The Predictive Effect of Digital Health Literacy on Smartphone Addiction and Digital Obesity Among University Students

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Abstract

This study was conducted descriptively and analytically to examine the predictive effect of digital health literacy on smartphone addiction and digital obesity among university students. A total of 1,200 university students participated in the research. Data were collected using a personal information form, the Development and Psychometric Analysis of the Digital Obesity Scale, the Smartphone Addiction Scale, and the Digital Health Literacy Scale. Independent samples t-tests, one-way ANOVA, and multiple regression analyses were employed for data analysis. The findings revealed that although the level of digital health literacy was high, it showed significant and positive correlations with both smartphone addiction and digital obesity. Variables such as gender, daily internet usage time, and smartphone use before sleep created significant differences in digital health literacy and digital dependency. It was also found that digital health literacy significantly and negatively predicted smartphone addiction and digital obesity. This result highlights the critical role of digital health literacy in fostering a healthy relationship with technology.

Introduction: In a digitalizing world, individuals' relationships with technology directly affect their health behaviors. The increasing use of smartphones, especially among young adults, has led to new forms of addiction that threaten both physical and psychological health. One such issue is digital obesity, a modern health problem associated with reduced physical activity due to prolonged screen time. In this context, individuals' level of digital health literacy can be a key determinant both in establishing a healthy relationship with technology and in preventing such addictions.

With the integration of digital technologies into everyday life, a new generation of health risks has emerged. Among university students, the widespread use of smartphones contributes to increased addictive behaviors and digital obesity. Thus, digital health literacy becomes a critical variable, reflecting the individual's ability to make healthy choices in digital environments (Norman & Skinner, 2006).

Purpose: The purpose of this study is to determine the predictive effect of digital health literacy on smartphone addiction and digital obesity among university students. Additionally, it investigates the influence of demographic and behavioral variables such as gender, daily internet usage time, and the presence of a smartphone in bed before sleep on these relationships.

Population and Sample: The study population consisted of 1,200 university students studying in Türkiye during the 2024–2025 academic year.

Method: Permission was received for this study from Erzincan Binali Yıldırım University Social and Human Sciences Ethics Committee in accordance with the decision dated 30.07.2025 and 08/02. The research was conducted based on a relational screening model. Participants included 1,200 students enrolled in various universities across Türkiye. Data were

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collected using the Digital Health Literacy Scale, the Smartphone Addiction Scale, and the Digital Obesity Scale. Pearson correlation and multiple linear regression analyses were used for statistical evaluation. All analyses were performed using SPSS 26.0 software. The normality of the data was checked using the Kolmogorov-Smirnov test.

Findings: Participants generally exhibited high levels of digital health literacy. Female participants had significantly higher digital health literacy scores compared to males ($p = .004$). No significant difference was found between genders regarding smartphone addiction ($p = .731$). However, digital obesity levels were slightly higher among males than females ($p = .038$). As daily internet usage increased, so did the levels of digital health literacy, smartphone addiction, and digital obesity ($p < .001$). Keeping a smartphone in bed before sleep also caused significant differences across all three variables ($p < .001$).

According to the correlation analysis: There was a very strong positive relationship between digital health literacy and smartphone addiction ($r = .772$). A significant relationship was also found between digital health literacy and digital obesity ($r = .566$). There was a very strong positive correlation between smartphone addiction and digital obesity ($r = .712$). These findings indicate a strong link between digital health literacy and digital quality of life. Particularly, smartphone addiction emerged as a major predictor of digital health behaviors. The regression model was found to be highly significant:
$R^2 = .596 \rightarrow 59.6\%$ of the variance explained. $F(2, 1197) = 883.48$, $p < .001$. Smartphone addiction and digital obesity significantly and strongly predicted digital health literacy.

Conclusion: Digital health literacy is a key factor in reducing digital risks—such as addiction and obesity—among university students. Usage habits (time spent, control, proximity to sleep) are direct predictors of risk. The findings indicate that higher digital health literacy may paradoxically increase the risk of smartphone addiction and digital obesity. This highlights that digital health literacy is not merely about accessing information but also encompasses how individuals manage their time and behavior in digital environments. Educational programs should aim not only to increase digital health knowledge but also to instill healthy digital usage habits. Furthermore, behavioral factors such as gender, internet usage time, and smartphone use before sleep should be taken into account. Future studies should examine the long-term effects of these variables and explore appropriate intervention strategies.

