

Original Article
Oncology & Hematology



Gap between Perceived eHealth Literacy and Ability to Use Online Cancer-Related Information

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Received: Oct 25, 2019

Accepted: Apr 23, 2020

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Funding

This study was supported by a grant from the National R&D Program for Cancer Control, Ministry of Health and Welfare, Republic of Korea (No. 1720250).

Disclosure

The authors have no potential conflicts of interest to disclose.

ABSTRACT

Background: The effective evaluation of health information available online is an important skill. However, consumers' self-perceptions of their eHealth literacy levels do not reflect their actual capabilities. The goal of this experimental study of online search behavior is to identify differences between self-perceived eHealth literacy and actual ability to use the accuracy of cancer information available online.

Methods: Thirty-one adults participated in the study conducted on July 15 and 16, 2017. We first measured perceived eHealth literacy and then asked participants 5 questions concerning cancer. Bandicam (v3.3.0) and BrowsingHistoryView were used to record search behavior and uniform resource locators, respectively. A Mann-Whitney U test and Fisher's exact test were performed.

Results: The results showed that participants most frequently searched for cancer information on blogs and café websites. Regarding search behavior, those who perceived higher knowledge in available resources tended to solve the given problem with significantly smaller number of webpages to answer a weight management question. Participants who perceived higher knowledge in helpfulness of information tended to use significantly smaller number of webpages to answer questions on red ginseng's preventive effects on cancer and weight management. However, there was no proof that the high eHealth literacy group had significantly higher rates of correct answers than the low eHealth literacy group. Further, regarding cancer screening, the rates of correct answers were low for groups who considered their ability higher to find helpful resources and perceived higher knowledge in helpfulness of information.

Conclusion: There is a gap between perceived eHealth literacy and the actual ability to use online cancer-related information. To fundamentally improve eHealth literacy, it is important to evaluate the actual abilities concerning each eHealth literacy component and to provide customized education.

Keywords: Cancer Information Online; Health Information Search; eHealth Literacy; Decision-making

INTRODUCTION

The number of cancer cases in Korea has steadily risen, as has the number of survivors owing to advancements in medical technology. According to the Korea Central Cancer Registry, the

Author Contributions

Conceptualization: Jo HS. Data curation: Jo HS, Park KH. Formal analysis: Jo HS, Kim SR. Investigation: Jo HS, Kim SR. Writing - original draft: Jo HS, Park KH, Kim SR. Writing - review & editing: Jo HS, Park KH, Kim SR.

number of patients with cancer was 232,255 in 2017, an increase of 38.2% from 2007, when there were 168,027 such patients. Furthermore, the survival rate of patients with cancer over the 5-year period of 2013–2017 was 70.4%, 1.3-fold the survival rate (54.1%) over the period 2001–2005.¹

The internet has become an important source of health-related information, covering topics ranging from lifestyle habits to common illnesses to professional medical knowledge.² In light of the increasing cancer rates, Koreans are increasingly coming to recognize the importance of having access to health-related information on cancer prevention, treatment, and management. According to a 2015 report from the Korea Internet and Security Agency, 72.5% of Korean internet users indicated having accessed health or medical information online.³

However, such increases in the use of online cancer information can have both positive and negative effects. Chae⁴ reported that while the use of online cancer information increases alertness to cancer and encourages screening, it also leads to increased anxiety and worry about health because such information is often not based on scientific evidence. Additionally, since a large proportion of online cancer information is commercially driven, people can be exposed to unreliable information posted for the purpose of encouraging product sales.

