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Digital Health Literacy as a Mediator Between Technology Usage and Health Decision-Making Behaviour

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ABSTRACT

Aims In today's technology-driven world, the general public increasingly relies on wearable devices and online platforms to monitor their health and access health-related information. This study explored how online health knowledge-seeking behavior and the use of wearable devices influence health decision-making behavior, with digital health literacy serving as a mediating factor.

Instrument & Methods This correlational cross-sectional study collected 1,196 valid responses from the general public in Guntur city who actively use wearable devices and online platforms to seek health-related knowledge. Data analysis was carried out using Smart PLS, employing partial least squares structural equation modeling for path analysis and bootstrapping with 5,000 samples to assess mediation effects.

Findings All structural model paths were statistically significant ($p<0.05$). Online health knowledge-seeking behavior and wearable device usage positively influenced health decision-making behavior both directly ($\beta=0.296$; $\beta=0.254$) and indirectly through digital health literacy ($\beta=0.397$; $\beta=0.421$). Digital health literacy had the strongest effect on decision-making behavior ($\beta=0.431$). Mediation analysis confirmed partial mediation, as direct effects remained significant alongside indirect effects.

Conclusion Digital health literacy plays a central role in translating access to technology and online information into informed health decisions.

Keywords Decision-Making; Wearable Devices; eHealth; Health Knowledge, Attitudes, Practice; Health Literacy

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Introduction

In recent years, the internet has become a primary source of health-related information for people worldwide. The widespread availability of smartphones, affordable internet access, and the growth of digital health platforms have transformed the way individuals seek, share, and apply health knowledge. Online health knowledge refers to information about health that individuals access, understand, and apply from digital sources to maintain or improve their health [1].

In the digital era, individuals are increasingly relying on technology not only for communication and entertainment but also for managing their health [2]. Among the many technological advancements, wearable health devices, such as fitness trackers and smartwatches have gained popularity for their ability to monitor real-time physiological data like heart rate, sleep patterns, and physical activity [3]. Alongside this trend, the internet has become a major source of health-related knowledge [4], empowering individuals to seek and access information [5] beyond traditional clinical settings. This has given rise to health knowledge-seeking behavior, which refers to the intentional actions of individuals to obtain health-related knowledge and the ways in which they search for, evaluate, and utilize such knowledge to make informed health decisions [6]. Together, these digital resources offer unprecedented opportunities for individuals to become active participants in their own healthcare management.

However, although access to data and information is growing rapidly, not all of it is reliable [5, 7], and many people lack the necessary skills to accurately interpret and utilize health information [8]. The mere availability of health-related data does not guarantee meaningful or informed health-related decisions [9]. This gap between information access and informed decision-making highlights the importance of digital health literacy, which is the ability to search for, understand, and apply digital health information responsibly and effectively [10].

Health technologies and digital resources have become integral to modern healthcare, reshaping how individuals access, process, and utilize health information. Research consistently shows that searching for health information online is linked to more active participation and better decision quality. A systematic review found that online health information seeking (OHIS) influences medical and health decisions [11], while clinical studies report that patients who look up information online engage more effectively in shared decision-making with clinicians [12, 13].

Wearables provide continuous, real-time feedback, such as data on activity, sleep, and heart rate, which support self-monitoring and behavior change—key inputs to day-to-day health decisions [14]. Reviews highlight the role of wearables in empowering users and improving outcomes, although data quality and equity caveats remain [15]. Engagement with online health resources is tied to higher digital health literacy [16]. People who seek information online develop the skills to find, appraise, and use digital content [17]. Large-scale and patient studies show that OHIS relates positively to eHealth literacy levels and to how people process and evaluate online information [18].

Using consumer health technologies is associated with greater familiarity and competence in digital health tasks. Recent evidence shows differences in digital health literacy between wearable users and non-users [19], suggesting that interacting with wearables can build digital skills relevant to health management. Broader reviews also position digital health literacy as integral to realizing value from digital tools [20, 21]. Digital health literacy (DHL) enables individuals to find, understand, appraise, and use online health information—capabilities that underpin informed health choices and patient autonomy [22]. Empirical work links higher digital health literacy to more active decision-making and better engagement in health behavior [23]. Studies indicate that the effect of online health information seeking (OHIS) on health behaviors and decisions often operates through literacy pathways. People who search online benefit most when they have the skills to evaluate and apply information. Recent models show digital health literacy as a mediator between online seeking and downstream health engagement [16, 24, 25]. Evidence suggests that the benefits of wearables for behavior and decisions are amplified when users possess higher digital health literacy [19], such as interpreting metrics, judging data quality, and integrating app feedback. Emerging work positions digital health literacy as a key mechanism linking digital tool use to informed actions [25, 26].

