarding behaviors such as physical activity and having a good diet [27].

Regarding the reason for physical activity as the weakest component of HPB, it can be justified that many barriers affect the physical activity of the elderly. The most important tasks for solving such problems are creating motivation, making the environment appropriate, and presenting a special sports program for the elderly by the experts. It is worth noting that the weak status of spiritual growth among the elderly can create positive and constructive relationships and compatibility with situations [28].

The findings of the previous studies indicated that 76% of the elderly in America use the Internet for gaining health information [29]. Internet use is increasing among the elderly in Europe [30], while most Internet users in Iran are young people [31], not the elderly. On the other hand, the level of EHL among the elderly was low in the present study. Thus, it can be claimed that the lack of trust and ability among the elderly of Iran led to the low score of EHL. In addition, empowering the elderly to change health-related behaviors requires accurate information. Thus, educational interventions for acquiring accurate information from the Internet should be among the occupational priorities of healthcare experts because such measures can improve users' trust in acquiring e-health information. The findings of this study indicated that the ability to recognize high-quality resources from low-quality ones, the ability to evaluate the resources, and their use for making decisions are among the most effective factors in the reduced privilege of EHL, which are consistent with the results of Park *et al.* [32]. In this regard, the authorities should increase the awareness of the elderly referred to Tehran retirement center by designing websites, educational programs, and Telegram channels to help them identify reliable sources. In addition, they should explain the

information quality evaluation method to the elderly or their families.

However, the most significant findings of this study showed that the EHL level has a significant effect on the health-promoting lifestyle and its components. Since the components of a health-promoting lifestyle also have a high correlation and strongly affect each other, it's reasonable to conclude that EHL affects some of the components directly and some others indirectly. It is rationales that EHL directly affects health responsibility, nutrition, and interpersonal relationships. In addition, these three variables indirectly affect the other components. Spiritual growth and physical activity can be improved by strengthening health responsibility. However, this study aimed to investigate the relationship between HPB and EHL of the elderly. The finding was consistent with the findings of other studies [13, 33]. Internet is considered the most preferred source of health information for promoting health behaviors. The studies on the relationship between HPB and EHL among the elderly are limited, and extensive should be performed to understand this relationship. The elderly with higher EHL indicated more appropriate health behaviors. The reasons for emphasizing this finding are increasing the use of e-health information by patients before the consultation with the medical tea, preventing the diseases, and regarding the self-care [34]. In addition, those who actively search for health care information often seek to find such information online by visiting websites based on health information [35]. In other words, the findings of this study indicated that higher EHL leads to more responsibility which can lead to more physical activity and improvement in health status. Further, EHL directly affects nutrition and interpersonal relationships, while the improved EHL can promote health responsibility among the elderly. Thus, all these factors promote healthy behaviors that can have a healthy lifestyle for the healthy elderly.

This study indicated that age has a significant relationship but had a weak correlation with health promotion behaviors, which is inconsistent with others' studies' findings [36], maybe because of the studied people in the same age range. In addition, other factors such as chronic diseases, lack of motivation, and illiteracy lead to the negligence of health behaviors. A significant relationship was found between marital status, health responsibility, nutrition, and interpersonal relationships of the studied units, so that married individuals had higher relationships related to the fact that the married elderly maintain a higher level of social relationships. In contrast, the single elderly become more isolated and have fewer daily activities such as health behaviors [37]. This finding was not consistent with the other findings [38]. Individuals with better



**Correlation between Electronic Health Literacy and Health ...**  
health behaviors have more ability to have a job. Having a job can be regarded as the cause and effect of gaining health information from the Internet.

The significant relationship between HPB and economic status was another finding of this study, which was inconsistent with the study by Ohm [39] since economic areas can have a positive and negative effect on the status of health behaviors. Based on the other findings, lifestyle had a significant relationship with all other components of health behaviors except physical activity. The results of other studies were inconsistent with the present study [36-39]. The fact that the studied elderly had favorable interpersonal relationships can indicate the effect of loneliness on the motivation of the elderly in health behaviors.

In this study, a significant relationship was found between the studied units' academic level and physical activity [40, 41]. The finding was consistent with other studies because the low academic level is another significant barrier for communication and makes people have less access to health information sources such as the Internet. On the other hand, having high education can increase health and quality of life among the elderly. Despite the precision of the researchers, the high number of questions in the questionnaire, fatigue, and impatience of the elderly may affect their answers.

One of the limitations of this study was the lack of female participants as retirees. Also, the cross-sectional design of the present study was another limitation of this study in which cannot be considered as a gold standard design and the level of bias in cross-sectional studies are more. It is suggested to perform further studies with a larger sample size to be generalized. Identifying and evaluating the EHL of the elderly is the first necessary step in improving health behaviors. Finally, further studies are suggested to perform as cohort design with a large sample size.

## Conclusion

There is a correlation between HPB and EHL among the elderly. In addition, EHL affects all the components of HPB positively so that by promoting EHL, all the components will promote. Thus, the improved EHL should be considered a necessary goal for promoting the healthy behaviors of these people because the obtained correlation was significantly positive.

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