

The impact of internet health information usage habits on older adults' e-health literacy

DIGITAL HEALTH
Volume 10: 1–8
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DOI: 10.1177/20552076241253473
journals.sagepub.com/home/dhj



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Abstract

Objective: As the demand and supply sides of popular health services increasingly rely on the Internet, mastering e-health literacy should become an essential skill for older adults. The aim of this article is to analyse the effects of Internet health information usage habits on older adults' e-health literacy and to investigate the influencing mechanisms.

Methods: Using a combination of random sampling and convenient sampling, data were collected through questionnaire surveys. Data from 776 older adults was analysed using correlation and hierarchical regression to analyse.

Results: The mean scores for all aspects of older adults' habits of using health information on the Internet and electronic health literacy were relatively high. There was no statistically significant difference in the predictive power of the three aspects of electronic health literacy among older adults with different genders, health statuses, education levels and ages ($p > 0.05$). The four factors of older adults' habits of using Internet health information can increase the explanatory power of application ability, judgment ability and decision-making ability in Model 2 by 53.7%, 46.2% and 57%, respectively, with statistical significance ($p < 0.001$).

Conclusion: The better the habits of older adults in using health information on the Internet, the higher their level of electronic health literacy. Families, communities and social groups should help older adults use online health resources to improve their e-health literacy. Older adults can use WeChat or other interpersonal information platforms to share online health information with each other.

Keywords

Habit of using internet health information, application ability, judgment ability, decision-making ability, e-Health

Submission date: 31 January 2024; Acceptance date: 22 April 2024

Introduction

With the development of new network media, the proliferation of cloud services and the popularization of smart devices, people can feel the social benefits of big data, and the benefit of disseminating health information on the Internet is one of them. Especially in the prevention and control of COVID-19, the Internet and health information enable and strengthen the 'anti-epidemic' with significant social benefits. In recent years, domestic and foreign scholars have attached great importance to this research area. Health information on the Internet is increasingly becoming a new space for people to learn about, live with as well as deal with health and medical care, and a new platform for accessing public services. Research on e-health information

literacy among older adults is one of the hotspots, e-health literacy refers to the ability to search for, understand, and evaluate online health information and to use the information obtained to address and solve health problems.¹ Some scholars believe that e-health literacy reflects a person's comprehensive ability to solve their health problems.² Building electronic health literacy requires a

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process of internalizing an individual's ability to acquire, understand and use health information. Electronic health literacy helps individuals to promote their own health.^{3,4} The digital transformation of health information services is a technological innovation that older adults need to embrace. It helps to improve the accessibility of medical and health services and health knowledge for older adults. It can effectively reduce the impact of income inequality on disparities in access to medical and health services in order to achieve health equity.⁵ E-health literacy is also key to enabling older adults to benefit from the digital dividend of health information services. Improving e-health literacy helps to improve the physical health of older adults.

Against the background of an aging population, the increase in chronic diseases and the ever-growing demand for health information among older adults, e-health literacy among older adults has become a research priority. However, there is still room for further improvement in the e-health literacy of older adults.^{6,7} Some scholars believe that the Internet is more beneficial for groups with higher levels of education and that differences in educational attainment among older adults may extend to the digital space, creating a cumulative advantage that leads to new health inequalities and potentially widening the digital divide in older adults' health literacy.⁸ In addition, the impact of e-health literacy on different health conditions of older adults varies due to individual differences such as gender, age, health status and limitations associated with urban and rural areas and class structure. Gender differences in social resources and education levels result in men using the Internet more frequently than women. There are significant differences in the application of information technology among older youth groups. As a result, older adults are often excluded from the digital society and become digital refugees.⁹ Compared to the privileged classes, disadvantaged groups tend to have significant gaps in access to and ability to use information technology. People in poor health, older age, lower income and education levels face significant barriers to digital inclusion.¹⁰ Therefore, differences in personal characteristics and social structures mean that different groups have different digital resources and differ in their ability to use digital technology to improve physical health. Some studies suggest that older adults' level of e-health literacy is related to their online health information use habits.¹¹ Higher e-Health literacy is associated with more positive health behaviours and better health knowledge and attitudes among older adults.^{12,13} Some scholars have identified relative weaknesses in e-health literacy among older adults. Weaknesses include low knowledge of how to use the Internet to answer their own health questions and weak skills in evaluating good and bad information about online health resources.¹⁴ Therefore, an in-depth study of the relationship between older adults' habits of using online health information and their e-health literacy is of

great value. There are few studies in the available literature on the level of e-health literacy of older adults and their habits of using online health information. However, older adults who frequently consult online health information have more robust skills to perform their health behaviours.¹⁵ Based on the existing literature review, this study aims to further investigate the relationship between these two by refining the implicit and independent variables and using hierarchical regression analysis. I hope that these theoretical results will contribute to the promotion of healthy aging.

