Relationship between High School Adolescents' Health Literacy and Their Propensity to Engage in Internet Addictive Behaviors

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Abstract

Background: Adolescents' health literacy is essential in shaping their behaviors, including their engagement with technology. In addition to providing adolescents with new socialization opportunities and benefits for academic accomplishment, the extensive use of internet has resulted in a number of unfavorable outcomes. Adolescents are progressively becoming addicted to the internet. **Aim:** To explore the relationship between high school adolescents' health literacy and their propensity to engage in internet addictive behaviors. **Subjects and method:** A descriptive cross-sectional design was applied. The study was conducted at four Governmental secondary schools in Al- Sharqia Governorate, Egypt. The studied subjects encompassing 351 adolescents recruited randomly from each educational grade during the 2024-2025 academic year. **Data collection tools:** A self-administrated questionnaire was utilized for data collection which consisted of three parts which were; Student's Personal Characteristics Data Sheet, Adolescent Health Literacy Scale, and Internet Addiction Diagnostic Questionnaire. **Results:** The study revealed that the total mean score for internet addiction among high school adolescents was 8.63±1.68, and the majority of the participants (87.1%) had low level of health literacy. **Conclusion:** Notably, a highly significant negative correlation was detected between total mean scores of health literacy and internet addiction among high school adolescents. This result delivers preliminary confirmation for the extrapolative role of health literacy in adolescents' internet addiction. **Recommendation:** The existing results can be utilized to launch health promotion and health literacy initiatives. This comprise designing and implementing multimedia ongoing educational initiatives to raise adolescents' awareness of internet addiction phenomenon and stop its detrimental effects on their mental, behavioral, academic, and even physical health.

Key words: Adolescents, Addictive behaviors, Health literacy, Internet.

Introduction

It is well established that health promotion and health literacy (HL) are factors that support excellent health outcomes and ensure adolescents have a positive developmental trajectory. Adolescents begin to make their own health decisions and make several health-related decisions as they transitioned into young adulthood. During this time, they gain the cognitive abilities and skills necessary to maintain their health and make critical decisions (**World Health Organization, 2024**). Adolescents often lack the necessary understanding and expertise required to maintain optimal health. The development of health literacy skills, plays a critical role in enabling them to acquire the knowledge and competencies essential for achieving and sustaining good health (**Liu et al., 2020**).

Adolescents who possess health literacy are better able to comprehend and control their health problems in a healthier way **(Nobre et al., 2021)**. The **World Health Organization (2021)**, recognizes health literacy as a key determinant of health, encompassing an individual's social and cognitive skills. According to **McAnally & Hagger (2023)**, health literacy skills shape adolescents' motivation and capacity to seek, comprehend, and utilize health-related information and services to make informed choices that promote and maintain overall well-being.

According to **Silva & Santos (2021),** health literacy is a broad concept that relies on the accessibility of knowledge regarding harmful health behaviors and their effects. Low health literacy was associated with poorer health and a lower ability to understand both oral and written data from medical experts, which increases hospitalization and medical expenses **(Chu-ko et al., 2021).** Providing adolescents with a high degree of health literacy is crucial since it is a prerequisite for a healthy behavior (**Adewole et al., 2021).**

Recent literature revealed that health literacy, encompassing curiosity about health, the capacity to comprehend health information, and the commitment to apply health knowledge, plays a pivotal role in influencing the health behaviors of adolescents **(Tomé et al., 2024)**. By fostering adequate levels of health literacy, it is not only to enhance individuals' understanding of vital health information but also to empower them to actively engage with the healthcare system. This engagement is essential for achieving positive health outcomes in the future **(Chu-Ko et al., 2021)**.

An increasing number of studies have indicated that health literacy (HL) is a crucial factor influencing utilization of healthcare, outcomes of health, and risky health behaviors, such as excessive usage of the internet **(Ceylan et al., 2022)**. According to a study by **Turan et al. (2021),** health literacy is important for encouraging healthy behaviors and favorably affecting perceptions of healthcare. Nevertheless, health literacy levels among the general population differ across countries and are frequently inadequate **(Reisi et al., 2020; Guo et al., 2022).**

The rapid advancement of information technology over the last 20 years has made the internet a necessary component of our everyday life **(Szymkowiak et al., 2021).** This rapid evolution has significantly transformed the lives of adolescents around the world, offering new chances for communication, learning and entertainment. However, there are hazards associated with excessive internet use. Internet addiction (IA), which characterized by compulsive usage and negative consequences, has become a growing concern among adolescents. It negatively affects their mental health, academic performance, and social interactions (**Mohammed Al Mansoor, 2023).**

At the present, there is no universal agreement on the criteria for diagnosing addiction of the internet. This encompasses behaviors such as examining emails, instant chatting, pornography, gambling, shopping, and gaming online, and engaging with social media **(Li et al., 2021).** In terms of psychology, young individuals are more receptive to new technology and are able to adjust to it more readily than adults are. Adolescents, who are digital natives, use a variety of applications (apps), express their opinions online, try to stay up to date with fashion trends, and look for emotional support and connections **(Haddock et al., 2022).**

Suicidal thoughts and actions, substance abuse, social anxiety disorder, depression, and attention-deficit hyperactivity disorder (ADHD) are among the illnesses that have been found to be comorbidities of IA **(Sakamoto et al., 2022).** Additionally, some demographic factors such as obesity, poor academic performance, high-risk behavior, higher family wealth, and lower levels of parental attachment are linked to Internet addiction. It is crucial to explore these variables in order to develop effective interventions that promote healthy adolescent development, particularly in light of the ongoing efforts to avoid and control epidemics (**Liu et al., 2023**).

Adolescents who possess greater health literacy are more susceptible to make informed choices about internet usage, balancing its

benefits with the need to minimize risks. Conversely, Unhealthy behaviors have been linked to insufficient health literacy, including excessive internet use **(Taba et al., 2022**). According to a recent research, adolescents who have lower health literacy levels are less able to make logical decisions based on perceived risk-reward ratios. Adolescents with lower HL levels are therefore more prone to make reactive decisions, which are predicated on snap assessments about their surroundings **(Jafari et al., 2021).** Poor decision-making abilities among adolescents are linked to internet addiction and insufficient health literacy **(Lubis & Handayani, 2022).**

In Egypt, internet access among adolescents is growing rapidly, making the impact of health literacy on their online behaviors especially important. Studies indicate that Egyptian adolescents spend several hours each day online, frequently engaging with social media, gaming, and streaming platforms. Reduced physical activity, worse academic achievement, and detrimental mental health effects including anxiety and depression are all associated with this increased screen usage **(Hassan & Masoud, 2021).**

Significance of the Study:

Research on health literacy among adolescents remains scarce, with limited studies examining its connection to health behaviors in this demographic **(Chu-Ko et al., 2021)**. Nonetheless, available evidence suggests that low health literacy is widespread among adolescents, with prevalence rates ranging from 34% in the US to 93.7% within China. This low level of health literacy is associated with adverse health related behaviors **(Brandt et al., 2019; Guo et al., 2022).**

In contrast to smoking and alcohol consumption, the onset of internet addiction tends to be more gradual and less immediately noticeable. However, its long-term effects can lead to significant health and social challenges, making it a growing concern. Despite the increasing prevalence of internet addiction among adolescents, there is still limited research exploring the relationship between health literacy and internet addiction within this group. Various factors contribute to the development of IA, but health literacy stands out as a modifiable factor that can be addressed and improved **(Liu et al., 2023).**

Understanding the connection between HL and IA is crucial, as it could provide valuable insights for developing targeted interventions aimed at reducing internet addiction in adolescents. This study was therefore created to elucidate these issues, shed light on the association between high school adolescents' health literacy and their propensity to engage in internet addictive behaviors, and subsequently, lead to the extension of preventive efforts for internet addiction through the exploration of definite probable risk issues and upgrade adolescents with required knowledge.