In considering the potential negative impact of this exposure to unreliable information, it becomes clear that the risk posed by internet health information depends on the user's ability to identify accurate, quality information and use it to make the necessary health decisions. Consequently, eHealth literacy is an important factor to consider when studying consumers' behavior surrounding internet searches for cancer-related information. Norman and Skinner⁵ defined eHealth literacy as “the ability to search, discover, understand, and evaluate health information from an online source”; They also developed the eHealth Literacy Scale (eHEALS) covering the 6 major aspects of the concept: traditional literacy, health literacy, information literacy, scientific literacy, media literacy, and computer literacy. Many studies have identified eHealth literacy as an important predictive variable for selecting the source of online information.^{6,7} Higher eHealth literacy has been associated with increased interest in online health-related information and also been reported to be strongly correlated with participation in health-related behaviors such as exercise and health screenings.⁸⁻¹²

However, one issue with the current methods of measurement of eHealth literacy is that they rely on individuals' subjective evaluations, which may differ from their actual ability to use online health information. Some studies argue that current measures of eHealth literacy are more closely related to perceived efficacy in searching for online health information than to actual ability.

Noblin et al.¹³ also suggested that efficacy with regard to searching for online health information does not directly relate to actual behaviors. Further, according to a Dutch study, the validity of the eHEALS is questionable and there is limitation because it does not account for an actual performance.¹⁴ However, few empirical studies have investigated the relationship between self-perceived eHealth literacy and an individual's actual ability to use health information.¹⁵ Therefore, more studies are needed to explore this aspect.

In this study, we directly observed adults' behavior as consumers of information while they searched the internet for cancer-related information. We sought to answer the following research questions:

- 1) Where and how do consumers search for cancer-related information online?
- 2) What is the relationship between perceived eHealth literacy and search behavior?

- 3) What is the relationship between perceived eHealth literacy and the ability to use online information?

METHODS

Research participants

Thirty-one participants were recruited from the pool of survey participants in the Korea Data Network, a research institution. The sample comprised adults who reported searching for information at least 5 times per week and were interested in health-related information. Three age categories were created: 20–39 years, 40–59 years, and 60 years or above. About 10 participants were recruited for each group.

Research methods

eHealth literacy was measured using the Korean translation of the eHEALS developed by Norman and Skinner (2006).⁵ The eHEALS comprises 8 questions that measure users' perceived skills, knowledge, and comfort regarding using online health information on a 5-point Likert scale. Park et al.⁹ reported a Cronbach's alpha of 0.875 for this tool, and the Cronbach's alpha in the current study was 0.906.

Participants were asked 5 questions that addressed cancer prevention, maintenance, examination, and treatment, and which reflected the frequently asked questions on the National Cancer Information Center,¹⁶ a cancer-related information website maintained by the Korean National Cancer Center (Table 1).

The study was conducted in the computer room of an institution on July 15 and 16, 2017. For each group, the participants spent 10 minutes completing the eHealth literacy measure and 40–50 minutes searching for information. Half of the computer screen presented a browser for searching, and the other half presented one for reporting responses. Each search started from a blank internet browser page, and participants were allowed to freely search for the answer to the given question. Bandicam (v3.3.0; Bandicam Co., Seoul, Korea) recorded the computer screen and sound to capture the search process. The BrowsingHistoryView program was used to collect the uniform resource locators (URLs) of accessed pages, time of initial page access, frequency of access, and page title, allowing us to view participants' methods of searching for appropriate health information.^{17,18}

Table 1. Questionnaire items for each cancer information category

Categories	Operational definition	Question
Prevention	Red ginseng and cancer prevention (Q1)	Please search for information on whether red ginseng has a preventive effect on cancer and note down your response. (Answer: Yes)
	Alcohol consumption and carcinogenesis (Q2)	Please search for information on whether alcohol consumption is a risk factor for cancer and note down your response. (Answer: Yes)
	Weight management (Q3)	Please write down your weight and height. Please search your weight status according to the 'height and weight chart' (BMI) on the internet and write it down.
Examination	Cancer examination (Q4)	(For the 20s and 30s age groups): Please state the types of cancer for which 65-year-old women and 67-year-old men can get themselves screened by the National Cancer Screening Program this year. (For those aged 40 and older): Please write your birth date and year. Please state the types of cancer for which you can get screened by the National Cancer Screening Program this year.
Treatment	Treatment methods of stomach cancer (Q5)	Imagine that a family member has been diagnosed with stage 2 stomach cancer. Please search for and discuss briefly the treatment methods.