Materials and methods

Research subjects

In this study, a cross-sectional study was conducted using a combination of random and convenience sampling to select 30 communities in Luoyang City. The study focused on the older adults in these communities who were the subjects of the questionnaire survey. The questionnaire was either completed by the participants themselves or assisted by the researchers. In each community, 30 older adults were selected as the primary research subjects. Inclusion criteria: (1) they were able to communicate linguistically and move themselves; (2) they were ≥ 60 years old; (3) they had ≥ 1 year of experience using the Internet, including searching for health information and (4) they voluntarily participated in this survey and signed the informed consent form. Exclusion criteria: (1) who were unable to complete the questionnaire due to hearing or visual impairment and (2) who were unable to provide complete information.

With the help of the community managers, based on the data of the older adults in the community office, the researchers informed the older adults to gather in the community workshop. And then we conducted the study with their informed consent. Before the survey, the researchers introduced the purpose and importance of the study to the older adults to gain their support. The questionnaire was distributed and collected on site, and the survey was completed within 60 min. During the survey, the researchers answered the older adults' questions about the questions in the questionnaire. They did not explain other topics to ensure that they fully understood the content of the questionnaire and to avoid other confounding factors as much as possible. After completing the questionnaire, the researchers collected the questionnaires and checked them individually. They reminded the older adults to fill in any missing information in time to ensure that the questionnaire was completed as fully as possible. Finally, 38 older adults were randomly interviewed about their habits in using health information from the Internet and their e-health literacy. The aim is to gain an in-depth understanding of the situation of older adults in this area.

Investigation tools

Survey on the background information and internet health information use habits of older adults. The researcher discussed the research framework with three experts. The researcher independently designed the research plan for the project based on the results of the discussions. Regarding the age classification of older adults, the World Health Organization (WHO) defines young older adults as those aged 60–74 years. However, the current global standard for categorizing older adults varies. In developing countries, people aged 60 and over are considered older adults, while in the developed countries of Europe and America, people aged 65 and over are considered older adults. The Geriatrics Division of the Chinese Medical Association stipulates that people aged 60 and over are considered older adults.

Contents of the older adults background material survey: Gender (Female, male. Assigned values in the order 1, 2), age (age groups: 60–62, 63–64, 65–67, ≥ 68 . Assigned values in the order 1, 2, 3, 4), education level (education level categories: primary school education or below, middle (or high) school education, college degree or above. Assigned values in the order 1, 2 and 3 respectively) and health status (health status categories: unhealthy status: feeling unwell or ill in the last eight weeks; healthy status. Assigned values in the order 1, 2).

The researcher discussed the content of the health information utilization questionnaire with three experts and then attempted to test the feasibility of the questionnaire content with 30 older adults. The Cronbach's α coefficient of the scale was 0.805. Some words and sentences that were difficult to understand were modified and finally formed into the questionnaire. The questionnaire on the use of online health information consists of four factors: frequency of using online health information, forwarding and sharing online health information, using online health information to regulate one's behaviour and a positive attitude towards online health information. Each item is rated on a scale of 1–5 points from 'never/very unreliable' to 'very often/very reliable'. The higher the score, the higher the level of agreement with the content of the respective item. In this study, the Cronbach's α coefficient for this scale was 0.822.

E-health literacy scale. This scale was proposed by Norman and other scientists in 2006. Chinese scientists such as Guo Shuaijun have adapted it for Chinese use.¹⁶ The scale is divided into three dimensions: ability to use online health information and services (5 item factors), evaluation ability (2 item factors) and decision-making ability (1 item factor) with a total of 8 items. Each item factor is rated with a score of 1 to 5 on a scale from 'very inconsistent' to 'very consistent', with a total score of 8 to 40. The higher the score, the higher the self-perceived e-health

competence. In this study, the Cronbach's α coefficient of this scale was 0.852.