Aim of the Study:

This study aimed to explore the relationship between high school adolescents' health literacy and their propensity to engage in internet addictive behaviors.

Research Objectives:

The study targeted these objectives: -

1.Assess high school adolescents' health literacy levels.

2.Measure high school adolescents' tendency for engaging in internet addictive behaviors.

3.Find out the relationship between high school adolescents' health literacy and their propensity to engage in internet addictive behaviors.

Research Questions:

The following were the research questions for which the researchers hope to provide answers:

- What are the levels of health literacy among high school adolescents?
- Are internet addictive behaviors predominant among high school adolescents?

What relationship is there between high school adolescents' health literacy and their

propensity to engage in internet addictive behaviors?

Study Design:

The study employed a descriptive cross-sectional design. Descriptive cross-sectional studies elucidate things or how variables are associated to each other at a specific time. A descriptive cross-sectional design was appropriate for assessing high school adolescents' health literacy ln compliance with the reporting standards for observational studies specified in the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement **(Ndidiamaka & Chikeme, 2020).**

Study Setting:

The existing study was conducted at four governmental high schools in Al- Sharqia Governorate, Egypt. It is the third most populous of the governorates of Egypt. The governorate is located in the lower Egypt delta region, situated north of Cairo up to the Mediterranean See. Its capital is Al-Zagazig. In terms of its educational districts, there are twenty districts.

Target Population:

This study's target population included Egyptian high school adolescents enrolled in the previously mentioned settings during the 2024-2025 academic year. Adolescents were recruited randomly from each school, to give the best representation. Recruitment criteria for the subjects encompassing the subsequent:

1.From every educational grade at the school.

2.Aged between 15 to 18 years.

3.From both sexes.

4.Had a smartphone and utilized the internet.

5.Enthusiastic and have an interest to share in the study.

While, students who suffered from any psychiatric disorder, or did not fill out the questionnaires completely were excluded.

Sample Size Calculation:

The following equation **(Dobson, 1984)** was used to estimate the sample size:

$$\textbf{Sample size (n)} = \frac{Z^2}{\Delta^2} \; P\,(100 - P)$$

Where

P:	The prevalence rate of excessive internet use among adolescents in Alexandria, ranging from 10.69% to 35.2% (**Abou El Wafa et al., 2021**).
Zα/2:	A 95% confidence level of 1.96 is used to calculate a percentile of the standard normal distribution.
Δ :	The confidence interval's width is 5.

$$\textbf{Sample size (n)} = \frac{1.962}{52} \; 35.2 \times (100 - 35.2) = \textbf{321} \text{ students.}$$

For the purpose of compensation of the anticipated dropout rate (10%), an increase in the sample size to 353 students was indispensable.

Recruitment Technique and Sampling:

A multi-stage stratified random sampling technique was employed as follows:

Initial Stage: A sampling frame encompassing a list of all educational districts in Al-Sharqia Governorate comprising 20 districts was developed to pick four districts randomly. Subsequently, from each district, one governmental high school was chosen randomly.

The second stage involved using stratified sampling to ascertain the number of students who participated per school. The following formula was used to estimate the desired number of students from each school: sample size for stratified subgroups = (Total sample size / Total number of all schools' students) * Total number of the students in each school. The stratification method selection was to guarantee adequate representation of each school in the sample, while taking into consideration dissimilarities in students' size

across different schools and intended to diminish sampling bias. Likewise, it gives a systematic approach of obtaining a population sample.

Third Stage: From each chosen school, three classes were randomly hand-picked up, one class from each secondary grade to facilitate reasonableness and viability in data collection, The Student Affairs department in each school provided a list of students enrolled for 2024–2025, and students were chosen at random from each classroom utilizing a randomizer generation program. (**Figure A)** illustrates a flow diagram clarifying the sampling method.

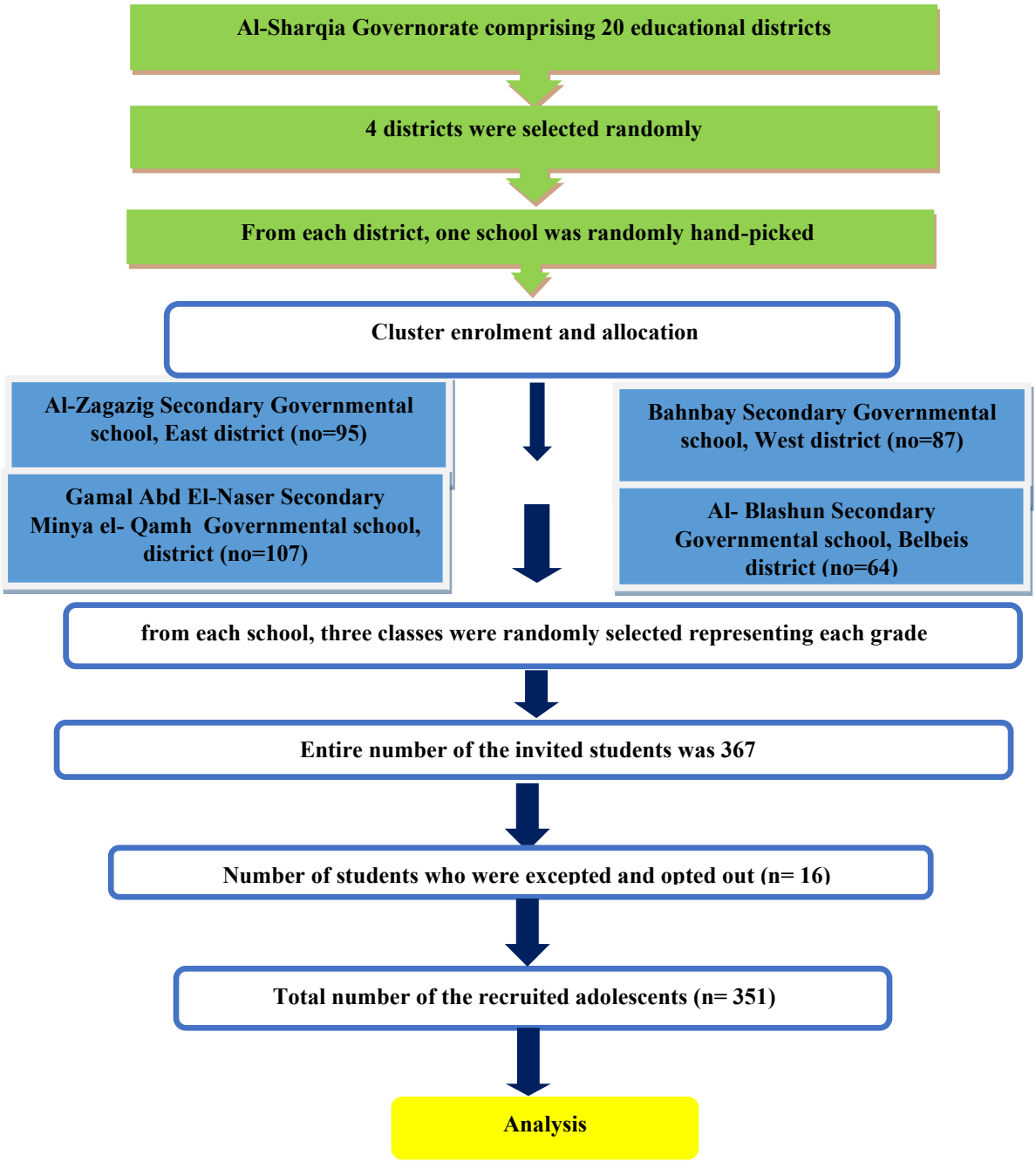

Figure A. Flow Sample

Data Collection instruments:

Self-administrated questionnaire was utilized to obtain data for the existing study which consisted of three parts;

Part I: Student's Personal Characteristics Data Sheet:

The researchers created this structured interview questionnaire in Arabic language, which included personal information like the students' age, sex, having siblings, school achievement, and educational grade. It also included questions about parents such as parents' educational level, occupational status, and perception of monthly income.