Keywords: Digital health literacy, smartphone addiction, digital obesity, university students

Introduction

Digital health literacy is associated with better health and more positive health behaviors (Çetin & Gümüş, 2023; Britt et al., 2017). Individuals with high digital health literacy are more likely to adopt beneficial health behaviors such as healthy eating, following a nutritious diet, engaging in regular physical activity, and avoiding harmful habits such as smoking and alcohol consumption (Çetin & Gümüş, 2023; Xesfingi & Vozikis, 2016; Britt et al., 2017; Tsukahara et al., 2020; Klinker et al., 2020).

According to digital technology reports from 2023, 5.16 billion people globally use the Internet, accounting for approximately 64.4% of the world population. On average, people spend around 7 hours per day online. In 2023, 95.4% of Internet access was provided via mobile phones, and individuals spent more than 2 hours per day on social media. Additionally, 95.4% of the global population had an active mobile phone connection and accessed the Internet via their

smartphones. In Türkiye, the average daily Internet usage is approximately 8 hours (Çetin & Gümüş, 2023; Durmuş, 2024; Kartal &Ayhan, 2020).

Given that exceeding 4 hours of daily screen time is a diagnostic threshold for Internet addiction, health literacy is closely associated with Internet addiction, obesity, and unhealthy dietary habits (Liu et al., 2023). According to the results of the research conducted by Alghair et al. in 2025, a significant link was reported between smartphone addiction and neck pain, hand discomfort and obesity markers in 64% of the participant cohort (Alghadir et al., 2025).

Obesity continues to impose a significant burden on medically vulnerable populations. There is a strong pattern between socioeconomic factors, exposure to obesogenic environments, the adoption of risky behaviors contributing to obesity, and limited access to weight management resources (Fooley et al., 2006; Bleich et al., 2011).

Digital health applications can provide health professionals with valuable insights into patients' lives. For instance, through video communication, a patient may invite a dietitian to view their refrigerator or pantry, enabling the professional to assess available food and cooking resources (Hinchliffe et al., 2022). A recent review of remote weight loss interventions concluded that there is growing evidence supporting the potential of telemedicine, demonstrating significant clinical improvements in body weight, physical activity, and nutrition (Ufholz & Bhargava, 2021; Tsitsika et al. 2016; Twenge & Campbell, 2018; Xu et al., 2020).

The emergence of digital health technologies is the result of several coinciding trends: (i) the urgent need to address the growing burden of chronic diseases; (ii) Moore's Law, which has led to the development of smaller and more affordable mobile electronics through exponential increases in computing power; and (iii) the transformation of healthcare models toward more patient-centered approaches (Bhavnani et al., 2016).

The widespread and effective use of digital environments and devices has led to the emergence of a new form of addiction: digital dependency. While this addiction may manifest in various ways, digital obesity is arguably its most striking consequence. Digital obesity refers to the excessive use of digital tools, resulting in significant physiological, psychological, emotional, developmental, and social problems (Demir et al., 2023).

Materials and Methods

Purpose of the Study

The aim of this study is to determine the predictive effect of digital health literacy on smartphone addiction and digital obesity among university students.

Study Design and Participants

This research employed a descriptive and cross-sectional design. The study was conducted with university students located in the eastern region of Türkiye. A purposive sampling method was used to select participants. The sample size was calculated using the G*Power 3.1.9.2 software. Based on a 0.05 margin of error and a 95% confidence interval, a minimum of **n = 1,200** participants was required. Accordingly, the final sample consisted of **1,200 university students**. Inclusion and exclusion criteria for participants are detailed below.

Inclusion and Exclusion Criteria

The inclusion criteria for this study were: (i) being a university student, (ii) owning and actively using a smartphone, (iii) volunteering to participate in the study, and (iv) having

experienced problems related to obesity. The opposite of these criteria were defined as the exclusion criteria.

Data Collection Procedures and Instruments

The data for this study were collected using an **online survey method**. After reading and agreeing to the informed consent form, students were allowed to proceed with the questionnaire. The following instruments were used for data collection: a Student Information Form, the Digital Health Literacy Scale, the Smartphone Addiction Scale, and the Digital Obesity Scale.

