

Health-Promoting Behavior and Health Empowerment by Types of Digital Health Technology Literacy

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ABSTRACT

Advancements in digital technology have significantly impacted healthcare delivery, necessitating greater attention to individuals' digital health literacy. This study examined how digital health technology literacy influences health empowerment and health-promoting lifestyles among Korean adults. A cross-sectional secondary data analysis was conducted using data from 935 individuals aged 20–59. Digital literacy was assessed using subdomains of functional and critical literacy, alongside validated tools for health empowerment and health-promoting behavior. K-means clustering identified three groups based on literacy levels. Group 3, with high functional and critical literacy, demonstrated the highest levels of health empowerment and health-promoting behaviors. These findings emphasize the importance of recognizing diverse digital literacy patterns and suggest that tailored, person-centered interventions may be necessary to reduce disparities and support health outcomes in the digital age.

KEYWORDS

Digital Health Literacy, e-Health Literacy, Digital Health Technology Literacy, Health Empowerment, Health Promotion

INTRODUCTION

The development of information technology has resulted in significant changes in the field of health care. According to the Office of Disease Prevention and Health Promotion (2022), 83.3% of the adult population has some experience of information-technology-based tracking of medical information or communication with health-care providers. However, information provided online may be contaminated by biased content or low-quality information created with the specific interests

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or purposes of the information providers in mind (K. Kim et al., 2023). Particularly, there have been concerns over the infodemic caused by various kinds of fake information presented during the COVID-19 pandemic (Hua & Shaw, 2020; Zarocostas, 2020). Therefore, digital health technology literacy, which refers to the ability to find, understand, and evaluate health information using the digital environment to solve health problems, is increasing in importance (Van der Vaart & Drossaert, 2017).

Traditional health literacy, a branch of health management competency, refers to an individual's motivation and ability to access, understand, and utilize information for health promotion and maintenance (Nutbeam et al., 1988). Health literacy affects a wide range of health outcomes, including health awareness, use of preventive care, decreases in unhealthy behaviors, and reduced mortality rates (Berkman et al., 2011). Digital health technology emphasizes finding and understanding health information on the internet, as well as evaluating information from a critical perspective (Choi, 2020). In the contemporary era, where digital technology plays a crucial role in accessing and utilizing health information, digital health technology literacy has the potential to influence health outcomes (Guo et al., 2021; Hwang & Kang, 2019). Moreover, research dealing with specific conditions, such as diabetes (Guo et al., 2021), and specific populations, such as college students (Hwang & Kang, 2019), has shown that digital health technology literacy affects health-promoting behavior.

As indicated in Table 1, digital health technology literacy encompasses two aspects: functional digital literacy (FDL), which refers to the ability to use the digital devices and internet to identify health information, and critical digital literacy (CDL), which is the ability to critically evaluate health information (Yoon et al., 2022), reflect on the factors and processes that determine health, and apply the results of that reflection to individual or group activities on health in a given situation (Abel & Benkert, 2022). The lack of FDL can serve as a barrier to accessing health information for groups not familiar with the digital environment (Ministry of Science, 2021). Furthermore, even though FDL can help individuals distinguish health information at a basic level, the additional step of evaluating the information, called CDL, is necessary in the process of deciding to use health information (Yang et al., 2017). The inability to critically verify accurate information about one's health amid the overflow of information can lead to misconceptions about actual risks, making it challenging to engage in health behaviors (Okan et al., 2020). In other words, both sub-domains of digital health technology literacy, namely FDL and CDL, are crucial from a health promotion perspective.

Table 1. Sub-Domains of Digital Health Technology Literacy

Variables	Definition
Functional digital literacy (FDL)	The ability to use digital devices and applications to access health information
Critical digital literacy (CDL)	The ability to evaluate the reliability and relevance of health information

Health empowerment refers to the ability of individuals to exercise autonomy and actively participate in health management (Shearer, 2009). It is strongly associated with self-determination regarding health (Papp-Zipernovszky et al., 2021). As digital health services have emerged, research has been conducted on the positive impact of these technologies on health empowerment (Audrain-Pontevia et al., 2018; Jiang et al., 2022; Sharma et al., 2022). However, as noted by Jiang et al. (2022), for this health empowerment to translate into actual health behaviors, it is crucial that one not only have the ability to find information using digital technology but also to critically assess this information and select only the useful information for oneself.