Analysis

The recorded data were coded by 2 researchers involved with this project and a student with a master's degree not involved in the research process. The collected behavioral data were divided into extractable variables such as total time spent searching, search engines used, search keywords, search pages, URLs accessed, and reported responses and then re-coded.

The evaluation of participants' ability to use online information was based on their answers to the 5 questions, which were evaluated by the 2 experts mentioned above. If the 2 experts disagreed on the accuracy of an answer, another medical expert was consulted. Based on the median values of each of the 8 eHEALS questions, the participants were divided into a high eHealth literacy group and a low eHealth literacy group. The data analysis was conducted using SPSS version 23.0 (IBM Corp., Armonk, NY, USA).

Search characteristics were identified through frequency analysis and descriptive statistics of search page types, correct answer rates, number of page views, and number of search keywords for each question. A nonparametric statistical analysis and Mann-Whitney U test were conducted to examine the differences in page views between the high and low eHealth literacy groups. Furthermore, Fisher's exact test was performed to examine the relationship between the level of perceived eHealth literacy and the proportion of correct responses by question. *P* values of less than 0.05 were considered statistically significant.

Ethics statement

This study conformed to the principles of the Declaration of Helsinki regarding the treatment of human participants and was approved by the Institutional Review Board of Kangwon National University (KWNUIRB-2017-04-002-001). All participants provided written informed consent.

RESULTS

General participant and search-related characteristics

Of the 31 participants, 17 were men and 14 women (Table 2). Ten participants were aged 20–39, 11 aged 40–59, and 10 aged 60 or above. Participants had a high educational level, with 27 (87.1%) possessing a college degree (including professional colleges).

The mean values for each question concerning perceived eHealth literacy were 4.32 for “I know how to find helpful health resources on the internet,” 4.00 for “I know how to use the internet to answer my health questions,” 4.00 for “I know what health resources are available on the internet,” 4.32 for “I know where to find helpful health resources on the internet,” 4.10 for “I know how to use the health information I find on the internet to help me,” 3.48 for “I have the skills to evaluate the health resources I find on the internet,” 3.58 for “I can tell high-quality from low-quality health resources on the internet,” and 4.03 for “I feel confident about using information from the internet to make health decisions.” The scores were lowest for the items concerning skills needed to evaluate health resources and the ability to distinguish between high- and low-quality information.

Participant characteristics as demonstrated by the online search

The participants spent 31 minutes and 42 seconds, on average, searching for information on all 5 questions. Most of them (58.1%) used a single search engine to find answers to all 5 questions. Eight participants (25.8%) used 2 search engines, and 5 (16.1%) used 3 or more.

Table 2. Demographic and search behavior characteristics of study participants

Variables	Values
Demographic characteristics	
Total	31 (100.0)
Gender	
Men	17 (54.8)
Women	14 (45.2)
Age group (yr)	
20–39	10 (32.3)
40–59	11 (35.5)
≥ 60	10 (32.3)
Educational level	
Middle school graduate or lower	1 (3.2)
High school graduate	3 (9.7)
College (including professional college) graduate or higher	27 (87.1)
Search behavior characteristics	
No. of search engines used	
1 search engine	18 (58.1)
2 search engines	8 (25.8)
3 or more	5 (16.1)
Search start site	
Naver	19 (61.3)
Daum	7 (22.6)
Google	5 (16.1)
Time required, min	31.42 ± 9.24
Perceived eHealth literacy	
eHLQ1. I know how to find helpful health resources on the internet.	4.32 ± 0.65
eHLQ2. I know how to use the internet to find answers to my health questions.	4.00 ± 0.63
eHLQ3. I know what health resources are available on the internet.	4.00 ± 0.68
eHLQ4. I know where to find helpful health resources on the internet.	4.32 ± 0.54
eHLQ5. I know how to use the health information I find on the internet to help me.	4.10 ± 0.79
eHLQ6. I have the skills to evaluate the health resources I find on the internet.	3.48 ± 0.72
eHLQ7. I can tell high-quality from low-quality health resources on the internet.	3.58 ± 0.81
eHLQ8. I feel confident about using information from the internet to make health decisions.	4.03 ± 0.75

Data are presented as number (%) or mean ± standard deviation.
eHL = eHealth literacy.