Part II: Adolescent Health Literacy Scale (AHLS):

Liu et al. (2023) developed this measure to provide profiles of students' health literacy skills and health science needs in order to guide the creation of health literacy initiatives. AHLS comprises 61 items with three dimensions, namely, functional (37 items), interactive (14 items), and critical (10 items).

Scoring system:

Participants were asked to score each item on a five-point Likert scale, with 1 denoting "strongly disagree" and 5 denoting "strongly agree". An overall AHLS score ranged from 61–305 with greater scores signifying a high level of the student's health literacy. Also, each dimension yielded a separate score.

Through the use of quartiles as the cutoff points, the participants' HL levels were divided into three levels; high with total HL more than 272, functional HL upper 169, interactive HL higher than 62, and critical HL greater than 48, moderate by means of functional HL = 144-169, interactive HL = 49-62, crucial HL = 39-48, and total HL = 272-235 and low through entire HL fewer than 235, functional HL less than 144, interactive HL fewer than 49, and critical HL less than 39.

Part III: The Internet Addiction Diagnostic Questionnaire (IADQ):

This standard Questionnaire was developed by **Wang et al., (2012).** It was a dimension of Chinese Adolescent Health Risky Behavior Questionnaire (HBICA) To assess the likelihood of developing an internet addiction. The DSM-IV criteria for problematic gambling served as its foundation. The IADQ is a self-rating scale with ten items. A respondent is considered an internet addict if they meet the requirements for the first item (using the internet for more than four hours a day over the previous seven days) and at least four of the other nine items. In earlier research, the IADQ shown strong psychometric qualities in both college students and adolescents (**Yang et al., 2020; Liu et al., 2023**).

Translation, Validity, and Trustworthiness of the Study Instruments:

For the intention of the current study, the scales were translated into Arabic using the translation-back-translation process to guarantee cross-linguistic equality. Translation was finished in two major phases, including forward and backwards. Forward translation of the original scale to Arabic was accomplished by three multilingual experts, consequently, three additional linguists, who were not aware of the original version (blind backward translation), carried out a back translation from Arabic to English. The translated versions were then compared with the original scale to verify the accuracy of the translation, eliminate any discrepancies, and ensure that the newly translated versions closely matched the original. Consequent modifications were done to align the translated version with Egyptian norms plus cultural nuances.

The translated instruments were revised to confirm its face as well as content validity through inviting a group of five expert professors in the field of Psychiatric and Pediatric nursing to express their opinions in relation to construction, lucidity, significance, and coverage. As well, to confirm that the instruments efficiently captured the proposed constructs and were appropriate for the context of the study. Their comments were considered to confirm precision and to impede possible undermining the study.

To ascertain the reliability of the translated instruments, it confirmed using a test–retest approach, yielding a Pearson coefficient of 0.78 and 0.81 for scale of Adolescent Health Literacy and Internet Addiction Diagnostic Questionnaire respectively which signifying worthy reliability. Demonstrating the instruments' validity and reliability persisted for two months.

Pilot Study:

Prior to starting the actual data collection, a pilot research was conducted on 10% of all the study sample who were chosen randomly. A pilot study had been carried out to; assess time necessary to complete the instruments, test their lucidity, applicability, significance, and feasibility. Furthermore, finding any hurdles that can impede the data collection process. Students who shared in a pilot study were excepted from the entire research sample to guarantee the consistency of the results. In the light of the pilot study's results, indispensable adjustments were done. Two weeks of pilot research were carried out spanning from 22th September to 3th October 2024.

Data Collection Phase:

Data were collected covering a period of three months from early October to the conclusion of December 2024, following delivering an official letter to the undersecretary of the Ministry of Education in Al-Sharqia Governorate, Egypt, requesting his acquiescence and cooperation to carry out the study, afterwards expounding the purpose of the study. Subsequently, official mails directed from the undersecretary of the Ministry of Education to the randomly selected schools demanding their permissions to conduct the study. The researchers be present at each study setting by alternation. The researcher interviewed the headmaster and the social worker to introduce self, elucidate to them the intention of the study. From every school, classes were selected randomly signifying students from the three educational grades.

In classrooms, the intent of the study and how to fill the study instruments were clarified to the adolescent students by the researcher. Subsequently, a written informed consent of each student who come across the eligibility criteria was obtained. The self-administered instrument was distributed by the researchers to students in their classrooms and filled by them in the attendance of the researcher to illuminate any inquiry. Students were instructed to exclude any personal identifiers in the questionnaire to safeguard anonymity. The time required for filling the instruments extended from 15 to 25 minutes. Students who decided to refrain from participation could refrain from completing the instruments. Upon completion, the researcher guaranteed that wholly items incorporated in the study instruments were finalized. At that point, the students were acknowledged for the effort and time they generously presented.

Ethical Considerations:

This study was implemented in agreement with the Declaration of Helsinki, an ethical clearance was granted by the Research Ethics Committee of the Faculty of Nursing at Zagazig university, Egypt (ID/Zu. Nur. REC #:0143). The goals of the study and the students' freedom to discontinue participation at any moment were carefully explained to the participants. The researchers clarified that all data will be utilized exclusively for the research purposes. Subsequently, informed written consent was then obtained, and participation was firmly voluntary. The privacy and anonymity were strictly guaranteed. All gathered data was handled with the maximum level of confidentiality. Finally, the data collection process didn't disturb the flow of work of the study locations.

Statistical Analysis and Data Interpretation:

The raw data were carefully coded and subjected to statistical analysis using SPSS version 20 to analyze the responses from the 351 recruited adolescents. Reviews and confirmation were completed after the data was entered to evade any errors throughout data input process. Various statistical tools were employed including; Kolmogorov–Smirnov tests to determine if the quantitative variables were normally distributed. Frequencies and percentages utilized to reveal the qualitative data, while, quantitative data were described utilizing means and standard deviations. Qualitative categorical variables were compared applying Chi-square test, and Fisher's Exact correction for chi-square when more than 20% of the cells have expected count less than 5. Pearson's correlation coefficient was calculated to evaluate the relationship between high school adolescents' health literacy and their propensity to engage in internet addictive behaviors. The attained results were considered noteworthy at P-value equal to or less than 0.05 and highly significant at < 0.001.

Results:

Table 1, elicits the distribution of the participants' personal characteristics encompassing 351 recruited high school adolescents, the table reveals that, 65.2% of the studied adolescents falling into the 17-year-old and more category,

with a mean age of 15.4 years (SD= 4.9). The participants seem to be unjustly distributed, with almost two thirds (66.4%) males. Regarding educational grade, a significant proportion of the students are in the third grade (58.4%), followed by the second year (33.0%), and the first year represents only (8. 5%). The perception of family income distribution indicates that most participants announcing sufficient income (63.2%). Academic achievement reveals diversity, with 37.9% expressing very good achievement, 35.0% reporting excellent, 23.1% good, while merely 4.0% stating poor achievement. Lastly, the studied adolescents' academic stress highlights that the majority (85.2 %) have academic stress.

Table 2, displays the frequency and percentage distribution of the studied adolescents according to engagement in internet addictive behaviors. It was evident that nearly three quarters (74.9%) of the studied adolescents spend four hours or more online each day. More than half (63.5%) feel uncomfortable or don't want to do other things once they can't surf the internet, which is relieved by going online. Furthermore, virtually two thirds of them (65.2%) mention that they are increasing the time spent online to get satisfaction, and 60.1% stating that they are losing interest with different recreational activities such as hobbies, or meeting friends for surfing the internet.