To date, a variety of studies have examined factors that may influence digital health technology literacy. Several factors, such as gender, education, income, and region, have been identified as influencing digital health technology literacy, with age emerging as the primary factor negatively

associated with it (Hagan et al., 2023; Shi et al., 2023). However, the lack of digital health technology literacy is not solely an issue confined to older adults, and the outcomes in younger adults and adults have not yet been clearly identified (Estrela et al., 2023). According to Zur and Zur (2011), the utilization of digital information is dependent, not on generation, but rather on individual characteristics. Considering that the impact of FDL and CDL on health-promoting behavior varies (Yang et al., 2017), individuals may exhibit different patterns depending on whether they lack FDL, CDL, or both.

However, whether digital health technology literacy can truly enhance health empowerment remains unconfirmed. Prior studies on Generation Z and older adults indicate that, while higher digital health technology literacy promotes more frequent information-seeking behavior, it does not necessarily lead to greater health empowerment (Jiao et al., 2023). This gap underscores the need for further research to clarify the mechanisms through which digital health technology literacy may—or may not—translate into actual health behaviors. In this context, it is crucial to examine participants' specific types of digital health technology literacy and to analyze how differences in these literacy types influence health-related factors.

This study aimed to examine the digital health technology literacy and identify patterns for each population group, according to their levels of digital health technology literacy. The specific objectives of this study included (a) examining the digital health technology literacy levels of individuals, (b) forming and analyzing clusters using a K-means cluster analysis according to the type of digital health technology literacy, (c) confirming the differences in each cluster according to general characteristics, and (d) comparing the differences in health empowerment and health-promoting lifestyles for each cluster.

METHODS

Design and Data Source

This study used data from our earlier research, first released as a preprint (<https://doi.org/10.2196/preprints.53547>) and subsequently published in the *Journal of Posthumanism* (J. S. Kim et al., 2025). The original data collected included responses from 1,000 men and women aged 20–65 years from across South Korea. A three-step stratified random sampling method, a type of population proportional probability sampling, was employed considering gender, age, region, and population proportional allocation.

Study Variables

General Characteristics

Socio-demographic characteristics and individual health conditions were evaluated as part of each individual's general characteristics. Socio-demographic characteristics assessed included gender, age, economic status, marital status, region, current economic activity, education, and religion. Age was divided into four categories: 20–29, 30–39, 40–49, and 50–59. Economic status was divided into upper, middle, and lower classes. Region was divided into Seoul Metropolitan City, a special self-governing city, and Do Province. Education was categorized as (a) middle school or lower, (b) high school, (c) university student or baccalaureate, and (d) graduate student or higher. Religion and livelihood status were categorized into “yes” or “no” responses.

Questions related to individual health conditions included current smoking status, high-risk drinking, and number of chronic diseases. Current smoking status was divided into non-smokers, ex-smokers, and current smokers. High-risk drinking referred to drinking an average of seven or more glasses of alcohol for men and five or more for women at a time and drinking more than twice a week. The number of chronic diseases could be answered by “none” to “three or more.”

Digital Health Technology Literacy

Digital health technology literacy was assessed using the digital health technology literacy assessment questionnaire (DHTL-AQ) scale developed by Yoon et al. (2022). The DHTL-AQ contains 34 items across two domains: digital functional literacy and digital critical literacy. Digital functional literacy is composed of objective evaluation items related to the use of digital technology and consists of three categories: information and communications technology terms, information and communications technology icons, and use of an application. Additionally, digital critical literacy is assessed based on participants' abilities to evaluate the reliability and relevance of health information and consists of a single category: evaluating the reliability and relevance of health information. At the time of development, the DHTL-AQ had good internal consistency (overall Cronbach's $\alpha = .95$; .87–.94 for subtotals) and an acceptable model fit (comparative fit index = .821, Tucker–Lewis index = .807, standardized root mean square residual = .065, root mean square error of approximation = .090).

