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ABSTRACT: In recent years, concerns about internet addiction (IA) have grown. The study aimed to assess to what extent teachers are informed about IA and are familiar with the internet, and to investigate their personal views and their perceptions of students' daily habits. A cross-sectional survey was conducted from Nov 2023-to-Apr 2024 across public high schools (Day Lyceums) in Crete, Greece, with high school teachers from 42 randomly selected schools completing an original structured questionnaire on internet use. Habits and IA were assessed through regression analysis. Of the 349 high school teachers with a mean age of 47.1 years (± 9.1), 65.9% were female. The teachers primarily used the internet for educational purposes (70.5%) or for social media/communication (50.7%). In fourteen questions regarding IA, feeling curiosity when using the internet was the most prevalent response (74.2%), while the mean total IA score (scale 0-100) was low (36.3 ± 14.2). Discussions with students about rational internet use were more common among female teachers in relation to male (83.9% vs. 73.9%, respectively, $p=0.026$), those with longer work experience (14.3 years vs. 11.4 years, $p=0.014$), and those who had a lower mean IA score (34.6 vs. 41.3, $p<0.001$). In general, teachers who discussed rational internet usage with students had a lower IA score (unstandardized $\beta=-6.62$, $p<0.001$). High school teachers' perceptions highlight the complex relationship between teachers and internet use. Our findings underscore the crucial role that teachers play in promoting healthy lifestyles and the need for better training in digital literacy and internet safety practices.

KEYWORDS: Internet addiction, teachers' awareness, physical activity, high school students, prevention.

Introduction

As the internet continues to grow and reach every part of the world, the amount of time spent online is increasing, highlighting issues related to its excessive use. Internet addiction (IA), also referred to as problematic use, pathological use, or abuse of the internet, can be categorized as a compulsive-impulsive spectrum disorder based on its symptoms [1].

IA is characterized by a diminished ability to control various aspects of internet use, such as initiation, duration, termination, frequency, and context [2].

Furthermore, it involves prioritizing internet applications to the point where they surpass other life interests and activities, along with persistent use despite negative consequences [3].

IA, usually driven by the addictive nature of various online content, such as games, videos, and social media [4], appears to be related with several risk factors, including male gender, younger age at the onset of internet use, low socioeconomic status, and specific goals for internet use [1,5-8].

Excessive use of social media has been identified as a potential risk factor for mental

health issues, including depression, anxiety, and low self-esteem [9-11].

Previous research has also reported a negative correlation between IA in adolescents and their physical activity levels, dietary and sleep habits, and mental well-being [12-16].

A large-scale, school-based study in Japan revealed that IA and risky behaviors were common among children [17].

The study found that IA was associated with unhealthy lifestyle habits, including excessive internet use, late bedtimes, lack of physical activity, and skipping breakfast [17].

It was also linked to family and social factors, such as the absence of rules at home, limited real-life friendships, and reduced interactions between children and parents [17].

Individuals with IA may be unaware of their condition, and its symptoms are often overlooked by family, friends, and colleagues [18].

Interventions aimed at addressing IA and promoting healthier internet usage habits may focus on the environment of each child, such as family members and significant others, including teachers, in addition to targeting adolescents directly [19].

Based on this, it could be argued that the adolescent's environment may play a crucial role in addressing or preventing IA. Teachers, in particular, seem to play a vital role as sources of social support for high school students. The quality of student-teacher relationships is considered a key factor in students' adaptive conditioning at school. When students perceive their teachers as supportive and caring, they are more likely to perform better academically and exhibit fewer problematic behaviors [20,21].

Therefore, teachers' involvement is essential in helping students develop healthy internet habits and mitigating the adverse effects of excessive internet use.

To the best of our knowledge, only a few studies have examined teachers' awareness of IA and their roles in supervising, guiding, and implementing preventive programs for students [2,22].