Concerning trial to cease surfing the internet many times but always cannot control, 66.4% of the studied adolescents mention that they don't stop surfing the internet many times. Nearly three quarters (74.9%) of the respondents are keeping their internet usage a secret from their parents, instructors, or fellow students. In spite of the negative effects such as sleep deprivation, tardiness to class, and arguments with parents, 49.3% of the studied adolescents continue to use the internet. 76.6% of the studied adolescents declare that their parents don't place daily time limits on how much time they spend engaging in video games, or using their smartphones.

Table 3, the findings obtained by the Internet Addiction Diagnostic Questionnaire indicate that, internet addictive behaviors among the studied adolescents was with a mean of 8.63 (SD= 1.68).

Table 4, describes the distribution of health literacy's dimensions among the studied adolescents. In relation to functional health literacy, 48.7% of the surveyed adolescents exhibiting low level, 48.4% scoring moderate, while only 2.8% reporting high. Concerning interactive dimension, 19.7% reporting low level, less than three quarters (70.4%) demonstrating moderate, and 10.0% scoring high. As for critical dimension, more than half (52.4%) of them reporting low level, 42.2% exhibiting moderate, and the rest of them scoring high.

Figure 1, it is vibrant from the figure that, the majority of the studied adolescents (87.1%) demonstrating low level of health literacy, 10.4 % scoring moderate, while merely 2.5% reporting high.

Table 5, it was evidenced that there is a highly statistically noteworthy negative correlation between total scores of health literacy and internet addiction among the studied adolescents (r= -.188) whereby $p < 0.001$. What it means when the total mean score of health literacy increased, the total mean score of internet addiction decreased.

Table 6, puzzles out that there are statistically significant differences between total mean score of health literacy and the studied adolescents' personal characteristics in relation to sex, having siblings, perception of family income, academic achievement, and academic stress. Males had a higher mean score of health literacy (1.76) than females (1.72) with a statistically significant difference (p=.038). Health literacy's mean score was higher among the studied adolescents who have siblings (1.76) than those who haven't (1.70) with a statistically significant difference (p=.004). Adolescents who perceived family income not sufficient had the highest mean health literacy score (1.76) which is statistically noteworthy (P= .000). Health literacy's mean score was higher among the adolescents who reported good achievement (1.80), followed by those with excellent achievement (1.75) reflecting a statistically significant difference (p=.001). Finally, students who demonstrating academic stress had a higher mean score of health literacy (1.75) with a statistically significant difference (p=.000).

In relation to internet addiction, it is noticeable that statistical remarkable differences were detected between the total mean score of engagement in internet addictive behaviors and the studied adolescents' personal characteristics concerning age, educational grade, perception of family income, and having friends. As age decreased, the mean score of engagement in

internet addictive behaviors increased significantly (P= .004). First-year students had the highest mean score of engagement in internet addictive behaviors (9.83), followed by the second-year students (8.81) with a highly statistically noteworthy difference (p= .000). Adolescents who perceived family income not sufficient had the highest mean engagement in internet addictive behaviors score (8.90) which is statistically noteworthy (P= .000). Lastly, adolescents who had friends had the lowest mean engagement in internet addictive behaviors score (8.55) with a highly statistically remarkable difference (p= .000).

Table (1): Frequency& percentage distribution of the studied adolescents according to their personal characteristics (No=351).

Personal Characteristics	No.	%
Sex	**233**	**66.4**
▪ Male	**118**	**33.6**
▪ Female		
Age (year)	**122**	**34.8**
▪ 15- <17	**229**	**65.2**
▪ 17 and more		
Mean ± SD.	**15.4±4.9**	
Educational grade	**30**	**8.5**
▪ First	**116**	**33.0**
Second	**205**	**58.4**
▪ Third		
Having siblings	**258**	**73.5**
▪ Yes	**93**	**26.5**
▪ No		
Perception of family income	**222**	**63.2**
▪ Sufficient	**129**	**36.8**
▪ Not Sufficient		
Having friends	**280**	**79.8**
▪ Yes	**71**	**20.2**
▪ No		
Academic achievement	**14**	**4.0**
▪ Poor	**81**	**23.1**
▪ Good	**133**	**37.9**
▪ Very good	**123**	**35.0**
▪ excellent		
Academic stress	**52**	**14.8**
▪ Yes	**299**	**85.2**
▪ No		

SD: Standard deviation

Table (2): Frequency& percentage distribution of the studied adolescents according to engagement in internet addictive behaviors (n=351).

Internet Addictive Behaviors	No.	%		
In the past week, how long did you usually spend online each day?				
• less than one hr	**29**		**8.3**	
• 1-less than 4 hrs	**59**		**16.8**	
• 4hrs or more	**263**		**74.9**	
• No internet access	**0**		**0**	
Do you have any of the following situations?				
Items	**Yes**	**%**	**No**	**%**
1. Often surfing the internet, the internet-related things keep coming to mind even without going online.	**96**	**27.4**	**255**	**72.6**
2. Feeling uncomfortable or don't want to do other things once you can't surf the internet, which is relieved by going online.	**223**	**63.5**	**128**	**36.5**
3. Increasing the time spent online to get satisfaction	**229**	**65.2**	**122**	**34.8**
4. Losing interest in other recreational activities (hobbies, meeting friends) for surfing the internet.	**211**	**60.1**	**140**	**39.9**
5. Trying to stop surfing the internet many times, but always cannot control yourself.	**118**	**33.6**	**233**	**66.4**
6. Not being able to finish homework or play truant for surfing the internet.	**230**	**65.5**	**121**	**34.5**
7. Hiding the fact that you surf the internet from parents, teachers or classmates.	**263**	**74.9**	**88**	**25.1**
8. Continuing to surf the internet knowing the negative consequences (lack of sleep, being late for class, arguing with parents	**173**	**49.3**	**178**	**50.7**
9. Surfing the internet in order to escape from reality, get rid of your dilemmas or depression, helplessness or anxiety.	**142**	**40.5**	**209**	**59.5**
Do your parents limit the amount of time spend engaged in video games, or using smart phones?	**82**	**23.4**	**269**	**76.6**

Table (3): Total mean score of engagement in in internet addictive behaviors among the studied adolescents (n=351).
SD: Standard deviation

Item	Mean ±SD.
Internet Addictive Behaviors	**8.63 ±1.68**

Table (4): Frequency& percentage distribution of health literacy's dimensions among the studied adolescents (n=351).

Health Literacy's Dimensions	Min. – Max.	Levels					
		Low		Moderate		High	
		No.	%	No.	%	No.	%
Functional	**109-173**	**171**	**48.7**	**170**	**48.4**	**10**	**2.8**
Interactive	**35- 67**	**69**	**19.7**	**247**	**70.4**	**35**	**10.0**
Critical	**26- 50**	**184**	**52.4**	**148**	**42.2**	**19**	**5.4**

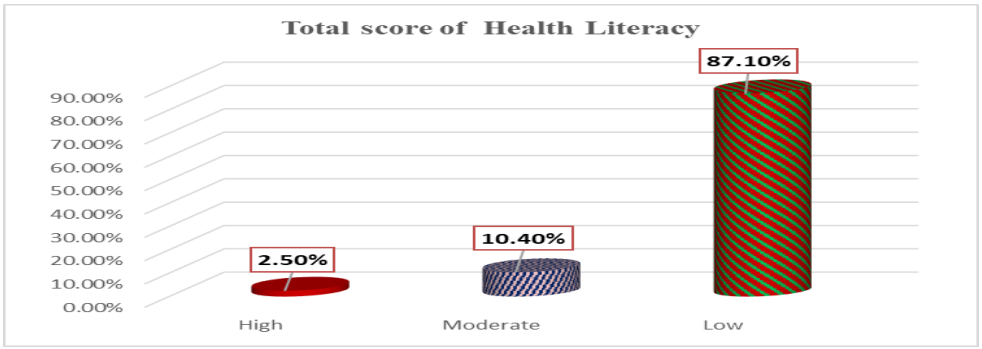

Figure (1): Percentage distribution of the studied adolescents according to levels of total health literacy (n=351).