Health-Promoting Lifestyle

Health-promoting behaviors were measured using the health-promoting lifestyle profile (HPLP) scale, originally developed by Walker et al. (1987). The HPLP comprises 47 items and six dimensions. The items are rated on a 4-point Likert scale (1 = never; 4 = routinely). The possible scores range from 47–188, with higher scores indicating a more health-promoting lifestyle. The Cronbach's alpha for the original HPLP was .922. The Korean version of the HPLP was modified and adapted by Song et al. (2001) to measure the health habits of patients with myocardial infarction. The Korean HPLP consists of 25 questions tailored to Korean seniors and focuses on five sub-areas: exercise, medication, diet, smoking habits, and stress management. The Cronbach's alpha reliability coefficient for the Korean HPLP was 0.90. In this study, the internal consistency reliability was .88.

Health Empowerment

Health empowerment was assessed using the diabetes empowerment scale-short form (DES-SF) developed by Anderson et al. (2003). Park and Park (2013) adapted and modified the DES-SF for the Korean context, developing the Korean health empowerment scale (K-HES). The eight-item DES-SF is a shorter version of the DES, which originally comprised 37 items. The Cronbach's alpha for the original scale was .84. Unlike the original scale, which was employed only for diabetic patients, the K-HES was modified to cover various health conditions. The Cronbach's alpha for the K-HES was .80. In this study, the internal consistency reliability was .89.

Data Analysis

The data were analyzed using IBM Statistical Product and Service Solutions Statistics 22.0. The digital health technology literacy levels and HPLPs of the participants were examined using descriptive statistics, such as means, standard deviations, and minimum and maximum values. Clusters based on participants' digital health technology literacy types were identified using a K-means cluster analysis. To confirm the differences in the digital health technology literacy levels between clusters, the analysis of variance (ANOVA) was conducted followed by a post hoc analysis using the Scheffé test. To identify the differences between the groups of digital health technology literacy types based on the participants' general characteristics, an independent t-test was performed, followed by a chi-square test, the ANOVA, and a post hoc analysis using the Scheffé test. For digital health technology literacy types, the HPLP and health empowerment levels were analyzed using descriptive statistics, such as mean and standard deviation. Differences in the HPLPs between groups were analyzed using the ANOVA, followed by a post hoc analysis using the Scheffé test.

Ethical Considerations

The study received approval for exemption from deliberation from Chung-Ang University's Institutional Review Board Committee (1041078-20230718-HR-193).

RESULTS

Table 2 shows the level of digital health technology literacy and HPLPs of all participants. FDL had a score of 26.06 ± 4.38 , and CDL had 3.75 ± 1.45 . HPLP had a score of 63.54 ± 10.52 .

Table 2. Level of Digital Health Technology Literacy and Health-Promoting Lifestyle Profile (N = 935)

Variables	M $\pm$ SD	Min	Max
Functional digital literacy	26.06 ± 4.38	3	29
Critical digital literacy	3.75 ± 1.45	0	5
Health-promoting lifestyle profile	63.54 ± 10.52	36	98

Note. M = mean; SD = standard deviation.

Table 3 shows the level of digital health technology literacy, health promoting behavior, and health empowerment according to the general characteristics. For digital health technology literacy, statistically significant differences were observed based on age, economic status, region, and education. The 50–59 age group showed a lower level of digital health technology literacy compared to other age groups. Those with higher economic status exhibited higher digital health technology literacy compared to those with lower economic status. Residents of Seoul had statistically significantly higher digital health technology literacy than those living in other major cities. In terms of education level, individuals with a bachelor's degree or higher had higher digital health technology literacy compared to high school graduates.