However, in order to select the most appropriate intervention at the school level, it is necessary to explore teachers' knowledge of IA, their familiarity with internet use, previous efforts to raise awareness, and their beliefs about the current situation within the school environment. From this perspective, a study was designed to assess to what extent teachers were informed about IA and were familiar with the internet, and to investigate their personal views

and their perceptions of students' daily habits. We also aimed to gain insights into teachers' internet usage habits and understand how they perceive students' physical activity, dietary habits, and internet behaviors.

Methods

Study population and sample

The research was conducted from November 2023 to April 2024 in public high schools in the Region of Crete, Greece.

In Greece, high schools (Lyceums) are 3 years long and divided into 1st, 2nd, and 3rd grades. Initially, 33 out of 69 day-general high schools were randomly selected, using a random number generator, to guarantee geographic coverage and school representativeness (four provinces and rural/urban areas).

The goal was to involve 15%-20% of the estimated 1,500 teachers employed at regional general high schools.

Due to initial limited teacher participation, a second inclusion round was prioritized, additionally involving nine randomly selected schools from the remaining pool, using a similar procedure and framework. Ultimately, 42 schools were listed and 400 teachers were approached.

Data collection

We conducted a quantitative study, incorporating a combined approach with limited qualitative information. Questionnaires featuring simple, linguistically adapted questions to ensure comprehensibility were utilized. This was tested by asking two secondary school teachers not involved in the study if items were clear and comprehensive. A few minor adjustments were made. Questionnaires were designed to be completed in a few minutes. After the randomization process and school administrators' consent, teachers were asked by the instructed researchers to participate in the study. They were informed about the study aim and that the survey was voluntary. Anonymity and confidentiality were ensured. Upon collection, data were tabulated and analyzed.

Data collection tools

Data were collected using a structured questionnaire designed for the study, with questions including demographic information (gender, age, work experience, parenthood, education), internet usage characteristics (e.g. preferred internet connection means, purpose of internet usage, time devoted to the internet), and information regarding teachers' knowledge on issues related to internet use (e.g. motives behind

internet usage, awareness of risks related to the internet). The core study questions aimed to retrieve information regarding students' physical activity, dietary, and internet usage behavior, as perceived by their teachers, and to collect data on teachers' incentives to raise awareness of IA and promote healthier daily habits. An IA score was estimated based on 14 questions (see **Figure 1**).

Every response (*no* or *yes*) related to IA was re-coded with a value of 1, and a composite score created (from 0 to 14). The row score was rescaled to 0-100, with higher values indicating higher addiction.

Ethical Considerations

For the conduct of this research, approval was granted by the Research Ethics Committee of the University of Crete (REC-UOC, decision no: 140/22.09.2022). Initial clearance to access schools was obtained by the Regional Directorate of Education of Crete (10556-03/11/2022; 7571-19/07/2023; 1413-12/02/2024). Informed consent was obtained from the participants.

Statistical analysis

Analysis was carried out using the SPSS program (IBM Corp. Released 2019, IBM SPSS Statistics for Windows, v.25.0, Armonk, NY: IBM Corp.). Frequency distributions and measures of location and dispersion of the attributes of the teachers were calculated. 95% confidence intervals (95%CI) were also assessed for comparing frequencies. The IA score (on a scale of 0-100) was checked for normality using

Blom's method (QQ plot). Chi-square (χ^2) and Student's t-tests were used to compare the teachers' sociodemographic characteristics and addiction scores with their tendency to discuss rational internet use and provide health recommendations. The correlation of IA score with teachers' characteristics, cell phone (smartphone) usage, reason for internet usage, and their tendency to discuss rational internet use and provide health recommendations to their students was assessed using multiple linear regression analysis. The acceptable level of significance was set at 0.05.

Results

Teachers from 39 schools participated in the study. Out of 400 teachers approached, 349 teachers eventually participated, returning fully completed questionnaires. Twenty-one questionnaires were partially completed and excluded.

Most teachers were female (65.9%), the mean age of all was 47.1 years (± 9.1), 70.8% reported having children, 58.7% held an MSc or/and PhD, and the mean duration of their professional experience was 13.6 years (**Table 1**).

53.3% of teachers preferred to access the internet through their cell phone.