Table (5): Correlation matrix between total mean scores of health literacy and internet addiction among the studied adolescents (n=351).

Total Mean Scores of	Health literacy	
Internet addiction	**r**	**P-value**
	-.188	**0 .000****

r: Pearson coefficient ****: High statistical significant difference *at* P < 0.001**

Table (6): Relation between the studied adolescents' personal characteristics and the total mean scores of health literacy, and internet addiction (n=351).

Personal Characteristics	Health Literacy	Chi – Square / Fisher's Exact Test		Internet Addiction	Chi – Square / Fisher's Exact Test	
	Mean ± SD	X^2	P	Mean ± SD	X^2	P
Sex	**1.76 ± 14.42**			**8.83± 1.74**		
▪ Male	**1.72 ± 11.14**	**4.334**	**.038***	**8.22 ± 1.48**	**1.969**	**.161**
▪ Female						
Age (year)	**1.76 ± 13.90**			**9.06 ± 1.71**		
▪ 15 -< 17	**1.74 ± 13.32**	**.346**	**.557**	**8.40 ± 1.62**	**8.312**	**.004***
▪ 17 and more						
Educational grade	**1.80 ± 15.52**			**9.83 ± 1.48**		
▪ First	**1.75 ± 14.47**	**2.723**	**.067**	**8.81 ± 1.93**	**11.698**	**.000****
▪ Second	**1.74 ± 12.51**			**8.35 ± 1.46**		
▪ Third						
Having siblings	**1.76 ± 14.12**			**8.42 ± 1.69**		**.186**
▪ Yes	**1.70 ± 10.65**	**8.335**	**.004***	**9.21 ± 1.53**	**1.755**	
▪ No						
Perception of family income	**1.74 ± 14.61**	**14.585**	**.000****	**8.47 ± 1.83**	**14.883**	**.000****
▪ Sufficient	**1.76 ± 11.25**			**8.90 ± 1.35**		
▪ Not Sufficient						
Having friends	**1.7 5± 13.50**			**8.55 ± 1.77**		**.000****
▪ Yes	**1.74 ± 13.68**	**.006**	**.939**	**8.94 ± 1.25**	**21.171**	
▪ No						
Academic achievement						
▪ Poor	**1.74 ± 14.89**	**5.759**	**.001***	**8.07 ± 1.49**		
▪ Good	**1.80 ± 6.54**			**8.43 ± 1.21**	**1.419**	**.237**
▪ Very good	**1.72 ± 15.17**			**8.63 ± 1.75**		
▪ Excellent	**1.75 ± 2.48**			**8.82 ± 1.86**		
Academic stress	**1.75 ± 19.68**			**7.65 ± 1.66**		
▪ Yes	**1.74 ± 12.18**	**14.461**	**.000****	**8.80 ± 1.63**	**1.362**	**.244**
▪ No						

SD: Standard deviation X^2: Chi square test FE: Fisher Exact
*: Statistically significant at $p \leq 0.05$ **: High statistical significant difference *at* P < 0.001

Discussion:

Health literacy can affect persons' capacity to properly regulate their online use, internet addiction and health literacy are connected. Individuals with greater health literacy are better able to identify the possible negative effects that excessive internet use may cause to both their mental and physical wellbeing as well as their general productivity. Individuals with greater health literacy are frequently more adept at self-control, judiciously allocating their screen time, and striking a balance between their online and offline obligations (**Abdrbo & Hassanein, 2017; Liu et al 2023**). Overcoming internet addiction necessitates understanding this phenomenon. Thereupon, the existing study was conducted to explore the relationship between high school adolescents' health literacy and their propensity to engage in internet addictive behaviors.

Adolescents' use of the internet has increased significantly in the contemporary digital era, and it is now a major component of both entertainment and education. However, adolescents are especially susceptible to internet addiction because of the continuous cognitive, social, and emotional development that defines this stage of life **(Jang et al., 2023).** Researchers indicate a concerning trend toward excessive internet use among youth, it could result in a development of addictive pattern of behaviors.

The result of the present study revealed that nearly three quarter of the studied adolescents spent four hours or more daily online in the past week. In this respect, an Egyptian study conducted by **Abdrbo & Hassanein (2017)** revealed the mean hour of using the internet was with a mean of 8.87 hours and approximately 45% of the participants was deemed to have an internet addiction. As well as, **Yaseen & Salah, (2021)** reported an average of 8.2± 4.2 hours of using laptops and tablets each day. Similarly, **Abdelaziz et al. (2024)** conveyed that nearly over than half of the students spent between one and five hours online daily, with a significant portion over two-fifths engaging for 6 to 10 hours. Furthermore, **Farahaninia et al. (2024)**, indicated that almost one-third of the teenagers in the study spent more than four hours a day on the internet, 31% three to four hours, and more than one-third one to two hours.

The present study concerned with measuring high school adolescents' tendency for engaging in internet addictive behaviors. The results publicized that, the total mean score of internet addiction among the studied adolescents was 8.63 ±1.68. This implies that this age group uses electronics on a daily basis and is exposed to a lot of media overall, with little regard for the ramifications of their actions. Regretfully, not every adolescent is able to benefit from the features that electronic innovations provide. Therefore, it is imperative that parents and educators focus on educating adolescents about the potentially serious repercussions of extensive internet usage on both themselves and the environment.

Analogous with the foregoing findings, **Atalay (2024)** disclosed that, around one-third of Ethiopian students be burdened with internet addiction. Likewise, **Lebni et al. (2020)** clarified that the mean score for internet addiction among students was 3.81 ± 0.88 suggesting a moderate level of dependency. Besides, **Dong et al. (2020)** discovered that over fifty percent of the adolescents in their study met the criterion for addictive internet use. Additionally, **Abou El Wafaa et al. (2021)** in the study of internet abuse in children and adolescents in Alexandria, Egypt, revealed that the majority of the participants were problematic users, and 10.69% were categorized as internet addicts, and only 14.66% were considered as average internet users,

An Arabian study carried out by **Alkhani et al. (2021)** in the Gulf Cooperation Council (GCC) countries including Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates, noted that the prevalence rate of addiction to the internet amongst adolescents and young adults have been found to reach 33.0%, demonstrating the pervasiveness of this problem among Arabs. Moreover, **El-Zayat et al. (2023)** who studied cyberchondria and its association with smartphone addiction and electronic health literacy among Saudi population, discovered that two-thirds of participants exhibited signs of smartphone

addiction. When all of these findings highlight the rising concern about adolescents' internet addiction, its possible negative impacts on physical and mental wellbeing, and the significance of programs that increase internet addiction literacy. Therefore, encouraging better internet usage habits and offering informational materials about the dangers of internet addiction are crucial first steps in reducing these adverse effects.

One of the conspicuous results of the contemporary study, that the majority of the studied adolescents had low health literacy level, while, only 2.5 % had high health literacy. These statistics call for urgent need to comprise a school-based health literacy intervention and implementation in the school context, which can effect adolescents' health-promoting behaviors and health literacy. In line with the foregoing, **Patil et al. (2021**) who assessed digital health literacy among college students, reported that over half of the study's sample experienced low level of health literacy.

According to a similar research, **Liu et al. (2023)** mentioned that the percentages of individuals with low, moderate, and high health literacy were 33.2%, 39.9%, and 24.9%, respectively. Furthermore, this result was in line with **Khanal et al. (2023)** who explored the HL needs of adolescent students in Nepal, and reported that school adolescents had a low level of HL and health-promoting activities. Unlikely, a research paper by **El-Zayat et al. (2023)** conveyed that less than three quarter of the studied sample possessed a high degree of health literacy.