This study is grounded in social cognitive theory (SCT), which highlights the dynamic interaction between knowledge, personal capabilities, and environmental factors in shaping behavior [27]. In the digital health context, online health knowledge-seeking reflects the cognitive process of acquiring information; wearable device usage represents environmental support through real-time feedback; and digital health literacy captures personal competence in interpreting and applying health knowledge. Together, these elements influence health-related decision-making, with digital health literacy serving as a key mechanism linking technology use and informed health choices.

Given the growing reliance on digital tools for personal healthcare, it is essential to understand how online health knowledge-seeking behavior and wearable device usage interact with digital health literacy in influencing health-related decision-making. This study investigated how wearable device usage and online health knowledge-seeking behavior

influence health-related decision-making, with digital health literacy as a mediating factor. Focusing on fitness trackers and smartwatches, the most commonly adopted devices, the study highlights the role of health technologies and online knowledge in shaping individuals' ability to make informed health decisions.

Instrument and Methods

Study design and participants

This cross-sectional correlational study was conducted on the general public seeking health-related knowledge online and using smartwatches and fitness trackers for their health management.

For large populations, the minimum required sample size is determined using Cochran's formula [28]. At a 95% confidence level, with a 5% margin of error and a 50% response distribution, the minimum required sample size was calculated to be 385. Respondents were selected using a convenience sampling method from the general public of Guntur city. Convenience sampling is widely used when the population is large, dispersed, and difficult to access in its entirety [29].

Data collection

Data were collected using a structured questionnaire administered through Google Forms. The questionnaire comprised two sections: demographic information of the respondents and items measuring the key parameters of the study. To assess online health knowledge-seeking behavior, usage of wearable devices, digital health literacy, and health decision-making behavior, items were adapted from validated tools in the existing literature [30-33] and modified to suit the study context. The questionnaire was reviewed by two experts in quantitative analytics and the subject domain to ensure content validity. The study targeted the general public, excluding vulnerable populations. Data were collected through a voluntary, self-administered online questionnaire. Participants were informed about the study's purpose, and consent was obtained prior to participation. Confidentiality and anonymity were maintained, with no personal identifiers collected. The research adhered to the ethical principles of the Declaration of Helsinki.

Instrument

In total, the questionnaire comprised 27 items: 4 related to demographics, 2 screening questions, 6 on online health knowledge-seeking behavior, 4 on wearable device usage, 5 on digital health literacy, and 6 on health decision-making behavior. All items related to the study parameters were measured using a five-point Likert scale, ranging from strongly disagree to strongly agree.

The reliability and validity statistics for the measurement items were assessed, confirming the robustness of the instrument. At the beginning of the questionnaire, two screening questions were included: 1) "Have you ever used the internet to search for health-related information?" and 2) "Are you currently using any smartwatch or fitness tracker to monitor or manage your health?" Only respondents who answered "Yes" to both questions were considered eligible for the study. A total of 1,219 responses were received, of which 23 did not meet the inclusion criteria, leaving 1,196 valid responses for data analysis.

Statistical analysis

Partial least squares structural equation modeling (PLS-SEM) was employed to examine the relationships, and mediation analysis was performed using bootstrapping with 5,000 resamples. All statistical analyses were carried out using SmartPLS software 4.1.1.4.

Findings

Most respondents were aged 31-40 years (33.7%), followed by those aged 21-30 years (31.1%) and ≤20 years (28.7%), indicating a strong representation of younger and middle-aged groups. Females (51.6%) slightly outnumbered males (48.4%), and 53.4% were married. Most respondents were undergraduates (76.2%), followed by postgraduates (20.5%), reflecting a highly educated sample (Table 1).