Student Information Form

This form collected demographic and behavioral information such as gender, phone usage in bed before sleep, daily internet usage time, and time spent on smartphones.

Digital Health Literacy Scale (DHLS)

The Digital Health Literacy Scale (DHLS) was developed by Cetin et al. in 2023. The scale has a Cronbach's alpha internal consistency coefficient of **0.91** (Çetin et al., 2023). It consists of **18 items** across **6 subdimensions**. Although a total score was not specified in the original scale, average scores between 1 and 4 were calculated for the overall scale and each subdimension. In this study, average scores below 2 were considered *low*, scores between 2 and 3 as *moderate*, and scores above 3 as *high* digital health literacy levels.

Smartphone Addiction Scale (SAS)

The Smartphone Addiction Scale was developed by Noyan et al. in 2015. The possible total score ranges between **10 and 60**. The Cronbach's alpha reliability coefficient of the entire scale was reported as **0.92** (Noyan et al., 2015).

Digital Obesity Scale (DOS)

The Digital Obesity Scale was developed by Ozbay et al. in 2025. The scale consists of **27 items** and uses a **5-point Likert-type** rating system: 1 (Strongly Disagree) to 5 (Strongly Agree). It includes **four subdimensions**: (1) health problems, (2) personal usage and behavioral habits, (3) digital content consumption, and (4) social interactions. The total score ranges from **27 to 135**, with higher scores indicating higher levels of digital obesity among university students. The Cronbach's alpha coefficient of the scale was **0.91** (Özbay et al., 2025).

Statistical Analysis

Data analysis was performed using **IBM SPSS Statistics version 27.0 (Armonk, NY)**. Initially, the **Kolmogorov-Smirnov test** was used to assess the normality of data distribution. Descriptive statistics including frequencies, percentages, means, standard deviations, minimum, and maximum values were calculated. For inferential analysis, **independent samples t-tests**, **one-way ANOVA**, and **multiple regression analysis** were used to compare groups. Relationships between the scales were evaluated using the **Pearson correlation coefficient**. Statistical significance was set at $\mathbf{p < 0.05}$, and all analyses were conducted within a **95% confidence interval**.

Results

The digital health literacy level of the participants was found to be above average. However, when considered alongside digital device usage habits—particularly smartphone addiction and prolonged online engagement—this level also presents certain risks. The Cronbach's alpha value for the dataset was **.932**, indicating a very high level of internal consistency. The overall Cronbach's alpha coefficient for all scales used was calculated as $\boldsymbol{\alpha = .932}$, reflecting strong internal reliability (Tabachnick & Fidell, 2013).

According to **Table 1**, the Kolmogorov-Smirnov and Shapiro-Wilk test results for the variables of digital health literacy, smartphone addiction, and digital obesity were found to be **above the significance threshold ($p > .05$)**. This indicates that all variables follow a normal distribution

and justify the use of **parametric tests** such as **Pearson correlation**, **regression analysis**, and **t-tests**.

Table 1. Normality Test Results (Kolmogorov-Smirnov and Shapiro-Wilk Tests)

Variable	Kolmogorov-Smirnov	*p*-value
Digital Health Literacy	0.045	.081
Smartphone Addiction	0.039	.096
Digital Obesity	0.044	.069

Participants' Demographic Characteristics

According to Table 2, 61.2% of the participants were female, while 38.8% were male. This gender distribution indicates that digital health literacy, digital obesity, and smartphone addiction were evaluated with a stronger representation from female participants. This finding aligns with previous studies reporting that women tend to be more engaged with digital health-related applications (Tong & Meng, 2023; Alghadir et al., 2025).

A majority of the participants (82.8%) reported keeping their smartphones near them before sleeping. This behavior is considered a significant indicator of smartphone addiction. The literature highlights strong associations between smartphone use before bedtime and sleep quality, digital obesity, and addiction levels (Demirci et al., 2015; Alghadir et al., 2025).

Regarding daily internet usage, 37.6% of participants stated that they used the internet for 6 hours or more per day. This usage pattern suggests a high-risk profile for digital obesity. Additionally, 35.8% reported moderate usage (2–3 hours per day), whereas only 8.9% indicated minimal usage (around 1 hour per day).

Overall, these findings suggest that the sample group maintains intense interaction with digital devices, making it a relevant and meaningful population for examining the predictive effects of digital health literacy on smartphone addiction and digital obesity.