Conferring to the results of the current study, almost fifty percent of the studied adolescents had low functional health literacy level. Concerning interactive health literacy, less than three quarters had moderate level, also slightly more than half had low critical health literacy. From our point of view, critical health literacy may perhaps be significant more than interactive or functional HL. With today's highly advanced internet technology, information is easily accessible and health knowledge is not as scarce as it once was. The majority of students are more frequently compelled to accept information, and it's important to note that not all of this information is good for adolescent development. As a result, it is particularly crucial to evaluate this information critically and to only accept information that is helpful. Given its potential to enhance adolescent and eventually adult health, critical health literacy certainly deserves more investigation.

The ultimate goal of the existing work was to explore the relationship between high school adolescents' health literacy and their propensity to engage in internet addictive behaviors. The study's meticulous results announced a highly statistically noteworthy negative correlation between total scores of health literacy and internet addiction among the studied adolescents, what it means when the total mean score of health literacy increased, the total mean score of internet addiction decreased. This may be explained by that, adolescents who are used to carefully appraising the validity, correctness, and relevance of the health information they are given may be less likely to develop an internet addiction. This finding shed light on the importance of developing one's own abilities and skills, like having a high level of information literacy, that could be a way to avoid using the internet and virtual networks extensively, thus is somewhat successful in reducing the prevalence of adolescent' internet addiction.

This result is in congruence with the results of **Langarizadeh et al. (2018)** who discovered a strong negative correlation between internet addiction and information literacy, indicating that pupils who possess greater information literacy were fewer likely to engage in harmful online behaviors. Besides, **Liu et al. (2023)** pointed out that, internet addiction in middle school adolescents had a positive association with a functional and an interactive health literacy, but a negative correlation with a critical health literacy. Their study suggested that critical dimension of health literacy may act as a barrier against internet addiction, whereas interactive and functional dimensions of health literacy, may not fully mitigate the risks of internet addiction. These findings demonstrate how health literacy plays the complex role in shaping students' internet behaviors and their vulnerability to internet addiction.

Similarly, **Soltani et al. (2019)** publicized a significant association between cell phones addiction and health literacy amongst Iranian healthcare students. The study indicated that students who had satisfactory score of health literacy were more likely to show improvements in psychological aspects of cell phone addiction. This emphasizes how crucial health literacy is as a deterrent to addictive behaviors, particularly in the context of technology use. In nursing students, mobile phone addiction and scores of health literacy were found to be positively correlated., suggesting that interventions related to health literacy could be extremely important in preventing or mitigating such addictions. Oppositely, **Liu et al. (2023)** pointed out that total health literacy was not linked with internet addiction.

In this sense, **Alkhani et al. (2021),** pronounced that higher electronic health literacy was often associated with more frequent internet use, particularly in seeking health-related information. This implies that students who are more health-literate might be more likely to use the internet for health-related reasons, but the prevalence of health-related internet searches could also lead to excessive internet use, which could result in internet addiction. In support of this, **Arslantas et al. (2024)** reported positive association between internet addiction and digital literacy, indicating that while digital literacy may help students navigate the internet more effectively, it could also increase their online engagement, potentially leading to a higher risk of internet addiction.

When taken as a whole, these studies highlight the complex connection between students' internet use, internet addiction, and health literacy. They contend that raising students' level of health literacy, especially critical health literacy, may help them better control their online behavior and lessen the harmful impacts of excessive internet use. To further understand how various aspects of health literacy impact the internet addiction and to create focused interventions that encourage students to adopt healthier online practices, more studies are required.

The current study's findings showed significant sex disparities in total health literacy and sex, with male participants displaying higher health literacy level than females. However, there was not a significant difference in terms of sex and engagement internet addictive behaviors. This finding aligns with **Alhodaib, (2022)** who publicized gender differences in electronic-health literacy, with male exhibiting a higher levels of literacy than female students. This gender disparity in health literacy may reflect differences in access to health information and engagement with health resources across genders. Additionally, because of sociocultural norms, women tend to spend longer indoors and may be involved in household duties, which can result in less frequent internet use than men.

Similarly, **Shiferaw et al. (2020)** discovered no notable variations in internet usage and access between genders; however, students' electronic-health literacy was found to be significantly predicted by their gender, female students showed relatively lower electronic-health literacy compared with males. Conversely, **Harsej et al. (2021)** & **Dong et al. (2020)** discovered that gender is a major factor in internet addiction.

One of the imperative findings of the existing study is that, there was no significant impact of age on health literacy. Nonetheless, age was significant for internet addiction, with older participants exhibiting lower levels of addiction. In the equivalent direction, a study by **Abou El wafa et al. (2021)** revealed that older age is meaningfully linked with internet addiction, as more than half of those categorized as internet addict were between 15 and 18 years old. In this sense, **Shiferaw et al. (2020) & Dong et al. (2020)** mentioned a significant correlation between age and total internet addiction score. In terms of health literacy, **Alhodaib, (2022)** conveyed that younger students demonstrated higher electronic-health literacy level in contrast to older students.

The present study outcomes revealed highly significant family income disparities with both health literacy and internet addiction, with higher income linked to improved health literacy and lower levels of addiction. **Harsej et al.**

(2021), who discovered a substantial statistical correlation between internet addiction and family income, corroborated this finding. In the same track, studies carried out by **Gottschalk & Weise (2023**); **Munir et al., (2023); World Health Organization (2024)** confirmed that higher family income often provides greater access to health-related resources, including educational materials, internet, and technology, which can improve health literacy, also is more likely to invest in quality education, which can foster skills that enhance both general and health-specific literacy. As well as the capacity to monitor internet use and guide adolescents on responsible online behavior, also promote mental and emotional health through economic stability which reduces stress associated with financial insecurity, which may decrease the likelihood of turning to the internet as an escape mechanism.

This current study is unquestionably important for theoretical and clinical applications, as it shed light on internet addiction and its relation with health literacy in adolescence. Even though internet addiction has a major negative influence on adolescents' health physically and psychologically, However, opinions on how it relates to health literacy are partitioned. Thus, further research into the connections between these variables is necessary in the Middle East and North Africa region. By analyzing the connections between these variables, this study seeks to close this gap. It's interesting to note that a thorough review found very few Egyptian studies that have yielded comparable findings, highlighting the significance and originality of this research. It may be possible to treat and eradicate the phenomenon of internet addiction more successfully not quite, but close enough.

Limitations:

The study has some limitations even though it poses significant queries regarding the relationship between high school adolescents' health literacy and their propensity to engage in internet addictive behaviors in Egypt. Participants may over report or under report their experiences due to social desirability and recollection bias, which introduces bias into research that solely uses self-reported data. It is more challenging to demonstrate a connection between high school adolescents' health literacy and their propensity to engage in internet addictive behaviors, because of the study's cross-sectional methodology. In order to better understand the causal relationships between high school adolescents' health literacy and their propensity to engage in internet addictive behaviors, longitudinal designs would be beneficial in future research. The sample size under study was small. This could therefore make it more difficult to generalize the results obtained. It is highly recommended that future studies include more of these participants in order to ensure that the findings are representative and generalizable. Additionally, the study was conducted in Egypt, which may limit the results' generalizability to other cultural or geographic contexts. Last but not least, carrying out comparable research in various cultural or geographic contexts may offer a more thorough comprehension of the worldwide effects of health literacy on adolescents' engagement in internet addictive behaviors.

Conclusion:

In deduction, the study revealed that internet addiction is a predominant issue among high school adolescents, with the majority of the participants exhibiting low health literacy. Notably, a highly significant negative correlation was detected between total mean scores of health literacy and internet addiction. This result delivers preliminary confirmation for the extrapolative role of health literacy in adolescents' internet addiction, underscoring the importance of enhancing health literacy to reduce the risks associated with internet addiction.