The most commonly used search engine was Naver, which was used by 19 participants (61.3%), followed by Daum, used by 7 participants (22.6%), and Google, used by 5 participants (16.1%) (Table 2).

We analyzed participants' characteristics with regard to searching for cancer-related information to answer a given question (Table 3). Participants showed similar characteristics with regard to entering keywords in the search engine: most used 1 or 2 words directly in the form of phrases. Only 2 participants used operators such as "&" and "*." According to an analysis of the page types explored by participants, café websites and blogs were the most frequently visited for all 5 questions.

The proportion of correct answers for each question was as follows: 93.5% for "Red ginseng and cancer prevention," 77.4% for both "Alcohol consumption and carcinogenesis" and "Weight management," and 74.2% for both "Cancer examination" and "Treatment methods of stomach cancer."

Next, we measured the number of page views. On average, participants visited 1.4 pages to answer the "Red ginseng and cancer prevention" question, 1.58 pages to answer the

Table 3. Characteristics of search behavior by question

Characteristics	Red ginseng and cancer prevention	Alcohol consumption and carcinogenesis	Weight management	Cancer examination	Treatment methods of stomach cancer
Page types ^a					
Blogs and café websites	27 (45.0)	18 (36.7)	21 (35.6)	40 (48.8)	83 (43.7)
News	21 (35.0)	10 (20.4)	3 (5.1)	3 (3.7)	21 (11.1)
Knowledge-sharing portal	6 (10.0)	2 (4.1)	3 (5.1)	5 (6.1)	36 (18.9)
Korean National Cancer Information Center	1 (1.7)	1 (2.0)	0 (0.0)	12 (14.6)	9 (4.7)
Encyclopedia	1 (1.7)	13 (26.5)	10 (16.9)	1 (1.2)	14 (7.4)
Misc.	4 (6.7)	5 (10.2)	22 (37.3)	21 (25.6)	27 (14.2)
Correct answers	29 (93.5)	24 (77.4)	24 (77.4)	23 (74.2)	23 (74.2)
No. of page views	1.94 ± 1.389	1.58 ± 1.148	1.90 ± 1.700	2.65 ± 2.823	6.13 ± 5.536
No. of search keywords	1.84 ± 1.214	1.26 ± 0.682	1.84 ± 1.267	2.45 ± 3.325	3.13 ± 3.096

Data are presented as number (%) or mean ± standard deviation.

^aMultiple selections.

“Alcohol consumption and carcinogenesis” question, 1.90 pages to answer the “Weight management” question, 2.56 pages to answer the “Cancer examination” question, and 6.13 pages to answer the “Treatment methods of stomach cancer” question. Participants viewed progressively more pages as they moved from questions regarding cancer prevention to examination to treatment. The average numbers of keywords used for “Red ginseng and cancer prevention” (1.84), “Alcohol consumption and carcinogenesis” (1.26), and “Weight management” (1.84) were lower than the average numbers for “Cancer examination” (3.13) and “Treatment methods of stomach cancer” (2.45). Compared to the cancer prevention question, participants searched for more keywords to answer the questions regarding cancer examination and treatment.

Relationship between perceived eHealth literacy and search behavior

Regarding search behavior, those who perceived higher knowledge in available resources tended to solve the given problem with significantly smaller number of webpages to answer a weight management question (Table 4). Participants who perceived higher knowledge in helpfulness of information tended to use significantly smaller number of webpages to answer questions on red ginseng's preventive effects on cancer and weight management ($P < 0.05$).

Relationship between perceived eHealth literacy and actual ability to use online cancer information

In analyzing the relationship between perceived eHealth literacy and actual ability to use online cancer information, there was no evidence that the group with high eHealth literacy had significantly higher rates of correct answers (Table 5). Further, regarding cancer screening, the rates of correct answers were low for groups who considered their ability higher to find helpful resources and perceived higher knowledge in helpfulness of information ($P < 0.05$).