Table 3. Level of Digital Health Technology Literacy, Health-Promoting Behavior, and Health Empowerment According to General Characteristics (N=935)

Variables		n (%)	Digital health technology literacy		Health promoting behavior		Health empowerment	
			M $\pm$ SD	t/F (p)	M $\pm$ SD	t/F (p)	M $\pm$ SD	t/F (p)
Gender	Male	480 (51.3)	29.90 ± 5.39	.579 (.563)	63.09 ± 10.68	1.347 (.178)	28.94 ± 5.12	.004 (.997)
	Female	455 (48.7)	29.71 ± 4.52		64.02 ± 10.34		28.94 ± 5.40	
Age	20–29 ^a	203 (21.7)	29.96 ± 5.23	10.653 (< .001)	64.22 ± 10.69	3.444 (.016)	29.44 ± 5.77	2.385 (.068)
	30–39 ^b	211 (22.6)	30.87 ± 4.06	a, b, c > d	62.00 ± 10.32	d > b	29.30 ± 5.04	
	40–49 ^c	267 (28.6)	30.17 ± 4.55		62.98 ± 10.19		28.28 ± 5.50	
	50–59 ^d	254 (27.2)	28.41 ± 5.60		64.88 ± 10.74		28.92 ± 4.66	

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Table 3. Continued

Variables		n (%)	Digital health technology literacy		Health promoting behavior		Health empowerment	
			M ± SD	t/F (p)	M ± SD	t/F (p)	M ± SD	t/F (p)
Economic status	Lower ^a	59 (6.3)	28.89 ± 5.64	6.032 (.002)	58.65 ± 10.69	34.474 (< .001)	27.05 ± 5.31	21.486 (< .001)
	Middle ^b	701 (75.0)	29.90 ± 4.94	c > a	64.20 ± 9.93	c > b > a	29.17 ± 5.11	c > b > a
	Upper ^c	175 (18.7)	31.36 ± 3.25		70.20 ± 11.29		31.78 ± 4.97	
Marital status	Single	396 (42.4)	30.02 ± 4.93	1.356 (.258)	63.20 ± 10.36	.366 (.694)	29.22 ± 5.42	1.031 (.357)
	Married	502 (53.6)	29.72 ± 4.96		63.80 ± 10.65		28.73 ± 5.08	
	Other	37 (4.0)	28.70 ± 5.83		63.70 ± 10.66		28.73 ± 5.74	
Region	Seoul ^a	168 (18.0)	30.67 ± 3.90	4.292 (.005)	63.89 ± 10.51	.445 (.721)	29.11 ± 5.55	.973 (.405)
	Metropolitan city ^b	287 (30.7)	29.28 ± 5.92	a > b	63.62 ± 11.01		28.92 ± 5.38	
	Special self-governing city ^c	19 (2.0)	27.42 ± 7.14		61.00 ± 9.12		26.95 ± 5.97	
	Do province ^d	461 (49.3)	29.91 ± 4.52		63.47 ± 10.28		28.97 ± 5.03	
Current economic activity	No	263 (28.1)	29.71 ± 4.96	.374 (.709)	63.51 ± 9.60	.055 (.956)	29.02 ± 5.28	.312 (.755)
	Yes	672 (71.9)	29.84 ± 5.00		63.55 ± 10.87		28.90 ± 5.25	
Education	Middle school ^a	5 (0.5)	25.60 ± 5.68	20.798 (< .001)	63.00 ± 4.12	2.804 (.039)	26.00 ± 3.24	5.648 (< .001)
	High school ^b	153 (16.4)	27.12 ± 5.96	c, d > b	61.54 ± 10.26		27.79 ± 5.22	d > b
	University student or Baccalaureate ^c	708 (75.7)	30.30 ± 4.60		63.79 ± 10.55		29.04 ± 5.29	
	Graduate student or higher ^d	69 (7.4)	31.00 ± 4.36		65.52 ± 10.63		30.68 ± 4.49	
Religion	No	607 (64.9)	29.80 ± 4.96	.003 (.998)	62.33 ± 10.21	4.794 (< .001)	28.58 ± 5.34	2.899 (.003)
	Yes	328 (35.1)	29.80 ± 5.04		65.79 ± 10.73		29.60 ± 5.04	
Current smoking status	Non-smoker ^a	579 (61.9)	29.85 ± 4.76	2.541 (.079)	64.68 ± 10.21	17.562 (< .001)	29.01 ± 5.35	1.473 (.230)
	Ex-smoker ^b	135 (14.4)	30.48 ± 4.59		64.56 ± 10.36	a, b > c	29.39 ± 4.51	
	Current smoker ^c	221 (23.7)	29.27 ± 5.70		59.94 ± 10.66		28.46 ± 5.42	
High risk drinking	Yes	111 (11.9)	30.00 ± 4.55	.476 (.634)	61.33 ± 9.59	2.552 (.012)	29.28 ± 5.10	.750 (.454)
	No	824 (88.1)	29.78 ± 5.04		63.84 ± 10.61		28.89 ± 5.28	