Table 1. Demographic characteristics of the participants (n=1196)

Parameter	Frequency (%)
Age (year)	
≤20	343 (28.7)
21-30	372 (31.1)
31-40	403 (33.7)
40-50	59 (4.9)
>51	19 (1.6)
Gender	
Male	579 (48.4)
Female	617 (51.6)
Marital status	
Single	557 (46.6)
Married	639 (53.4)
Educational qualification	
Under graduate	912 (76.2)
Post graduate	245 (20.5)
Diploma	19 (1.6)
Professional certifications	20 (1.7)

The structural model shows standardized path coefficients and indicator loadings. The values on the arrows represent standardized path coefficients, while the values on the constructs represent R^2. Indicator loadings are shown on the measurement model paths (Figure 1).

Outer loadings (0.735–0.915) exceeded the 0.70 threshold, confirming item adequacy. Cronbach's alpha (0.871–0.923) and composite reliability (0.903–0.945) were above 0.70, ensuring internal consistency. Average variance extracted (AVE) values (0.608–0.812) surpassed 0.50, establishing convergent validity. Overall, the measurement model was both reliable and valid for structural analysis (Table 2).

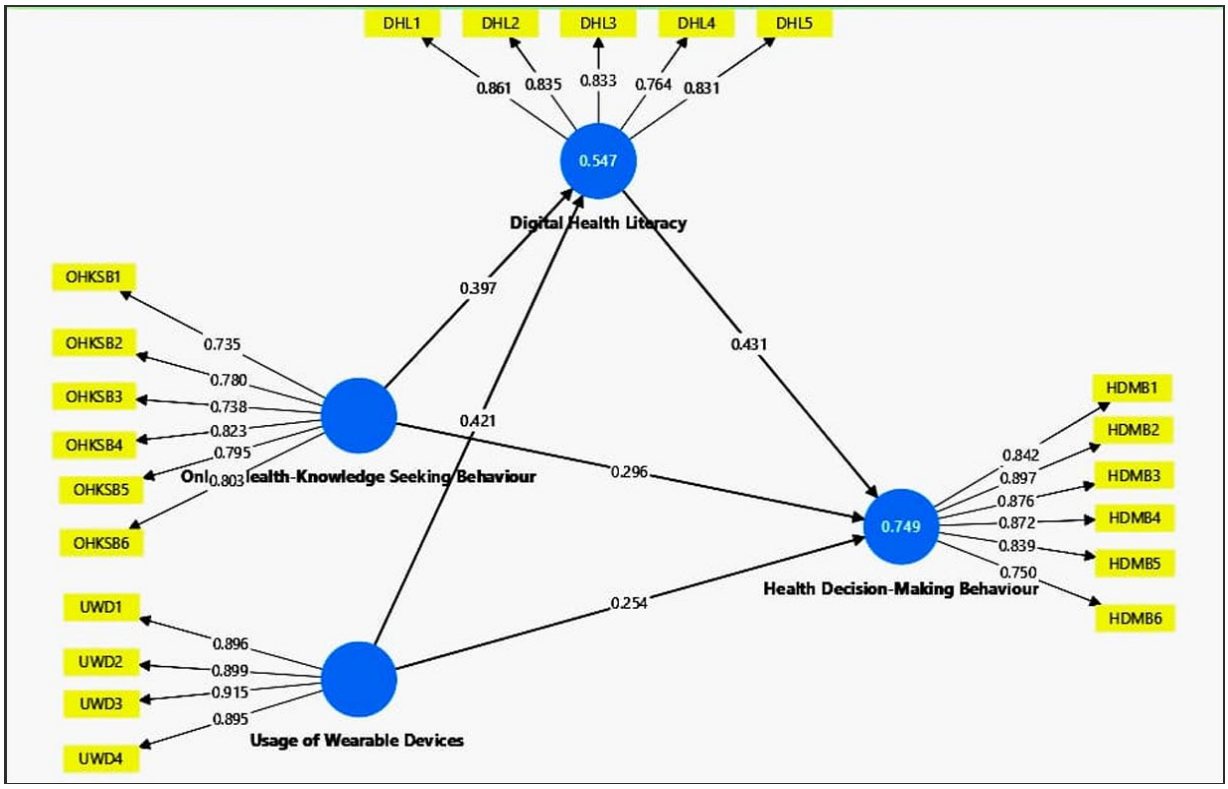

Figure 1. PLS-SEM structural and measurement model

Table 2. Reliability and convergent validity

Item	DHL	UWD	HDMB	OHKSB
DHL1	0.861			
DHL2	0.835			
DHL3	0.833			
DHL4	0.764			
DHL5	0.831			
UWD1		0.896		
UWD2		0.899		
UWD3		0.915		
UWD4		0.895		
HDMB1			0.842	
HDMB2			0.897	
HDMB3			0.876	
HDMB4			0.872	
HDMB5			0.839	
HDMB6			0.750	
OHKSB1				0.735
OHKSB2				0.780
OHKSB3				0.738
OHKSB4				0.823
OHKSB5				0.795
OHKSB6				0.803
Cronbach's alpha	0.883	0.923	0.921	0.871
Composite reliability	0.914	0.945	0.938	0.903
Average variance extracted	0.682	0.812	0.718	0.608