Almost all (97.1%) had a cell phone with internet connection and most reported having estimated their daily internet connection time (78.2%), with an average time of 114 minutes.

Table 1. Descriptive characteristics of n=349 Teachers participating in the current study.

		n	%
Gender	<i>males</i>	119	34.1
	<i>females</i>	230	65.9
Age, years	<i>mean\pmstand. dev. (min, max)</i>	47.1 \pm 9.1 (25.0, 66.8)	
Parenthood	<i>no</i>	102	29.2
	<i>yes</i>	247	70.8
Postgraduate degree (MSc, PhD)	<i>no</i>	144	41.3
	<i>yes</i>	205	58.7
Work experience, years	<i>mean\pmstand. dev. (min, max)</i>	13.6 \pm 9.9 (0, 40)	
Preferred means of internet connection ^a	<i>cell phone</i>	186	53.3
	<i>laptop</i>	176	50.4
	<i>tablet</i>	20	5.7
Cell phone with internet connection	<i>no</i>	10	2.9
	<i>yes</i>	339	97.1
Purpose of internet usage ^a	<i>education</i>	246	70.5
	<i>social media / communication information / entertainment</i>	177	50.7
	<i>information / entertainment</i>	71	20.3
	<i>other (e.g. purchases/services)</i>	14	4.0
<i>Have you estimated how long you are connected to the internet every day?</i>	<i>no</i>	76	21.8
	<i>yes</i>	273	78.2

^a more than one answers occurred (multiple response)

Figure 1 presents the response distribution of 14 questions on IA. It was found that 74.2% of teachers reported feelings of curiosity when using the internet and 71.3% mentioned feelings of temporary satisfaction while surfing.

In contrast, just 4.3% of teachers did not use the internet as a means of communication and 8.0% believed that there are no disadvantages to internet use.

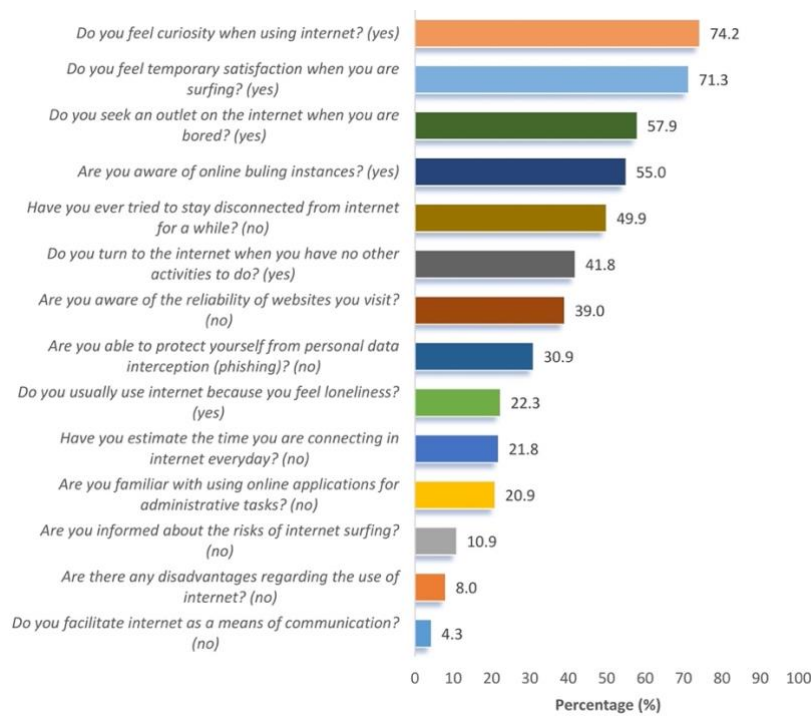


Figure 1. Response distribution of 349 participants in 14 questions regarding internet addiction.

Table 2 depicts the affirmative responses (“yes”) of the 349 teachers to the core study questions, along with their 95% Confidence Intervals.

These responses illustrated the views and practices of teachers regarding students' internet use and daily habits.