DISCUSSION

In this study, direct observation of people's searches for online cancer information illustrated key characteristics of search behavior. The results showed that participants predominantly entered keywords into major search engines rather than directly typing in a URL or visiting a specific health information website. This result is in accordance with those of prior empirical studies of online searches for health information.^{15,19,20} It is notable that search engines act as a gateway to information, absorbing the demand for health information and moderating

Table 4. Relationship between perceived eHealth literacy and number of page views

Variables	Red ginseng and cancer prevention		Alcohol consumption and carcinogenesis		Weight management		Cancer examination		Treatment methods of stomach cancer	
	MR	U	MR	U	MR	U	MR	U	MR	U
eHL-Q1		136.500		98.000		161.500		139.500		158.000
High (n = 13)	14.50		17.46		12.58		14.27		12.85	
Low (n = 18)	17.08		14.94		18.47		17.25		18.28	
eHL-Q2		108.000		90.000		108.000		91.000		114.000
High (n = 6)	10.50		13.50		10.50		13.33		9.50	
Low (n = 25)	17.32		16.60		17.32		16.64		17.56	
eHL-Q3		115.500		96.000		136.000 ^a		109.000		113.500
High (n = 7)	11.50		14.29		8.57		12.43		11.79	
Low (n = 24)	17.31		16.50		18.17		17.04		17.23	
eHL-Q4		135.500		112.000		127.000		139.000		142.500
High (n = 11)	13.68		15.82		14.45		13.36		13.05	
Low (n = 20)	17.27		16.10		16.85		17.45		17.62	
eHL-Q5		158.000 ^a		132.000		166.000 ^a		107.000		147.000
High (n = 11)	11.64		14.00		10.91		16.27		12.64	
Low (n = 20)	18.40		17.10		18.80		15.85		17.85	
eHL-Q6		151.500		130.000		166.500		129.000		134.500
High (n = 15)	13.90		15.33		12.90		15.40		15.03	
Low (n = 16)	17.97		16.62		18.91		16.56		16.91	
eHL-Q7		84.000		72.000		67.000		65.000		81.000
High (n = 4)	8.50		11.50		12.75		13.25		9.25	
Low (n = 27)	17.11		16.67		16.48		16.41		17.00	
eHL-Q8		111.500		108.500		116.500		92.500		106.500
High (n = 8)	13.56		13.94		12.94		15.94		14.19	
Low (n = 23)	16.85		16.72		17.07		16.02		16.63	

MR = mean rank, U = Mann-Whitney U statistic, eHL = eHealth literacy.

^aP < 0.05.

connections to specific websites based on their perspective standards. Consequently, preferences for the sites appearing in search engine results can be controlled by commercial marketing strategies. Thus, the public may be well served by a mechanism that enables the identification of sites that provide high-quality information on cancer by specifying certain keywords or hashtags in search engines.

Another noteworthy result was that the sites most frequently visited to find answers to all the questions were café websites and blogs rather than governmental or other reputable websites. A previous study analyzing cancer-related keywords from social networking services used by Koreans within the past 3 years showed that blogs and café websites contained the highest number of commercial keywords of all social networking service channels, with commercial keywords accounting for 16.8% of the words in blogs and 22.7% of the words in café websites.²¹

These findings can be attributed to the Korean internet search environment. On Korean portals, the results of internal database searches related to blogs and café websites are placed on the top of the search results page.²² As internet users most frequently view the top search results, they tend to come across blogs and café websites often. Furthermore, previous research has shown that in the case of several diseases, including cancer, people are most likely to trust information from online forums and social networking services, where users exchange personal stories and share practical tips.²³⁻²⁵

However, cancer-related information provided via café websites and blogs is problematic in that it is not tested for scientific merit or the influence of commercial entities posting the information for marketing purposes.²⁶ Anecdotal information may also be low in

Table 5. Relationship between perceived eHealth literacy and actual ability to use online cancer-related information