Digital health literacy (DHL); usage of wearable devices (UWD); health decision-making behavior (HDMB); health-knowledge seeking behavior (OHKSB)

The Fornell-Larcker criterion results confirmed that discriminant validity was established among all constructs. The square root of the AVE for each construct, shown on the diagonal in bold, was greater than its corresponding inter-construct correlations in the same row and column, (Table 3). This demonstrates that all constructs were empirically distinct and measured unique concepts within the model.

Path 1: Online health knowledge-seeking behavior had a significant positive impact on health decision-making (β=0.296, t=3.904, p<0.001). The confidence interval (0.152–0.453) further confirmed that the effect is stable and meaningful.

Path 2: The use of wearable devices positively influenced health decision-making (β=0.254, t=3.035, p=0.002). The confidence interval (0.087–0.411) supported the reliability of the relationship.

Path 3: A strong positive association was observed between online health knowledge-seeking behavior and digital health literacy (β=0.397, t=4.671, p<0.001). The confidence interval (0.245–0.581) further validated this significant effect.

Path 4: Wearable device usage had a significant positive effect on digital health literacy (β=0.421, t=4.494, p<0.001). The confidence interval (0.218–0.585) confirmed the strength and consistency of this relationship.

Path 5: Finally, digital health literacy showed the strongest direct effect on health decision-making behavior (β=0.431, t=4.994, p<0.001). The confidence interval (0.260–0.597) further demonstrated the robustness of this path.

All proposed paths were statistically significant (p<0.05), with positive β coefficients, confirming that both online and technology-driven health behaviors play an essential role in shaping individuals' digital health literacy and subsequent health-related decisions (Table 4).

Table 3. Discriminant validity (Fornell-Larcker criterion)

Parameter	4	3	2	1
1- Digital health literacy	0.672	0.663	0.798	0.826
2- Health decision-making behavior	0.730	0.742	0.847	
3- Online health-knowledge seeking behavior	0.631	0.780		
4- Usage of wearable devices	0.901			

Table 4. Structural model results (direct effects)

Path	β	t-Value	p-Value	95% CI Lower level-upper level
1- Online health-knowledge seeking behavior → Health decision-making behavior	0.296	3.904	<0.001	0.152-0.453
2- Usage of wearable devices → Health decision-making behavior	0.254	3.035	0.002	0.087-0.411
3- Online health-knowledge seeking behavior → Digital health literacy	0.397	4.671	<0.001	0.245-0.581
4- Usage of wearable devices → Digital health literacy	0.421	4.494	<0.001	0.218-0.585
5- Digital health literacy → Health decision-making behavior	0.431	4.994	<0.001	0.260-0.597

Digital health literacy partially mediated both relationships with health decision-making. For online health knowledge-seeking behavior, the direct effect was β=0.296, and the indirect effect via digital health literacy was β=0.171 (t=3.158, p=0.002), resulting in a total effect of β=0.467. For the usage of wearable devices, the direct effect was β=0.254, and the indirect effect was β=0.181 (t=3.468, p=0.001), yielding a total effect of β=0.435. Since the direct effects remained significant, both cases indicate partial mediation.

The model fit indices indicated an acceptable fit. The chi-square statistic was 523.576, and the standardized root mean square residual (SRMR) value was 0.077, which is below the recommended threshold of 0.08. Both d-ULS (1.362) and d-G (0.784) values were within the bootstrapped confidence intervals, confirming a good fit. Although the normed fit index (NFI) (0.771) fell below the 0.90 threshold, this is common in complex PLS-SEM models, and the overall fit was deemed adequate (Table 5).