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Table 3. Continued

Variables		n (%)	Digital health technology literacy		Health promoting behavior		Health empowerment	
			M ± SD	t/F (p)	M ± SD	t/F (p)	M ± SD	t/F (p)
Number of chronic diseases	No	640 (68.4)	30.10 ± 4.73	2.390 (.067)	63.45 ± 10.94	.709 (.547)	29.12 ± 5.25	1.593 (.189)
	1	227 (24.3)	29.14 ± 5.46		63.99 ± 9.08		28.77 ± 5.22	
	2	54 (5.8)	29.15 ± 5.41		63.74 ± 10.88		28.07 ± 5.02	
	≥ 3	14 (1.5)	29.79 ± 5.73		59.93 ± 11.53		26.79 ± 6.35	

Note. F = F distribution; Non-smoker = A person who has never smoked, or who does not currently smoke tobacco products; Ex-smoker = A person who previously smoked but has permanently stopped smoking.

For health-promoting behavior, statistically significant differences were observed based on age, economic status, education, religion, current smoking status, and high-risk drinking. The 50–59 age group had higher levels of health-promoting behavior compared to the 30–39 age group. Upper income levels were associated with higher health-promoting behavior. Regarding education, the ANOVA showed significant differences; however, the post-hoc analysis showed no significant differences. Non-religious individuals and current smokers showed statistically significantly lower health-promoting behavior. High-risk drinking was also associated with significantly lower health-promoting behavior.

For health empowerment, statistically significant differences were found in economic status, education, and religion. Higher economic status and having a graduate degree, as opposed to a high school diploma, were associated with higher health empowerment. Additionally, individuals with a religious affiliation demonstrated higher health empowerment.

Table 4 presents a description of the digital health technology literacy clusters identified through cluster analysis. Cluster 1 shows low scores in both FDL (11.76 ± 4.12) and CDL (2.90 ± 1.68). Cluster 2 shows a medium level of FDL (22.81 ± 2.15); this cluster's CDL (3.07 ± 1.71) is lower than that of Clusters 3 and 1. Cluster 3 has the highest scores in both FDL (28.11 ± 1.01) and CDL (4.02 ± 1.25).

Table 4. Description of Digital Health Technology Literacy Clusters Identified Through Cluster Analysis (N = 935)

Variables	Cluster 1 (n = 51)	Cluster 2 (n = 205)	Cluster 3 (n = 679)	Overall		Between clusters		
Cluster label	Low FDL and CDL	Medium FDL, low CDL	High FDL and CDL					
	M ± SD	M ± SD	M ± SD	F	p	1 to 2 p	1 to 3 p	2 to 3 p
FDL	11.76 ± 4.12	22.81 ± 2.15	28.11 ± 1.01	2900	<.001	<.001	<.001	<.001
CDL	2.90 ± 1.68	3.07 ± 1.71	4.02 ± 1.25	46.44	<.001	0.733	<.001	<.001

Note. FDL = functional digital literacy; CDL = critical digital literacy; M = mean; SD = standard deviation; F = F distribution.

Table 5 shows the comparison of health-promoting lifestyles and health empowerment by cluster. Overall, significant differences between the clusters were found in terms of health-promoting lifestyles and health empowerment. The average health-promoting lifestyle value of the total population was 63.54 ± 10.52 , and the averages for each area were health responsibility: 14.51 ± 3.01 ; dietary habits: 17.71 ± 3.89 ; exercise: 9.30 ± 2.62 ; stress management: 12.44 ± 2.73 ; and smoking habits: 9.58 ± 2.30 . The average value of health empowerment of the total population was 28.94 ± 5.25 .