Perceived eHealth literacy	Actual ability to use online cancer-related information									
	Red ginseng and cancer prevention		Alcohol consumption and carcinogenesis		Weight management		Cancer examination		Treatment methods of stomach cancer	
	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect
eHL-Q1										
High (n = 13)	84.6	15.4	69.2	30.8	76.9	23.1	53.8	46.2	69.2	30.8
Low (n = 18)	100.0	0.0	83.3	16.7	72.2	27.8	88.9	11.1	77.8	22.2
P value ^a	0.168		0.413		1.000		0.043		0.689	
eHL-Q2										
High (n = 6)	100.0	0.0	66.7	33.3	66.7	33.3	66.7	33.3	66.7	33.3
Low (n = 25)	92.0	8.0	80.0	20.0	76.0	24.0	76.0	24.0	76.0	24.0
P value	1.000		0.596		0.634		0.634		0.634	
eHL-Q3										
High (n = 7)	100.0	0.0	71.4	28.6	57.1	42.9	57.1	42.9	57.1	42.9
Low (n = 24)	91.7	8.3	79.2	20.8	79.2	20.8	79.2	20.8	79.2	20.8
P value	1.000		0.642		0.335		0.335		0.335	
eHL-Q4										
High (n = 11)	81.8	18.2	72.7	27.3	72.7	27.3	63.6	36.4	81.8	18.2
Low (n = 20)	100.0	0.0	80.0	20.0	75.0	25.0	80.0	20.0	70.0	30.0
P value	0.118		0.676		1.000		0.405		0.676	
eHL-Q5										
High (n = 11)	90.9	9.1	72.7	27.3	72.7	27.3	45.5	54.5	63.6	36.4
Low (n = 20)	95.0	5.0	80.0	20.0	75.0	25.0	90.0	10.0	80.0	20.0
P value	1.000		0.676		1.000		0.012		0.405	
eHL-Q6										
High (n = 15)	93.3	6.7	73.3	26.7	60.0	40.0	73.3	26.7	80.0	20.0
Low (n = 16)	93.8	6.3	81.3	18.8	87.5	12.5	75.0	25.0	68.8	31.3
P value	1.000		0.685		0.113		1.000		0.685	
eHL-Q7										
High (n = 4)	75.0	25.0	75.0	25.0	75.0	25.0	50.0	50.0	75.0	25.0
Low (n = 27)	96.3	3.7	77.8	22.2	74.1	25.9	77.8	22.2	74.1	25.9
P value	0.245		1.000		1.000		0.268		1.000	
eHL-Q8										
High (n = 8)	87.5	12.5	75.0	25.0	75.0	25.0	62.5	37.5	62.5	37.5
Low (n = 23)	95.7	4.3	78.3	21.7	73.9	26.1	78.3	21.7	78.3	21.7
P value	0.456		1.000		1.000		0.393		0.393	

Data are presented as percentage (%).

eHL = eHealth literacy.

^aP-value: Fisher's exact test.

trustworthiness and may distort facts. Therefore, there is a need for a systematic process that allows for the sharing of appropriate information. Power bloggers and popular café websites that provide information on cancer and health should be monitored to prevent the dissemination of distorted or commercial information. We confirmed the existence of a gap between perceived eHealth literacy and the actual ability to use online cancer-related information. Although better accessibility to health information makes it easier to find informative sites, on the question related to finding the right cancer screening types, the rates of correct answers were low for those who reported knowing the available health resources and who reported knowing how to use health information. These results indicate that while perceived eHealth literacy can serve as a way to evaluate the level of accessibility of health information on the internet, it is limited in its ability to reflect the level of understanding of the information internalized in the concept of eHealth literacy and the ability to apply such information to solving specific health problems. Although the eHEALS is widely used to measure an individual's ability to understand online health information, it has drawn criticism from those who believe it does not actually reflect eHealth literacy. Gilstad²⁷ claims that the eHEALS does not consider societal factors such as social norms, culture, and

beliefs and, therefore, cannot accurately estimate one's understanding of health information. Nguyen et al.²⁸ also criticized the lack of psychological evidence supporting the eHEALS.