Data processing

The data were compiled using Excel and processed using SPSS20.0, whereby the analysis was mainly carried out using correlation and hierarchical regression analyses. The data of all scale factors are normally distributed (kurtosis 0.200–0.966, skewness 0.762–0.416). All tests were performed with a bilateral α -level of <0.05 to indicate statistical significance.

Results

Demographic characteristics

The questionnaire was distributed and collected on site and the survey was completed within 60 min. A total of 923 questionnaires were distributed, of which 878 were collected. After excluding 226 incomplete questionnaires, 776 valid questionnaires remained. The statistical results are shown in Table 1. Based on the research objectives and the research framework, the researchers categorized the physical health status of the 776 older adults into healthy and unhealthy groups. Those who felt unwell or showed symptoms of illness were categorized as unhealthy. The data collected showed that more older adults had a middle (or high) level of education and an unhealthy status.

Statistical analysis of internet health information usage habits and e-health literacy

Factor mean and correlation analysis. The mean scores for the four factors of habits of using Internet health information and the three factors of e-health literacy range from 3.92 to 4.36, indicating that older adults have good habits of using Internet health information and have a high level of e-health literacy (Table 2). There is a statistically significant correlation between the seven factors ($p < 0.01$), which is positive and indicates that the better the habits of older adults in using health information on the Internet, the higher their e-health literacy.

Analysis of the impact of internet health information usage habits on e-health literacy

In the hierarchical regression analysis, the four aspects of older adults' habits of using health information on the Internet are used as independent variables. And the three aspects of older adults' electronic health literacy are dependent variables. Initially, gender, health, culture and age status are the first-level factors for the regression analysis (Model 1). Then, four additional factors are added:

Table 1. Demographic characteristics.

Variables	Scale	N (%)	Variables	Scale	N (%)
Gender	Female	395(50.9%)	Health condition	Health status	345(44.5%)
	Male	381(49.1%)		Non-healthy state	431(55.5%)
Education level	Primary school education or below	155(20.0%)	Age (years old)	60–62	238(30.7%)
				63–64	170(21.9%)
				65–67	205(26.4%)
				68–71	163(21.0%)
Middle (or high) school education	334(43.0%)				
College degree or above	287(37.0%)				

Table 2. Average and Pearson correlation analysis.

Factor (representative symbol)	M ± SD	A1	A2	A3	A4	B1	B2	B3
Frequency of browsing online health information (A1)	3.92 ± 0.852	1	0.483**	0.237**	0.306**	0.561**	0.521**	0.578**
Forwarding and sharing network health information (A2)	4.11 ± 0.752	0.483**	1	0.298**	0.270**	0.666**	0.615**	0.698**
Recognition attitude towards online health information (A3)	4.36 ± 0.676	0.237**	0.298**	1	0.375**	0.144**	0.123**	0.185**
Use online health information to regulate your behavior (A4)	4.05 ± 0.762	0.306**	0.270**	0.375**	1	0.315**	0.288**	0.274**
Applied ability (B1)	4.01 ± 0.782	0.561**	0.666**	0.144**	0.315**	1	0.933**	0.847**
Judgment ability (B2)	3.97 ± 0.799	0.521**	0.615**	0.123**	0.288**	0.933**	1	0.794**
Decision-making ability (B3)	4.06 ± 0.790	0.578**	0.698**	0.185**	0.274**	0.847**	0.794**	1

Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

frequency of browsing online health information, forwarding and sharing online health information, using online health information to regulate one's own behaviour and attitude towards online health information. These four factors are used as second-level factors for the regression analysis (Model 2). According to the statistical analysis, there is no covariance between the variables. The factor tolerance ranges from 0 to 1, and the variance inflation factor ranges from 1.003 to 1.399, which is consistent with the statistical analysis.