Specifically, 82.5% of teachers believed that a lack of physical activity might be related to IA,

and 80.5% provided students with health recommendations regarding habits such as sleep, diet, and exercise.

In addition, most teachers (74.5%) reported that they have discussed rational use of the internet or IA with their students, and 68.5% of teachers have suggested ways for students to reduce internet overuse.

Table 2. Affirmative responses (“yes”) to questions regarding teachers’ views on their students’ use of the internet and practices for promoting a healthier lifestyle.

Questions	n	%	95% CIs
Do you believe that lack of physical activity is related to internet addiction?	288	82.5	78.3, 86.2
Do you provide students with health recommendations regarding habits such as sleep, diet, and exercise?	281	80.5	76.1, 84.4
Do you believe that internet use affects the educational process?	275	78.8	74.3, 82.8
Have you observed difficulties in students who are consistently engaged with the internet?	264	75.6	70.9, 79.9
Have you discussed rational internet use or internet addiction with your students?	260	74.5	69.7, 78.9
Have you thought about ways to encourage your students to be physically active?	257	73.6	68.8, 78.1
Have you suggested ways for students to reduce their attachment to the internet?	239	68.5	63.5, 73.2
Do you recommend that students consume meals based on the Mediterranean diet pyramid?	238	68.2	63.2, 72.9
Do you suggest sources of information related to health habits?	224	64.2	59.1, 69.1
Have you observed increased body weight among the students you teach?	191	54.7	49.5, 59.9
Are your students familiar with the Mediterranean cuisine / diet?	139	39.8	34.8, 45.0

When comparing teachers' socio-demographic characteristics and IA score with their tendency to discuss rational internet use and provide health recommendations (Table 3), significantly more female teachers seemed to discuss rational internet use with their students (83.9% vs. 73.9%, $P=0.026$). Additionally,

discussing rational internet use with students was more common among teachers with longer work experience (14.3 years vs. 11.4 years, $P=0.014$) or those with a lower mean IA score (34.6 vs. 41.3, $P<0.001$). In general, the IA mean score of all teachers was found to be low, or 36.3 ± 14.2 (on a scale of 0-100).

Table 3. Comparisons of teachers' socio-demographic characteristics and internet addiction score with their tendency to discuss rational internet use and provide health recommendations.

		Have you discussed rational internet use or internet addiction with your students?		P-value
		No (n=89)	Yes (n=260)	
		%		
Gender	males	26.1	73.9	0.026
	females	16.1	83.9	
Age, years	mean±stand. dev.	46.1±10.2	47.4±8.7	0.235
Parenthood	no	22.5	77.5	0.353
	yes	18.2	81.8	
Postgraduate degree (MSc, PhD)	no	18.1	81.9	0.572
	yes	20.5	79.5	
Work experience, years	mean±stand. dev.	11.4±10.1	14.3±9.6	0.014
Internet Addiction score (0-100)^a	mean±stand. dev.	41.3±14.5	34.6±13.6	<0.001

^a Internet addiction score based on responses of 14 relative questions; higher score means higher addiction to internet use. The total mean score is 36.3 ± 14.2 . χ^2 and Student's t-tests

Table 4 displays the multiple linear regression analysis of the IA score in relation to teachers' characteristics, cell phone use, reason for internet use, and tendency to discuss rational internet use and provide health recommendations to their students. No significant relationships were found

between IA score and teachers' characteristics, cell phone use for internet connection, or any of the reasons for internet use ($P>0.05$). In contrast, teachers who discussed rational internet use with students were significantly correlated with lower IA score (unstandardized $\beta=-6.62$, $P<0.001$).

Table 4. Multiple linear regression analysis of the internet addiction score in relation to 349 teachers' characteristics, cell phone use, reason for internet use, and their tendency to discuss rational internet use and provide health recommendations to their students.