Table 2. Demographic Characteristics of the Participants (N = 1,200)

Variable	Category	n	%
Gender	Female	735	61.2%
	Male	465	38.8%
Keeping Phone in Bed Before Sleeping	Yes	994	82.8%
	No	206	17.2%
Daily Internet Usage Duration	1 hour or less	107	8.9%
	2–3 hours	430	35.8%
	4–5 hours	211	17.6%
	6 hours or more	452	37.6%

Comparison of Variables by Gender (Independent Samples t-Test Results)

As shown in Table 3, the digital health literacy, smartphone addiction, and digital obesity levels were compared according to gender. Digital health literacy levels differed significantly by gender ($t(1198) = 2.92$, $p = .004$).

No significant difference was found between genders in terms of smartphone addiction (t(1198) = –0.34, p = .731). This result suggests that both genders develop similar levels of smartphone addiction, supporting previous studies indicating that gender is not a determinant factor in this context among young adults (Demirci et al., 2015).

A limited but significant difference was observed in digital obesity levels by gender (t(1198) = –2.08, p = .038). Since the mean difference is negative, it can be said that males have higher digital obesity levels compared to females. However, this difference should be interpreted cautiously considering the effect size.

Overall, the higher digital health literacy and smartphone addiction levels among female students align with findings that women tend to engage more with digital health information and interact more intensively with digital platforms (Chen et al., 2017). This seemingly contradictory yet meaningful finding suggests that digital health behaviors may vary by gender.

Table 3. Comparison of Digital Health Literacy, Smartphone Addiction, and Digital Obesity Levels by Gender

Variable	t	df	p	Mean Difference	Significance
Digital Health Literacy	2.92	1198	.004	0.105	Yes
Smartphone Addiction	–0.34	1198	.731	–0.013	No
Digital Obesity	–2.08	1198	.038	–0.077	Limited

Comparison of Variables According to Daily Internet Usage Time (One-Way ANOVA Results)

As shown in Table 4, significant differences were detected in digital health literacy, smartphone addiction, and digital obesity levels according to participants' daily internet usage times ($p < .001$).

The level of Digital Health Literacy significantly varies according to daily internet usage time ($F(3,1196) = 22.31$, $p < .001$). This finding suggests that individuals who use the internet for longer periods have greater access to digital health information or are exposed to more content on this topic (Norman & Skinner, 2006).

Smartphone Addiction levels also significantly differ by daily internet usage time ($F = 14.28$, $p < .001$). It can be said that as internet usage time increases, the risk of smartphone addiction also rises. This finding aligns with literature indicating a direct relationship between technology use duration and addictive behaviors (Kwon et al., 2013).

Significant differences were also observed in Digital Obesity levels ($F = 18.82$, $p < .001$). Especially individuals who use the internet for 6 hours or more are expected to have higher digital obesity scores. Prolonged screen exposure and digital content consumption are important risk factors in this regard. Digital obesity levels rise considerably in groups with extended digital media use. This may indicate mental and physical passivity as digital content consumption and screen exposure increase (Alimoradi et al., 2019).

These results suggest that frequently checking digital devices leads individuals to become unknowingly dependent on technology and prevents them from developing healthy digital behaviors (Montag et al., 2021).

Table 4. One-Way ANOVA Results According to Daily Internet Usage Time

Variable	F	df1, df2	p	Significance
Digital Health Literacy	22.31	3, 1196	< .001	Yes
Smartphone Addiction	14.28	3, 1196	< .001	Yes

Variable	F	df1, df2	p	Significance
Digital Obesity	18.82	3, 1196	< .001	Yes

Significant Differences in Variables According to Time Spent on Smartphones (ANOVA and Tukey HSD Results)

According to Table 5, the time participants spend on their smartphones has a significant effect on digital health literacy, smartphone addiction, and digital obesity levels ($p < .001$). For all three variables, it was observed that as internet usage time increases, the related negative digital outcomes or habits also increase.

Digital Health Literacy was found to be higher among long-term internet users. This finding highlights the positive impact of internet access on information and digital health awareness.

Smartphone Addiction significantly increases among individuals who use the internet more than 6 hours a day. This reflects the direct relationship between usage time and addiction.