Table 3 shows that the habits of using Internet health information predict the application ability, critical judgment ability and decision-making ability of electronic health literacy in older adults. In Model 1, the control variables of gender, health, culture and age have no statistical significance in predicting the three levels of electronic health literacy ($p > 0.05$). The strength of the explanation

is 4%, 0.4% and 0.2%, respectively. In Model 2, after adding factors such as frequency of searching for online health information, forwarding and sharing of online health information, use of online health information for behaviour regulation and attitude towards online health information, the ability to use, critical appraisal ability and decision-making ability can be predicted by 54.1%, 46.6% and 57.2%, respectively. Compared with Model 1, the explanation of Model 2 increased by 53.7%, 46.2%, and 57%, respectively, with statistical significance ($p < 0.001$). Suggesting that the habits of using Internet health information are significant factor influencing the level of e-health literacy among older adults, especially the level of decision-making ability ($\Delta R^2 = 57\%$). The standardized regression coefficients show that the level of sharing and exchanging online health information has the greatest influence on the three levels. The three levels are electronic

Table 3. Stratum regression analysis of internet health information use habits on e-health literacy.

Independent variable	Application Ability		Judging ability		Decision-making ability	
	Mode 1	Mode 2	Mode 1	Mode 2	Mode 1	Mode 2
	β (t value)	β (t value)	β (t value)	β (t value)	β (t value)	β (t value)
Healthy	-0.034 (-0.935)	-0.011 (-0.428)	-0.022 (-0.598)	0.001 (0.046)	-0.004 (-0.119)	0.007 (0.301)
Gender	0.032(0.879)	-0.006 (-0.227)	0.044 (1.207)	0.010 (0.365)	0.003 (0.094)	-0.040 (-1.676)
Culture	-0.039 (-1.082)	-0.001 (-0.025)	-0.034 (-0.933)	0.002 (0.086)	-0.024 (-0.674)	0.010 (0.431)
Age range	-0.031 (-0.851)	-0.032 (-1.279)	-0.038 (-1.04)	-0.040 (-1.489)	-0.040 (-1.097)	-0.031 (-1.289)
A1		0.300*** (10.449)		0.283*** (9.141)		0.310*** (11.185)
A2		0.524*** (18.119)		0.484*** (15.509)		0.558*** (19.978)
A3		0.135*** (4.894)		0.139*** (4.679)		0.080** (3.014)
A4		0.134*** (4.812)		0.126*** (4.211)		0.061* (2.286)
F value	0.813	112.985	0.851	83.688	0.427	128.092
R^2	0.04	0.541	0.004	0.466	0.002	0.572
ΔR^2	0.04	0.537	0.004	0.462	0.002	0.570
P	0.517	0.000	0.493	0.000	0.789	0.000

Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

health literacy of older adults (β : 0.484–0.558), while the use of online health information to regulate one's own behaviour (β : 0.061–0.134), attitude towards online health information (β : 0.08–0.139) and the frequency of using online health information (β : 0.283–0.310) also having a positive influence on the three levels of e-health literacy of older adults. This proves that the better their habits of using online health information, the higher the electronic health literacy of older adults.

Discussion

The four factors related to older adults' use of online health information and the three dimensions of e-health literacy have high average scores. And there is a significant positive correlation between the seven dimensions. This indicates that older adults have good habits for using health information on the Internet and have a high level of e-health

literacy. According to the correlation between the two dimensions, the higher the habits of older adults in using Internet health information, the higher their level of e-health literacy. According to the research data and interviews, all older adults in the study have smartphones and experience with the Internet. It indicates that they can use the knowledge of online health information for their own health management in the face of the colourful world of big data. It also shows that they can acquire, understand and evaluate health information from online resources. They can apply the knowledge to solve health problems and utilize the social benefits of health information online.

In predictive model 1 of the three dimensions of e-health literacy in older adults, the control variables of gender, health, culture and age do not have statistically significant predictive power for judgement, application and decision-making ability. This indicates that these four control variables are not important influencing factors. However, the

standardized values of the regression coefficients for the age of older adults show that the level of e-health literacy in older adults tends to decrease with increasing age. Some studies suggest that the age of older adults is a primary factor influencing their e-Health literacy. The older the age of older adults, the lower their interest in obtaining e-Health information. This leads to a negative correlation between older adults' age and e-Health literacy.¹⁷

In Model 2, which predicts the application, judgment, and decision-making ability dimensions of Internet health information use habits on e-health literacy among older adults. The factors of forwarding and sharing online health information, using online health information to regulate behaviour, approving attitude towards online health information and frequency of using online health information are the main influencing factors. And the effect pathway is positively correlated. This indicates that older adults with a high acceptance of online health information have a higher ability to use, judge and make decisions about health information. Older adults with high levels of online health information have a more positive and optimistic attitude towards their health. They are more likely to use the Internet channel to obtain relevant health information. This is related to the perception of health information on the Internet and electronic health literacy. The higher the level of e-health literacy, the more diverse the channels through which they obtain information.^{18,19}