	Internet Addiction score		
	unstandardized β coefficient	standard error	P-value
Gender (1: male, 2: female)	0.79	1.65	0.633
Age (years)	0.12	0.13	0.366
Parenthood (1: no, 2: yes)	-2.72	1.83	0.138
Postgraduate degree (MSc, PhD) (1: no, 2: yes)	0.57	1.58	0.719
Work experience (years)	-0.08	0.12	0.470
Using cell phone connecting to internet (1: no, 2: yes)	2.74	1.51	0.071
Any of the reasons for internet use: surfing, administrative tasks, social networks or games (1: no, 2: yes)	4.13	14.1	0.769
Have you discussed rational internet use or internet addiction with your students? (1: no, 2: yes)	-6.62	1.76	<0.001
	R^2 (adj.)		0.061 (0.039)

Discussion

This study explored high school teachers' perceptions across Crete, regarding their internet connection habits. The participating teachers primarily used the internet for social

media/communication and educational purposes, with limited use for entertainment. However, this usage was sometimes linked to the search for an outlet and momentary satisfaction. Our findings underscored the crucial role that teachers may play in promoting healthy lifestyles and

addressing IA among students. Of note, female teachers and those with more years of experience frequently took the initiative in discussing rational internet use with their students, highlighting the need to strengthen associated training for teachers, especially those with less experience. IA and the response of not discussing rational internet use with students show a significant trend. This highlights the urgent need for enhanced training in this area so that teachers can effectively guide their students.

In our study, teachers reported an average daily internet use of 114 minutes with a preference for connecting via cell phones or computers, primarily for teaching purposes. These findings are consistent with, or slightly lower than, results of similar studies regarding time spent online [23-26].

Although only 8% of the participants did not recognize the potential risks and disadvantages associated with internet use, about half of the respondents had attempted to temporarily disconnect. Also, while few participants were not generally informed and were unaware of online risks, 3 out of 10 did not know how to protect themselves against phishing, and 4 out of 10 did not know how to verify the reliability of websites, suggesting a need for improved training on digital risks among teachers to enhance safe internet practices. Previous studies have highlighted that a significant number of teachers lack comprehensive knowledge of online safety practices and do not feel adequately prepared to address related issues, even though schools with well-trained teachers are more likely to empower students and help them use technology safely [27, 28].

This is logical considering that the generation averagely represented among study respondents was subject to no digital influence during childhood or adolescence.

The present study found that half of teachers were aware of bullying cases occurring via the internet. Bullying, which is generally characterized by intentional harm-including verbal abuse, social exclusion, and cyberbullying-mainly occurs during middle and early secondary school years [29].

It is increasingly considered a public health issue as it can lead, in some instances, to physical and mental health issues [30].

Despite the extensive rise of cyberbullying, it is necessary to prepare educators to deal with it effectively [31].

Given the pivotal role of educators in identifying and mitigating potentially harmful

behaviors among students, it is imperative to augment their knowledge of online risks and cyber-safety protocols. Furthermore, it is crucial to emphasize the significance of cultivating strong and nurturing relationships between educators and students.

According to our findings, a significant number of teachers reported observing struggles in students who exhibit excessive engagement with the internet. They believe that internet use affects the educational process, while they also associate it with lack of physical activity. Previous research has shown that IA has a severe effect on students' academic performance and may affect their focus, with positive correlations found between IA and learning difficulties, and negative correlations between IA and problem solving and inquiry skills [32,33].

Additionally, engaging in physical activity is associated with a significant reduction in IA symptoms, arguing that it could replace, to some extent, the gaming functions of the internet, while promoting willpower and self-control [34].

Physical activity may also lead to the reduction of certain negative emotions, such as loneliness and anxiety, since it affects the development of vital communication skills [35].

Although most teachers were aware of the negative impact of IA, only 68.5% had suggested ways for their students to reduce excessive internet use. The findings revealed that more than half of the teachers reported recommending informative sources (64.2%), observed increased body weight among their students (54.7%), and advocated for meals based on the Mediterranean dietary pyramid (68.2%). These results highlighted the need for further measures to equip both teachers and students with the knowledge necessary to improve their lifestyle. According to previous findings, possible links between IA and changes in dietary habits, nutrition and obesity risk among students have been suggested [36,37].