Discussion

The present study aimed to examine how online health knowledge-seeking behavior and the use of wearable devices contribute to health decision-making behavior, with digital health literacy acting as a key mediator. Consistent with the principles of SCT [27], individuals rely not only on external tools, such as online information and wearable devices but also on their internal capacity (digital literacy) to process, evaluate, and apply information when making health-related decisions.

First, the direct positive relationship between online health knowledge-seeking behavior and health-related decision-making confirms that individuals who actively engage in searching for health knowledge are more likely to make informed choices regarding their well-being. This aligns with the study conducted by Chen *et al.*, who examined 457 outpatients in Taiwan and found that online health information-seeking is positively correlated with changes in health decisions [34]. Similarly, Kyriacou and Sherratt reported that 36.6% of outpatients in Cyprus experience positive health behavioral changes after seeking online health information, and 15.4% stated that it directly influenced their care-related decisions [35]. McLeod *et al.*'s study on patients with gynecological cancer in Canada reported that 78% indicated that online health information increases their understanding of their diagnosis, and 26% noted it aids in treatment decision-making [36]. Collectively, these findings reinforce the role of online health information-seeking as an empowering behavior that supports better health-related decision-making across diverse populations.

Similarly, the use of wearable devices was found to positively influence decision-making, supporting earlier research. For example, a scoping review conducted by Kang and Exworthy concluded that wearable health technologies enhance self-monitoring and motivate individuals to take proactive steps in managing their health [14]. In line with this, Auerswald *et al.* conducted a pilot feasibility study in Germany and reported that activity trackers, such as Fitbit (Zip) had a high acceptance rate and significantly increased average daily step counts, with greater usage associated with more physical activity. These findings collectively suggest that wearable devices not only promote healthier behaviors but also facilitate informed health-related decision-making by providing users with continuous, actionable feedback [37].

Online health knowledge-seeking was found to positively influence digital health literacy, confirming that continuous exposure to online health information strengthens individuals' ability to critically evaluate and process digital content. This is consistent with prior research, which suggests that access to health information through digitization can improve health literacy among the population and promote a preventive approach to health problems and disease [38].

Likewise, wearable device usage was positively related to digital health literacy, suggesting that frequent interaction with health technologies enhances users' digital competencies by making them more familiar with interpreting data and engaging with digital platforms. In line with our findings, a recent German nationwide survey revealed that

adults who use wearable devices report significantly higher e-health literacy scores compared to non-users, and that digital health literacy is a stronger predictor of wearable adoption in older age groups [19].

Thus, both information-seeking behavior and technology adoption act as enablers of literacy development in the digital health context. Moreover, digital health literacy itself showed a strong positive effect on health-related decision-making, reinforcing its pivotal role as a bridge between technological engagement and effective health behavior. This result is consistent with previous literature [16, 21], which emphasizes that health technologies and online resources can translate into meaningful outcomes when individuals possess the literacy skills to evaluate, interpret, and apply the information appropriately.

Finally, the mediation results also align with recent evidence in the digital health domain, which emphasizes that literacy skills bridge the gap between technology use and effective health outcomes. For instance, studies have shown that without adequate digital literacy, individuals may misinterpret health information or fail to utilize wearable data effectively, potentially leading to poor health decisions [39, 40]. By highlighting the centrality of digital health literacy, this study confirms the growing consensus that literacy functions as both a facilitator and a safeguard in the digital health ecosystem.

From a practical perspective, these findings suggest that policymakers and healthcare providers should not only promote the use of wearable devices and online health resources but also invest in enhancing digital health literacy among the general population. Training programs, awareness campaigns, and user-friendly digital health platforms could help individuals harness the full potential of health technologies in making informed decisions.

This study highlights the critical role of digital health literacy in shaping health decision-making behavior, particularly in the context of online health knowledge-seeking and wearable device usage. While both information-seeking behavior and technology adoption directly improve decision-making behavior, their impact is significantly amplified through digital health literacy. By serving as a mediator, digital health literacy enables individuals to critically evaluate, interpret, and apply health information, thereby transforming access to digital resources into meaningful health outcomes. Grounded in SCT, the study underscores the dynamic interplay between behavioral engagement, technological interaction, and cognitive capability, offering valuable insights for researchers, policymakers, and healthcare practitioners aiming to leverage digital tools to foster informed health choices and promote public well-being.

Conclusion

Digital health literacy plays a central role in translating access to technology and online information into informed health decisions.

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