Recommendations:

The following suggestions are made conferring to the results of the current study:

1.Designing and implementing multimedia ongoing educational initiatives to raise adolescents' awareness of internet addiction phenomenon and stop its detrimental effects on their mental, behavioral, academic, and even somatic health.

2.Promoting digital literacy through campaigns for public awareness to educate the public particularly parents about safe internet practice, hazards of excessive screen time and the significance of striking a balance between online and offline activities, and boosting parental involvement, intermittent supervision, and role modeling.

3.Creating school-based interventions such as seminar sessions and student orientation programs that incorporate both formal and informal training on internet addiction, to increase awareness and sensitivity to internet addiction, along with resolutions to the problem.

4.Policymakers and health planners should place a high priority on tracking and combating internet addiction via creating interventions that are efficient, flexible, moral, and long-lasting, and launching health promotion and health literacy initiatives.

5.Establishing sensible limits to cut down on screen time and encourage better alternative behaviors. The establishment of time limits and "tech-free" zones or hours, particularly before bedtime are of crucial importance.

6.Special recreational and social activities should be available to all adolescents, like taking part in academic events and community campaigns, and participating in team sports, in order to improve socialization and lessen reliance on electronic devices for enjoyment.

7.Additional research on students at all educational levels is needed to gain awareness of the risk factors, causes, and dangerous populations of internet addiction as well as potential solutions. Furthermore, it is strongly recommended that related specific studies be replicated using large probability samples at various settings to guarantee that the results are rigor, representative, and generalizable.

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References

Abdelaziz, R., AbdElnabi, H., Ali, M., & Elsayed, N. (2024). Prevalence of musculoskeletal problems and its relation to psychological distress among general secondary students subjected to online learning. *Zagazig Nursing Journal, 20(2), 385-406.* https://doi.org/doi: 10.21608/znj.2024.387360.

Abdrbo, A., & Hassanein, S. (2017). Effect of internet use for health information and internet addiction on adolescents' female high school health lifestyle. Journal of Nursing Education and Practice, 7(12), 10-19. https://doi.org/10.5430/jnep.v7n12p10.

Abou El Wafa, H., Ashry, M., Mekky, J., & Elweshahi, H. (2021). Internet abuse in adolescents and adolescents during COVID-19 pandemic in Egypt. *Egyptian Journal of Psychiatry, 42 (1), 36-42*. https://doi.org/10.4103/ejpsy.ejpsy_43_20.

Adewole, K., Ogunfowokan, A., & Olodu, M. (2021). Influence of health literacy on health promoting behavior of adolescents with and without obesity. *International Journal of Africa Nursing Sciences, 15(100342),1-7.* https://doi.org/10.1016/j.ijans.2021.100342.

Alhodaib, H. (2022). E-health literacy of secondary school students in Saudi Arabia. *Informatics in Medicine Unlocked, 30(100922),1-5*. https://doi.org/10.1016/j.imu.2022.100922.

Al-Khani, A., Saquib, J., Rajab, A., Khalifa, M., Almazrou, A., & Saquib, N. (2021). Internet addiction in Gulf countries: A systematic review and meta-analysis. *Journal of Behavioral Addictions, 10(3),601-10.* https://doi.org/10.1556/2006.2021.00057.

Arslantas, T. K., Yaylacı, M. E., & Özkaya, M. (2024). Association between digital literacy, internet addiction, and cyberloafing among higher education students: A structural equation modeling. *E-Learning*

and Digital Media, 21(4),310-28. https://doi.org/10.1177/20427530231156180 .

Atalay, Y. (2024). Prevalence of internet addiction and associated factors among university students in Ethiopia: Systematic review and meta-analysis. *Frontiers in Digital Health. 6(1373735),1-11.* https://doi.org/10.3389/fdgth.2024.1373735.

Brandt, L., Schultes, M-T., Yanagida, T., Maier, G., Kollmayer, M., & Spiel, C. (2019). Differential associations of health literacy with Austrian adolescents' tobacco and alcohol use. *Public Health, 174, 74-82*. https://doi.org/10.1016/j.puhe.2019.05.033.

Ceylan, D., Akan-Çelen, F., Özkan, S., & Aycan, Z. (2022). Promoting adolescent health: Health literacy, self-efficacy and internet use. *Turkish Journal of Pediatrics, 64(1), 110-21.* https://doi.org/10.24953/turkjped.2021.1264.

Chu-Ko, F., Chong, M., Chung, C., Chang, C., Liu, H., & Huang, L. (2021). Exploring the factors related to adolescent health literacy, health-promoting lifestyle profile, and health status. *BMC Public Health, 21(2196), 1-12*. https://doi.org/10.1186/s1288902112239-w.

Dobson, AJ. (1984). Calculating sample size. Trans. Menzies Foundations, 7, 75- 9.

Dong, H., Yang, F., Lu, X., & Hao, W. (2020). Internet addiction and related psychological factors among adolescents and adolescents in china during the coronavirus disease 2019 (COVID-19) epidemic. *Frontiers in Psychiatry, 11(00751)*. https://doi.org/10.3389/fpsyt.2020.00751.

El-Zayat, A., Namnkani, S. A., Alshareef, N., Mustfa, M., Eminaga, N., & Algarni, G. (2023). Cyberchondria and its association with smartphone addiction and electronic health literacy among a Saudi population. *Saudi Journal of Medicine & Medical Sciences, 11, 162-8.* https://doi.org/10.4103/sjmms.sjmms_491_22.

Farahaninia, M. Azarang, Z. Bozorgnezhad, M. & Haghani, H. (2024). Relationship between health literacy and addiction susceptibility in high school adolescents. *Journal of Client-Centered Nursing Care, 10(1), 3-14.* https://doi.org/10.32598/JCCNC.10.1.93.21.

Gottschalk, F., & Weise, C. (2023). Digital equity and inclusion in education: An overview of practice and policy in OECD countries. *OECD Education Working Papers, 299 (14), 1-76.* https://dx.doi.org/10.1787/7cb15030-en.

Guo, S., Yu, X., Naccarella, L., Armstrong, R., & Davis, E. (2022). Health literacy and health-related quality of life in Beijing adolescents: A path analysis. HLRP: *Health Literacy Research and Practice, 6(4), e300-e9.* https://doi.org/ 10.3928/24748307-20221113-02.

Haddock, A., Ward, N., Yu, R., & O'Dea, N. (2022). Positive effects of digital technology use by adolescents: A scoping review of the literature. *International Journal of Environmental Research and Public Health, 19(21), 14009.* https://doi.org/ 10.3390/ijerph192114009.

Harsej, Z., Lakeh, N., Sheikholeslami, F., & KazemnezhadLeili, E. (2021). Internet addiction and its relationship with family functioning in high school students. *Journal of Holistic Nursing and Midwifery, 31(1), 44-52.* https://doi.org/10.32598/jhnm.31.1.2025.

Hassan, S., & Masoud, O. (2021). Online health information seeking and health literacy among non-medical college students: Gender differences. *Journal of Public Health: From Theory to Practice 29, 1267-73.* https://doi.org/10.1007/s10389-020-01243-w.

Jafari, A., Sany, S., & Peyman, N. (2021). The status of health literacy in students aged 6 to 18 old years: A systematic review study. *Iranian Journal of Public Health, 50(3), 448-58.* https://doi.org/ 10.18502/ijph.v50i3.5584.

Jang, Q., Chen, Z., Zhang, Z., & Zuo, C. (2023). Investigating links between internet literacy, internet use, and internet addiction among Chinese youth and adolescents in the digital age. *Front. Psychiatry, 14:1233303.* https://doi.org/10.3389/fpsyt.2023.1233303.

Khanal, S., Budhathoki, C., & Okan, O. (2023). Improving adolescent health literacy through school-based health literacy intervention: A mixed-method study protocol. *BMC Public Health, 23(407), 1-9.* https://doi.org/10.1186/s12889-023-15316-4.