Table 5. Comparison of Main Variables by Cluster (N = 935)

Variables		M $\pm$ SD	Cluster			F	p	Post hoc
			1 (n = 51)	2 (n = 205)	3 (n = 679)			
HPLP	Health responsibility (4)	14.51 $\pm$ 3.01	14.08 $\pm$ 2.69 ^a	13.90 $\pm$ 2.98 ^b	14.72 $\pm$ 3.02 ^c	6.470	.002	c > b
	Dietary habits (5)	17.71 $\pm$ 3.89	18.00 $\pm$ 3.34	17.33 $\pm$ 3.81	17.80 $\pm$ 3.95	1.312	.27	
	Exercise (4)	9.30 $\pm$ 2.62	9.27 $\pm$ 2.20 ^a	8.91 $\pm$ 2.54 ^b	9.43 $\pm$ 2.66 ^c	3.116	.045	c > b
	Stress management (5)	12.44 $\pm$ 2.73	11.94 $\pm$ 2.62 ^a	11.58 $\pm$ 2.56 ^b	12.73 $\pm$ 2.73 ^c	15.440	<.001	c > b
	Smoking habits (2)	9.58 $\pm$ 2.30	8.18 $\pm$ 2.36 ^a	9.18 $\pm$ 2.30 ^b	9.81 $\pm$ 2.24 ^c	16.540	<.001	c > b > a
	HPLP (Total)	63.54 $\pm$ 10.52	61.47 $\pm$ 8.95 ^a	60.90 $\pm$ 10.29 ^b	64.50 $\pm$ 10.55 ^c	10.466	<.001	c > b
Health empowerment		28.94 $\pm$ 5.25	24.73 $\pm$ 3.78 ^a	24.73 $\pm$ 3.78 ^b	29.94 $\pm$ 5.12 ^c	66.468	<.001	c > a, b

Note. HPLP = health-promoting lifestyle profile; M = mean; SD = standard deviation; F = F distribution.

The differences between health-promoting lifestyle and health empowerment by cluster were: In health-promoting lifestyles, Cluster 3 (64.50 ± 10.55) was significantly higher than Cluster 2 (60.90 ± 10.29). By sub-area, Cluster 3 was significantly higher than Cluster 2 in all areas, except dietary habits. In the health responsibility area, Cluster 3 was high at 14.72 ± 3.02 and Cluster 2 at 13.90 ± 2.98 . In the exercise area, Cluster 3 was high at 9.43 ± 2.66 and Cluster 2 at 8.91 ± 2.54 . Similarly, in the stress management area, Cluster 3 was high at 12.73 ± 2.98 , as was Cluster 2 at 11.58 ± 2.56 . Smoking habits were the highest in Cluster 3 (9.81 ± 2.24), followed by Cluster 2 (9.18 ± 2.30) and Cluster 1 (8.18 ± 2.36).

For health empowerment, Cluster 3 (29.94 ± 5.12), which had high FDL and CDL, was significantly higher than Clusters 2 (26.66 ± 4.77) and 1 (24.73 ± 3.78).

DISCUSSION

This study conducted a cluster analysis of adults under 60 based on their digital health technology literacy and examined differences in the health empowerment and health-promoting lifestyles of each cluster. Findings show that digital health technology literacy is higher among individuals aged over 50, those with higher economic status, residents of Seoul compared with rural areas, and individuals with higher educational levels. These results are consistent with prior research (Estrela et al., 2023), which demonstrated that higher socioeconomic status is associated with better digital health technology literacy, likely because socioeconomic disparities restrict access to the internet and digital health tools.

Overall, significant differences between the groups in health-promoting lifestyles and health empowerment are found. For health-promoting lifestyles, Cluster 3 (high FDL and CDL) is significantly higher than Cluster 2 (medium FDL and low CDL) in all sub-domains, except dietary habits. These results are consistent with those of previous studies (Yang et al., 2017), which revealed an association between digital health technology literacy and health-promoting behavior. Yang et al.'s (2017) study showed that CDL has a greater influence than FDL on health-promoting behavior. Similarly, the results of this study show that health-promoting behavior is higher in Cluster 3 than in Cluster 2.