Overall, even though participants may have conducted internet searches frequently, felt comfortable with using the internet, and believed that their ability to find information on the internet was high, the results showed that they lacked a systematic search strategy for finding health-related information. While the ability to find information on cancer can be important if there is a dearth of related information online, the increase in commercial and inaccurate information makes the ability to accurately assess information ever more important. When individuals lack the ability to assess information quality but are easily able to access health information from sites that they habitually use, their decision-making can be poor in situations where they need to obtain accurate information, apply it to their own situation, and engage in problem-solving.

Regardless of whether the eHEALS is used, there is a clear need to bridge the gap between perceived efficacy and the actual ability to use online health information. One effective intervention strategy might be for the government and educators to train consumers on how to search for accurate cancer information online and assess the quality of search results. Upon completion of the intervention, a study will need to be conducted to assess improvements, if any, in eHealth literacy as a result of the training.

We used convenience sampling to select a subset of adults from metropolitan areas as participants. Therefore, the results may not be generalizable to all consumers of online cancer information. However, our study is meaningful in that we observed the actual search behavior of consumers of online information. This study analyzed only the search history and question responses from time-limited internet searches for cancer information. Future research should consider a longer-term investigation to identify search patterns for online information in day-to-day life.

Our results showed a gap between self-perceived efficacy in using online health information and actual use ability. Overall, even though participants conducted frequent internet searches and felt comfortable using the internet, the results showed that they lacked a systematic search strategy for finding online health information.

This study demonstrates the need not only for an increase in access to online health information but also an effort to improve internet users' ability to evaluate such information and apply it to decision-making. This would require an effective educational intervention to bridge the gap between perceived efficacy and actual ability.

REFERENCES

1. National Cancer Center. Cancer registration statistics. <https://ncc.re.kr/cancerStatsList.ncc?sea>. Updated 2019. Accessed December 31, 2019.
2. Choung JT, Lee YS, Jo HS, Shim M, Lee HJ, Jung SM. What factors impact consumer perception of the effectiveness of health information sites? An investigation of the Korean National Health Information Portal. *J Korean Med Sci* 2017;32(7):1077-82.
[PUBMED](#) | [CROSSREF](#)
3. Korea Internet & Security Agency. Survey on computer and internet usage. <http://isis.kisa.or.kr>. Update 2015. Accessed March 8, 2018.