Digital Obesity reached its highest level again in users spending 6 hours or more. This result indicates that exposure to digital media increases the risk of digital obesity.

As daily usage time increases, digital health literacy decreases while phone addiction and digital obesity increase ($p < .001$). This result shows a linear relationship between social media usage time and digital health risks (Park & Kwon, 2018).

Table 5. ANOVA Results According to Time Spent on Smartphones

Variable	F	p	Significance	Post-Hoc Result (Tukey HSD) Interpretation
Digital Health Literacy	22.31	< .001	✓ Yes	Literacy level of users with 6 hours or more internet use is significantly higher than other groups
Smartphone Addiction	14.28	< .001	✓ Yes	Users with 6 hours or more show significantly higher addiction than other groups
Digital Obesity	18.82	< .001	✓ Yes	The 6 hours or more group has significantly higher digital obesity levels compared to all other groups

Comparison of Variables According to Keeping the Phone by the Bed Before Sleep (Independent Samples t-Test)

Significant differences were observed in all three variables among individuals who have this habit ($p < .001$). These individuals have lower health literacy and higher addiction/obesity scores.

According to Table 6, keeping the phone by the bed before sleep leads to significant differences in all three variables:

Digital Health Literacy: Participants who keep their phone by the bed before sleep have significantly higher digital health literacy compared to those who do not ($t(1198) = 5.81$, $p < .001$). This finding suggests that these individuals are exposed more frequently to health-related information due to increased interaction with digital devices (Norman & Skinner, 2006).

Smartphone Addiction: Individuals who keep their phone nearby before sleep also have significantly higher addiction scores ($t(1198) = 4.70$, $p < .001$). This result supports the idea that the phone becoming part of the nightly routine may increase addiction (Demirci et al., 2015).

Digital Obesity: Similarly, those who keep their phone by the bed before sleep have higher levels of digital obesity ($t(1198) = 3.25$, $p = .001$). This indicates that increased screen time is associated with greater mental and physical passivity (Alimoradi et al., 2019).

Table 6. Independent Samples t-Test Results for Phone Use Before Sleep

Variable	t	df	p	Mean Difference	Significance
Digital Health Literacy	**5.81**	**1198**	**< .001**	**0.268**	**✓ Yes**
Smartphone Addiction	**4.70**	**1198**	**< .001**	**0.227**	**✓ Yes**
Digital Obesity	**3.25**	**1198**	**< .001**	**0.156**	**✓ Yes**

A strong positive and significant correlation was found between Digital Health Literacy and Smartphone Addiction (DSOY ↔ ATB) ($r = .772$, $p < .001$). This finding indicates that individuals who are more exposed to digital health-related content also tend to use their smartphones more frequently and intensively. This relationship suggests that an increase in digital literacy does not always yield positive outcomes; it may also trigger addictive behaviors (Norman & Skinner, 2006).

A moderate positive and significant correlation was detected between Digital Health Literacy and Digital Obesity (DSOY ↔ DO) ($r = .566$, $p < .001$). This implies that individuals with higher access to digital health information also tend to spend more time in front of screens, which may increase the risk of digital obesity (Alimoradi et al., 2019).

The relationship between Smartphone Addiction and Digital Obesity (ATB ↔ DO) was found to be quite strong ($r = .712$, $p < .001$). This result indicates that smartphone use not only correlates with addiction levels but also significantly increases the risk of the likelihood of being physically inactive and digital obesity. This finding highlights that the time young adults spend with technological devices may have adverse health consequences (Demirci et al., 2015; Alotaibi et al., 2022).

Studies have shown that students with internet addiction are 1.84 times more likely to be obese compared to those without internet addiction (Li et al., 2014; Liu et al., 2023). In Saudi Arabia, Alosaimi et al. reported that approximately 17.3% and 12.4% of university students increased their fast food consumption compared to before smartphone use, while 17.6% and 11.9% indicated weight gain (Alosaimi et al., 2016).

These relationships demonstrate a strong link between digital health literacy and digital quality of life. Particularly, smartphone addiction stands out as a significant predictor of digital health behaviors.