Langarizadeh, M., Naghipour, M., Tabatabaei, S., Mirzaei, A., & Vaghar, M. (2018). Prediction of internet addiction based on information literacy among students of Iran University of Medical Sciences. *Electron Physician, 10(2),6333-40.* https://doi.org/10.19082/6333 PMID: 29629056.

Lebni, Y., Toghroli, R., Abbas, J., NeJhaddadgar, N., Salahshoor, M., Mansourian, M., Gilan, H., Kianipour, N., Chaboksavar, F., Azizi, S., & Ziapour, A. (2020). A study of internet addiction and its effects on mental health: A study based on Iranian university students. *Journal of Education and Health Promotion 9(205), 1-8.* https://doi.org/10.4103/jehp.jehp_148_20.

Li, S., Ren, P., Chiu, M. M., Wang, C., & Lei, H. (2021). The relationship between self-control and internet addiction among students: A meta-analysis. *Frontiers in Psychology, 12(735755), 1-16.* https://doi.org/ 10.3389/fpsyg.2021.735755.

Liu, C., Wang, D., Liu, C., Jiang, J., Wang, X., Chen, H. & Zhang, X. (2020). What is the meaning of health literacy? A systematic review and qualitative synthesis. *Family Medicine and Community Health, 8 (2), e000351.* https://doi.org/ 10.1136/fmch-2020-00035.

Liu, Y., Wu, N., Yan, J., Yu, J., Liao, L., & Wang, H. (2023). The relationship between health literacy and internet addiction among middle school students in Chongqing, China: A cross-sectional survey study. *PloS ONE, 18(3), e0283634.* https://doi.org/10.1371/journal.pone.0283634.

Lubis, M., & Handayani, D. O. D. (2022). The relationship of personal data protection towards internet addiction: Cybercrimes, pornography and reduced physical activity. *Procedia Computer Science, 197(1), 151-61.* https://doi.org/10.1016/j.procs.2021.12.129.

McAnally, K., & Hagger, M. (2023). Health literacy, social cognition constructs, and health behaviors and outcomes: A meta-analysis. *Health Psychology, 42(4), 213-34.* https://doi.org/10.1037/hea0001266.

Mohammed Al Mansoor, K. (2023). Relationship between problematic internet use and adolescent mental health in Saudi Arabia. *Egyptian Journal of Health Care, 14(4), 16-32.* https://doi.org/10.21608/ejhc.2023.322674.

Munir, j., Mehreen, F., & Daud, S. (2023). The impact of socio-economic status on academic achievement. *Journal of Social Sciences Review, 3(2),695-705.* https://doi.org/10.54183/jssr.v3i2.308.

Ndidiamaka, I-S, & Chikeme, P. (2020). A descriptive cross-sectional study: Practical and feasible design in investigating health care seeking behaviors of undergraduates. *SAGE Publications Ltd.* https:// doi. org/ 10. 4135/ 97815 29742 862.

Nobre, J., Oliveira, A., Monteiro, F., Sequeira, C., & Ferré-Grau, C. (2021). Promotion of mental health literacy in adolescents: A scoping review. *International Journal of Environmental Research and Public Health, 18(9500),1-15.* https://doi.org/doi: 10.3390/ijerph18189500.

Patil, U., Kostareva, U., Hadley, M., Manganello, J., Okan, O., Dadaczynski, K, & Sentell, T. (2021). Health literacy, digital health literacy, and COVID-19 pandemic attitudes and behaviors in US college students: Implications for interventions. *International Journal of Environmental Research and Public Health, 18(3301), 5-14.* https://doi.org/10.3390/ijerph18063301.

Reisi, M., Tavassoli, E., & Javadzade, H. (2020). Health literacy and the status of health-promoting behaviors in Shahrekord Adults. *Scientific Journal of Nursing, Midwifery and Paramedical Faculty, 6(2), 93-103.* http://sjnmp.muk.ac.ir/article-1-325-fa.html.

Sakamoto, S., Miyawaki, D., Goto, A., Hirai, K., Hama, H., Kadono, S, & Inoue, K. (2022). Associations between internet addiction, psychiatric comorbidity, and maternal depression and anxiety in clinically referred adolescents and adolescents. *Neuropsychiatric Disease and Treatment,*

18, 2421-30. https://doi.org/10.2147/NDT.S383160.

Shiferaw, K., Mehari, E., & Eshete, T. (2020). e-Health literacy and internet use among undergraduate nursing students in a resource limited country: A cross-sectional study. *Informatics in Medicine Unlocked, 18(00273), 1-4.* https://doi.org/10.1016/j.imu.2019.100273.

Silva, M. J., & Santos, P. (2021). The impact of health literacy on knowledge and attitudes towards preventive strategies against COVID-19: A cross-sectional study. *International Journal of Environmental Research and Public Health, 18(5421), 1-12.* https://doi.org/10.3390/ijerph18105421.

Soltani, E., Rezaei, M., Nasiri, M., Barasteh, S., Rahmati-Najarkolaei, F., & Mazaheri, M. (2019). The bivariate correlation of health literacy and cell phone addiction amongst Iranian healthcare students. *Journal of Clinical and Diagnostic Research, 13(6), IC1-IC5*. https://doi.org/10.7860/JCDR/2019/40306.12932.

Szymkowiak, A., Melović, B., Dabić, M., Jeganathan, K., & Kundi, G. S. (2021). Information technology and Gen Z: The role of teachers, the internet, and technology in the education of young people. *Technology in Society, 65, 101565*. https://doi.org/10.1016/j.techsoc.2021.101565.

Taba, M., Allen, T. B., Caldwell, P. H., Skinner, S. R., Kang, M., McCaffery, K., & Scott, K. M. (2022). Adolescents' self-efficacy and digital health literacy: A cross-sectional mixed methods study. *BMC Public Health*, *22*(1223), 1-16. https://doi.org/10.1186/s12889-022-13599-7.

Tomé, A., Rosa, M., & Silva, E. (2024). *Advancing health literacy in the technological era: The role of serious games in promoting body awareness among older adults. Transformative Approaches to Patient Literacy and Healthcare Innovation*, 65-88. IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-3661-8.ch004.

Turan, N., Güven Özdemir, N., Çulha, Y., Özdemir Aydın, G., Kaya, H., & Aştı, T. (2021). The effect of undergraduate nursing students' e-Health literacy on healthy lifestyle behavior. *Global health promotion, 28(3), 6-13.* https://doi.org/ 10.1177/1757975920960442.

Wang, M., Yi, J, Cai, L, Hu, M., Zhu, X., Yao, S., & Auerbach, R. (2012). Development and psychometric properties of the health-risk behavior inventory for Chinese adolescents. *BMC Medical Research Methodology, 12(94), 1-9*. https://doi. org/10.1186/1471-2288-12-94.

World Health Organization. (2024, November 12). *Health Promotion. Health literacy.* https://www.who.int/teams/health-promotion/enhanced-wellbeing/ninth-global-conference/health-literacy.

World Health Organization. (2021). *Health literacy in the context of health, well-being and learning outcomes: The case of adolescents and adolescents in schools* (No. WHO/EURO: 2021-2846-42604-59268). Regional Office for Europe.

Yang, L., Diao, H., Li, T., Pu, Y., Jin, F., & Wang, H. (2020). Internet addiction and its influencing factors among junior high school students in Shapingba District (in Chinese). *Preventive Medicine, 32(2),144-6*. https://doi. org/10.19485/j.cnki.issn2096-5087.2020.02.009

Yaseen, Q., & Salah, H. (2021). The impact of e-learning during COVID-19 pandemic on students' body aches in Palestine. *Scientific Reports. 11, 22379*. https://doi.org/10.1038/s41598-021- 01967-z.