Among the sub-domains of health-promoting behavior, only dietary habits do not show significant differences between the digital health technology literacy clusters. This partially aligns with the findings of Yang et al. (2017); however, it contradicts those of Mitsutake et al. (2016). This means that the ability to evaluate health information may not be the only factor contributing to food choices. Indeed, an individual's preferences, along with psychological and social factors, can play a role in shaping eating habits (Buja et al. 2020). For example, among the young generation who may lack time and financial flexibility, convenience and affordability often lead to a preference for fast food (Sogari et al., 2018).

Conversely, for smoking habits, there is a significant difference between the digital health technology literacy clusters. Cluster 3 (high FDL and CDL) shows the highest smoking habits, whereas Cluster 1 (low FDL and CDL) shows the lowest. Although previous studies suggested that low health literacy is associated with greater smoking prevalence and nicotine dependence (Li et al., 2022; Rababah & Al-Hammouri, 2023), the role of digital health technology literacy in smoking behaviors remains debated (Hwang & Kang, 2019; Ma et al., 2023). As K. Kim et al. (2023) pointed out, the influence of digital health technology literacy on smoking requires careful interpretation. In particular, as the participants in this study were adults under the age of 60, their sensitivity to health concerns may be relatively low. Consequently, even with higher levels of digital health technology literacy, highly addictive behaviors such as smoking may not readily translate into practical behavioral changes like smoking cessation. Therefore, further in-depth research is needed to explore the various factors that mediate the relationship between digital health technology literacy and health-promoting lifestyles.

In the context of health empowerment, Cluster 3 shows higher levels than Clusters 2 and 1. Health empowerment is the willingness and ability of individuals to actively participate in health management by exercising autonomy and mobilizing their capabilities and socio-contextual resources (Walker et al., 1987). Unlike the traditional model, in which the responsibility for medical services rests with health-care providers, individuals in the digital environment are required to acquire health information independently. This empowers and authorizes individuals to access and comprehend health-care resources; however, it simultaneously increases the level of responsibility for their health (Davis et al., 2020). Additionally, the lack of FDL may compromise autonomy in individual health management, thereby diminishing self-determination and potentially resulting in various forms of health inequality (Davis et al., 2020; Morley & Floridi, 2020; Nickel et al., 2023). Although the link between digital health technology literacy and health empowerment remains ambiguous (Nickel et al., 2023), the growing importance of digital health technologies underscores the need to strengthen individuals' competencies in this area. Nevertheless, digital health technology literacy must extend beyond the acquisition of technical skills to yield meaningful changes in health management practices. Future studies should examine the mechanisms through which digital health technology literacy influences behavioral change, identify potential mediating and moderating factors, and explore contextual influences such as cultural, socio-economic, and psychological determinants.

CONCLUSION

This study has several limitations. The online survey may have favored digitally literate individuals, introducing sampling bias. Self-reported measures limited verification of actual behavior and digital skills, posing a risk of measurement error. Although the DHTL-AQ was validated through mobile tasks, its broader applicability to devices such as tablets and wearables remains unclear. Also, as this study was limited to Korean adults, future research should extend to adults across diverse cultural contexts to elucidate the potential influence of cultural factors on the findings. Furthermore, given that this study employed secondary analysis of government data, its capacity to establish robust causal inferences is limited, underscoring the need for additional research that adopts longitudinal designs.

Still, the study is among the first to identify distinct digital literacy patterns, offering valuable insight into differences between young adults. Despite several limitations, this study is still significant in that it analyzed sub-domains of digital health technology literacy in detail to identify patterns in participants' digital health technology literacy and examined the differences in health behavior and health empowerment accordingly. This study provides valuable insights into how digital health technology literacy translates into actual health behaviors. Identifying the sub-domains of digital health technology literacy is crucial for the development of future health promotion interventions using digital technologies, and these elements must be carefully considered. Future research should further explore strategies to ensure that digital health technology literacy effectively translates into actual health-promoting lifestyles.

DATA AVAILABILITY

The tables used to support the findings of this study are included in the article.

COMPETING INTERESTS

The authors of this publication declare there are no competing interests.

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AUTHOR CONTRIBUTIONS

The authors confirm their contributions to the paper; study conception and design: JSK, HRS, YGC, HJK, BHK; analysis and interpretation: HRS, JSK, BHK; draft manuscript preparation: HRS, YGC. All authors reviewed the results and approved the final version of the manuscript.

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