4. Chae J. Online cancer information seeking increases cancer worry. *Comput Human Behav* 2015;52:144-50.
[CROSSREF](#)
5. Norman CD, Skinner HA. eHEALS: the eHealth Literacy Scale. *J Med Internet Res* 2006;8(4):e27.
[PUBMED](#) | [CROSSREF](#)
6. Zhang Y, Sun Y, Kim Y. The influence of individual differences on consumer's selection of online sources for health information. *Comput Human Behav* 2017;67:303-12.
[CROSSREF](#)
7. Wong DK, Cheung MK. Online health information seeking and eHealth literacy among patients attending a primary care clinic in Hong Kong: a cross-sectional survey. *J Med Internet Res* 2019;21(3):e10831.
[PUBMED](#) | [CROSSREF](#)
8. Britt RK, Collins WB, Wilson K, Linnemeier G, Englebert AM. eHealth literacy and health behaviors affecting modern college students: a pilot study of issues identified by the American College Health Association. *J Med Internet Res* 2017;19(12):e392.
[PUBMED](#) | [CROSSREF](#)
9. Park DJ, Kwon MS, Choi J. The influence of health information orientation, attitude of internet health information, and e-Health literacy on personal health behaviors. *J Public Relat Res* 2013;17(3):379-413.
[CROSSREF](#)
10. Kim SH, Son YJ. Relationships between eHealth literacy and health behaviors in Korean adults. *Comput Inform Nurs* 2017;35(2):84-90.
[PUBMED](#) | [CROSSREF](#)
11. Mitsutake S, Shibata A, Ishii K, Oka K. Associations of eHealth literacy with health behavior among adult internet users. *J Med Internet Res* 2016;18(7):e192.
[PUBMED](#) | [CROSSREF](#)
12. Xesfingi S, Vozikis A. eHealth literacy: in the quest of the contributing factors. *Interact J Med Res* 2016;5(2):e16.
[PUBMED](#) | [CROSSREF](#)
13. Noblin AM, Cortelyou-Ward K, Rutherford A. Weathering the storm: disaster preparedness and the Florida health information exchange. *Int J Priv Health Inf Manag* 2016;4(2):53-61.
[CROSSREF](#)
14. van der Vaart R, van Deursen AJ, Drossaert CH, Taal E, van Dijk JA, van de Laar MA. Does the eHealth Literacy Scale (eHEALS) measure what it intends to measure? Validation of a Dutch version of the eHEALS in two adult populations. *J Med Internet Res* 2011;13(4):e86.
[PUBMED](#) | [CROSSREF](#)
15. Quinn S, Bond R, Nugent C. Quantifying health literacy and eHealth literacy using existing instruments and browser-based software for tracking online health information seeking behavior. *Comput Human Behav* 2017;69:256-67.
[CROSSREF](#)
16. Korean National Cancer Information Center. Questions and answers/prevention FAQ. <https://www.cancer.go.kr/lay1/bbs/S1T674C676/E/22/list.do>. Updated 2017. Accessed June 10, 2017.
17. Pang PC, Chang S, Verspoor K, Pearce J. Designing health websites based on users' web-based information-seeking behaviors: a mixed-method observational study. *J Med Internet Res* 2016;18(6):e145.
[PUBMED](#) | [CROSSREF](#)
18. Song DJ, Choi JW, Kim K, Kim MS, Moon JM. Quasi-experiment study on effectiveness evaluation of health communication strategies. *J Korean Med Sci* 2016;31(7):1027-36.
[PUBMED](#) | [CROSSREF](#)
19. Eysenbach G, Köhler C. How do consumers search for and appraise health information on the world wide web? Qualitative study using focus groups, usability tests, and in-depth interviews. *BMJ* 2002;324(7337):573-7.
[PUBMED](#) | [CROSSREF](#)
20. Hansen DL, Derry HA, Resnick PJ, Richardson CR. Adolescents searching for health information on the Internet: an observational study. *J Med Internet Res* 2003;5(4):e25.
[PUBMED](#) | [CROSSREF](#)
21. Shim M, Jo HS, Jung SM. The associations of online health information search and eHealth literacy with perceived information usefulness: analysis in the context of diet and weight control. *Health Policy Manag* 2018;28(2):119-27.
22. Seol J. A comparative study of internet search engines: Naver versus Google. *J Commun Sci* 2011;11(1):157-86.
23. Blanch-Hartigan D, Blake KD, Viswanath K. Cancer survivors' use of numerous information sources for cancer-related information: does more matter? *J Cancer Educ* 2014;29(3):488-96.
[PUBMED](#) | [CROSSREF](#)

24. Maloney EK, D'Agostino TA, Heerdt A, Dickler M, Li Y, Ostroff JS, et al. Sources and types of online information that breast cancer patients read and discuss with their doctors. *Palliat Support Care* 2015;13(2):107-14.
[PUBMED](#) | [CROSSREF](#)
25. Zhang S, O'Carroll Bantum E, Owen J, Bakken S, Elhadad N. Online cancer communities as informatics intervention for social support: conceptualization, characterization, and impact. *J Am Med Inform Assoc* 2017;24(2):451-9.
[PUBMED](#) | [CROSSREF](#)
26. Jo HS, Song TM, Kim BG. Analysis of the factors affecting consumer acceptance of accredited online health information. *J Korean Med Sci* 2017;32(11):1757-63.
[PUBMED](#) | [CROSSREF](#)
27. Gilstad H. Toward a comprehensive model of eHealth literacy. In: *Proceedings of the 2nd European Workshop on Practical Aspects of Health Informatics*. 2014 May 19–20; Trondheim, Norway. [place unknown]: CEUR-WS.org; 2014, 63-72.
28. Nguyen J, Moorhouse M, Curbow B, Christie J, Walsh-Childers K, Islam S. Construct validity of the eHealth Literacy Scale (eHEALS) among two adult populations: a Rasch analysis. *JMIR Public Health Surveill* 2016;2(1):e24.
[PUBMED](#) | [CROSSREF](#)