The use of Internet health information has a greater impact on older adults' e-health literacy. Possibly because older adults have accumulated specific knowledge about health in their search for health information on the Internet, they are better able to understand and apply e-health knowledge. And they are also better equipped to deal with challenges in health promotion and health management. Older adults have more access to health channels, which can provide more health information. They have a strong sense of health self-efficacy and are willing to increase their health awareness. They improve their health behaviours and attitudes and therefore have a higher level of e-Health literacy.^{20,21} Research has shown that older patients often experience negative emotions such as anxiety and fear when dealing with their own illness. Online social sharing can provide older patients with more information and emotional support, which is beneficial for their health management and recovery. At the same time, older patients offer help to others based on their own understanding and experience of the disease, which also helps to boost their self-esteem. Presumably based on motivational theories, older adults' motivation to seek and learn online health information is influenced by their own needs and their interpersonal environment. In the study, we also found that people browsed a large amount of health information based on their own health status. They improve their understanding of health information through various methods. And then regulating their

behaviour in the hope of improving their own health is the driving force behind the behaviour of older adults in obtaining health information, and it is also an appropriate way to improve e-health literacy. Zhao²² also found that the high acceptance of health information or the use and sharing behaviour of friends and family members can influence their judgement, application and decision-making ability, and enhance their intention to engage with health or official WeChat accounts. Particularly for older users, because of their weaker ability to accept new technologies, they place great importance on the influence and demonstration of others and reference groups in their use and adoption of online health information.

In addition, there are similarities and differences between numerous pieces of literature and this study. Teaching the methods and skills of acquiring and discriminating information through group learning may help improve the level of e-health literacy of older adults^{23,24}; e-health literacy levels of older residents decrease with age^{25,26}; many older individuals question the reliability of online health information, yet engaging in online interactions with friends can enhance e-health literacy²⁷; primary and secondary education as a risk factor for e-health literacy²⁸; low frequency of use of Internet devices and low level of e-health literacy among rural older adults.⁹ The differences and similarities in the findings may be related to the differences in the number of subjects, their literacy, economic status and geographic location.

Limitations

The study is a cross-sectional study with regional characteristics, which allows a limited generalization of the research results. Future research with longitudinal data can explain more precisely the causal relationship between the habits of using health information on the Internet and the electronic health literacy of older adults. In addition, older adults' Internet health information use habits and e-health literacy have dynamic characteristics. Let us assume that future research integrates knowledge from psychology, sociology and sport. In this case, it can shed more light on the dynamic course of older adults' Internet health information use habits and e-health literacy, and the research results will be even more helpful.

Conclusion

There exists a positive correlation between older adults' e-health literacy and their utilization of Internet health information. The prediction of electronic health literacy in older adults is not significantly impacted by factors such as gender, age, educational attainment or health status. Older adults' Internet health information use habits had a high predictive power for older adults' e-health literacy, with a high impact on the decision-making ability level

and a low impact on the judgmental ability level. Older adults should have regular access to online health resources from their families, communities and social groups in order to improve their level of electronic health literacy. Using WeChat or other interpersonal communication platforms, older adults can exchange online health information with one another. In future research, it is also necessary to explore the intrinsic relationship between the use of Internet health information and the enhancement of electronic health literacy among older adults from a comprehensive perspective through multidisciplinary intersection and integration.

Acknowledgments: I am grateful to all the respondents of this survey.

Contributorship: W.Y: writing, data analysis, article review, and intellectual concept of the article.

Declaration of conflicting interests: The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.


Ethical approval: The Institutional Review Board of the College of Physical Education, Henan University of Science and Technology approved the study (No:20230711).

Funding: The author disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the fund provides: General Project of Humanities and Social Sciences Research of Henan Provincial Department of Education (No.2023-ZZJH-280); 2023 Henan Provincial Department of Science and Technology Soft Science Project (No.232400411107).

Gurantor: Wei Ye

Informed consent: This article does not contain any studies with animals performed by the author. Informed consent was obtained from all individuals. Older adults know the survey information and agree to participate in the project research.

Supplemental material: Supplementary material for this article is available online. Data online Nutstor: <https://www.jianguoyun.com/d/home#/>.

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