Another interesting finding is the correlation between teachers' gender and experience with their disposition to promote students' awareness of proper internet use. Previous research has also indicated that female teachers tend to have more positive relationships with students than male teachers and are generally perceived as being more attentive and perceptive [38].

However, according to another study, students generally do not view their teacher's gender as important but rather tend to value skilled and approachable teachers [39].

Furthermore, senior teachers are better equipped to create an optimal classroom

environment, show great care for their students, and aim to help them enhance their self-esteem and have a positive influence on their academic achievements [40].

The findings of the present study underline the need for further research on teachers' knowledge and practices regarding personal data protection online, as well as the development and implementation of comprehensive training programs for teachers, focused on the specific areas that teachers seem to be less acquainted with. The aim would be to enhance their knowledge and skills related to the safe and responsible use of the internet, focusing on incorporating discussions into the school curriculum to improve interventions in the school environment.

Strengths and limitations

In summary, this is a study involving an entire administrative region of the thirteen regions in Greece to examine teachers' awareness of IA and related factors among Greek adolescents.

Our findings highlight the essential role teachers may play in fostering healthy lifestyles and potentially tackling IA among students.

Nevertheless, this research poses some methodological limitations.

Firstly, inherent to the nature of the study, the use of self-reported measures introduces a response bias, partly mitigated by the anonymity of the questionnaire.

Some selection bias may have occurred since we conveniently included participants who returned questionnaires, without knowing the reasoning and the views of those who did not reply.

Limitations

Moreover, this study was a cross-sectional one yielding limited information on potential causal inferences and factors.

The pandemic period effect, social media use prevalence, replacement of social interactions with digital ones, and collective attitude trends constitute parameters that should be discussed in future similar research initiatives.

Another limitation is that this study used questions in terms of generally capturing content, a choice that limited the deeper interpretability of the results.

Information on the participants' technology or teaching skills is also missing.

These limitations may have influenced our findings in terms of detailed explanations. Furthermore, the number of participants and the inclusion of high school teachers from different

scientific fields and multiple educational facilities, while arithmetically representative, introduces sample heterogeneity and limited generalizability.

Recording the students' perspective on IA and daily habits would be interesting in order to understand further aspects of the problem from another standpoint, and available data in this direction are currently being analyzed by our research team.

Conclusions

This study explored the perceptions of general high school teachers in the Region of Crete, shedding light on the complex issue of internet use.

The participating teachers primarily used the internet for social media/communication and educational purposes, with limited use for entertainment.

There were no correlations between IA and teachers' characteristics but a significant trend emerged between IA and not discussing rational internet use with students.

These findings emphasize the critical role teachers play in addressing IA among students and underscore the need for improved training in digital literacy and internet safety practices.

Also, the need to re-skill teachers to effectively guide their students through the challenges of digital reality, while also promoting healthier behaviors such as physical exercise and balanced nutrition, is evident.

In doing so, teachers could contribute to higher overall well-being among their students.

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Author Contributions

All authors contributed to writing the manuscript. Conception and design: EKS; Data acquisition and tabulation: PV, AEM, EKS; data analysis: ML; data interpretation: ML, AEM, EM, ES, AK, GP, AP, EK, IR, NR; Drafting the article: NV, EM, IR; Critical revision for important intellectual content: EKS, PV, AEM, ES, AK, GP, AP, EK, ML, NR; All authors have approved the final version of the manuscript.

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Conflicts of interest

The authors declare no competing interests.

Institutional Review Board

The study was conducted according to the guidelines of the Declaration of Helsinki; the study and the protocols utilised therein were approved by the Institutional Review Board (Ethics and Deontology Committee) of the University of Crete (decision no: 140/22.09.2022). Initial clearance to access schools was obtained by the Regional Directorate of Education of Crete (10556-03/11/2022; 7571-19/07/2023; 1413-12/02/2024).

Consent Statement

All human subjects involved in this study provided a written informed consent prior to participation, including the consent of publishing their anonymized data.

Data availability

All data presented in the manuscript are available from the authors upon request.

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