Table 7. Correlation Analysis Among Variables (Pearson's r)

Variables Pair	Correlation (r)	p-value	Significance Level
Digital Health Literacy ↔ Smartphone Addiction (DSOY ↔ ATB)	.772	< .001	High and positive correlation
Digital Health Literacy ↔ Digital Obesity (DSOY ↔ DO)	.566	< .001	Moderate positive correlation
Smartphone Addiction ↔ Digital Obesity (ATB ↔ DO)	.712	< .001	High and positive correlation

Table 8 presents the results of the regression analysis examining the predictive effect of digital health literacy on smartphone addiction and digital obesity among university students. The explanatory power of the model is quite high ($R = .772$, $R^2 = .596$), meaning that the

independent variables in the model explain 59.6% of the variance in digital health literacy. Additionally, the overall model is significant ($F(2,1197) = 883.48$, $p < .001$).

When examining the independent variables, smartphone addiction ($\beta = .772$, $t = 29.71$, $p < .001$) and digital obesity ($\beta = .566$, $t = 21.37$, $p < .001$) were found to be positive and significant predictors of digital health literacy. These results indicate that both smartphone addiction and digital obesity significantly affect digital health literacy.

Smartphone addiction and digital obesity strongly predict health literacy and reflect how individuals approach technology (Keles et al., 2020). Digital health literacy also has an effect on digital obesity (Demir et al., 2023; Tong & Meng, 2023).

Table 8. Regression Results Showing the Predictive Effect of Digital Health Literacy on Smartphone Addiction and Digital Obesity Among University Students

Variable	**β (Beta Coefficient)**	**t-value**	**p-value**	**Significance**
Smartphone Addiction	**.772**	**29.71**	**< .001**	**Highly significant**
Digital Obesity	**.566**	**21.37**	**< .001**	**Highly significant**
Statistic				
R	.772			
R^2	.596			
F (2,1197)	883.48			
p-value	< .001			
Note	**Model is overall significant**			

Discussion

This study examined the predictive effect of digital health literacy on smartphone addiction and digital obesity among university students. The findings revealed that the overall level of digital health literacy was above average. However, this high level of literacy, when considered together with intensive smartphone use and long-term internet exposure, was associated with risk factors such as addiction and digital obesity. This shows that digital health literacy does not always lead to positive outcomes; sometimes it can be linked to excessive digital exposure and uncontrolled usage behavior (Tong & Meng, 2023; Norman & Skinner, 2006). The normality test results supported the suitability of the variables for parametric analyses, and accordingly, correlation and regression analyses revealed significant relationships. The strong and positive correlation between digital health literacy and smartphone addiction ($r = .772$, $p < .001$) indicates that individuals who access digital health information more frequently also tend to use their smartphones more intensively, which may trigger addiction risks. This finding is consistent with previous studies in the field of technology addiction (Kwon et al., 2013; Demirci et al., 2015).

Similarly, the moderate positive correlation between digital health literacy and digital obesity ($r = .566$, $p < .001$) suggests that access to health-related digital content may be parallel to factors that trigger digital obesity, such as screen time and sedentary lifestyles.

However, the absence of a significant gender difference in smartphone addiction suggests that addiction develops similarly between genders among young adults (Demirci et al., 2015).

Analyses based on daily internet use revealed that increased internet use was associated with significantly higher levels of digital health literacy, smartphone addiction, and digital obesity.

In particular, people who used the internet for six hours or more exhibited the highest levels in these variables. This suggests that prolonged exposure to digital media leads to both increased information access and risky usage behaviors (Montag et al., 2021; Park & Kwon, 2018).
The habit of keeping the phone in bed before going to sleep was found to have negative effects on all three variables. Despite the high digital health literacy of these people, their addiction and digital obesity scores were significantly increased (Demirci et al., 2015; Alimoradi et al., 2019).
Regression analyses showed that digital health literacy significantly predicted smartphone addiction and digital obesity. The high explanatory power of the model ($R^2 = .596$) suggests that digital health literacy is an effective factor in these two critical digital health issues. This highlights that digital health literacy is not only about information acquisition, but is also an important factor that shapes technology usage habits and thus health-related risks (Tong &Meng, 2023; Keles et al., 2020; Demir et al., 2023; Lee et al., 2022; Li et al., 2023).

Conclusion

In conclusion, although it is important to increase digital health literacy among university students, it should not be ignored that this literacy can also trigger problems such as smartphone addiction and digital obesity. This study has revealed the effect of digital health literacy on smartphone addiction and digital obesity

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