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Risk Factors Associated with Problematic Internet Use in High School Students: A Nested Case – Control Study

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Main Points

- In our nested case – control study, the risk of problematic Internet use (PIU) increased in individuals who spend "5 hours or more" daily on the Internet, perceive themselves as Internet addicts, use the Internet for virtual chatting, and do not use science and technology websites.
- Factors such as "reading books" as a leisure activity, using the Internet for "doing homework, studying," and preferring "educational" and "science and technology" websites among the visited sites were found to reduce the risk of PIU.
- As the total score obtained from the "Trait Anxiety" Inventory increased, the risk of PIU was found to increase.

Abstract

This study was conducted to determine the risk factors for Internet addiction levels in adolescents aged 13 – 19 years. In this nested case – control study, a total of 71 adolescents with problematic internet usage (PIU), identified as scoring "50 and above" on the Young Internet Addiction Scale, were categorized as the PIU group. Additionally, 70 adolescents with normal internet usage (NIU) were selected for the control group, matching the criteria of same gender, age, grade, and school characteristics. It was found to be 4.86 (95% CI: 2.04 – 11.57) of being in the problematic Internet use group in those who used the Internet for "5 hours or more" per day compared to others. Those who considered themselves Internet addicts had a 4.29 (95% CI: 1.44 – 12.74) of being in the problematic Internet use group. Furthermore, individuals who used the Internet for "virtual chat" purposes had a 2.73 (95% CI: 1.12 – 6.64) of being in the problematic Internet use group, while those who did not use "science and technology" websites had a 5.35 times higher risk (95% CI: 1.50 – 19.03) compared to users who did. Moreover, a 1-unit increase in the "Trait Anxiety" Inventory total score resulted in a 1.06 times higher risk (95% CI: 1.01 – 1.11) of being in the problematic Internet use group.

Keywords: Adolescent health, behavioral addiction, nested case – control, problematic Internet use, risk factors

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Introduction

Internet addiction and problematic Internet use (PIU) are significant public health issues that are becoming increasingly prevalent in society, impacting individuals' physical, social, and psychological well-being as Internet usage becomes more widespread. In recent years, the rise in Internet addiction prevalence has led to a growing number of studies on this topic. The American Psychological Association defines Internet addiction as "a behavioral pattern characterized by excessive or obsessive online and offline computer use that leads to distress and impairment" (APA, 2023). Internet addiction has been associated with various health-related, societal, social, and legal problems, such as disruption of daily life activities, neglect of important responsibilities, pain and numbness in the neck, shoulders, and wrists, headaches, dry eyes, obesity, reduced time for sports, academic work, and reading

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books, disturbed sleep hygiene, online sexual addiction, online gambling, emergence of aggressive emotions and behaviors due to violent content applications, and body image-related issues.

A study conducted on middle school and high school students revealed that 4.1% of students were Internet addicts, and 28.5% were at risk of Internet addiction. Numerous studies have evaluated the prevalence of Internet addiction in society, with the frequency of PIU ranging from 9.2% to 64.9% (Doğan, 2013; İnan, 2010; Kaval, 2018; Köfteci, 2018; Özparlak, 2020; Sonkur, 2014). The wide range of prevalence may be attributed to the fact that the scientific community has not yet established universally accepted tools and criteria for the diagnosis and assessment of Internet addiction or PIU. Several review studies have covered the definition, classification, evaluation, epidemiology, and comorbidity of Internet addiction (Beard, 2005; Chou et al., 2005; Douglas et al., 2008; Wölfling et al., 2009) as well as the treatment of Internet addiction (Petersen et al., 2009; Peukert et al., 2010; Widyanto & Griffiths, 2006).

This study aims to identify risk and protective factors associated with PIU among high school students in a selected district of Konya province.

Material and Methods

This is a nested case – control study. In this study, the authors aimed to determine the levels of Internet addiction among adolescents studying in four high schools in a selected district of Konya province, Turkey. The research included all individuals in the target population by reaching out to the entire universe.

Using Bayraktar's Turkish adaptation of the Young Internet Addiction Scale, individuals who scored "50 and above" were identified as having PIU. It was found that 71 adolescents scored 50 and above, resulting in a calculated prevalence of 16.5% (71/430) (Çiçek et al., 2022). These 71 adolescents with PIU were included as the case group in this study.

For each identified case with PIU, a control was selected from students who were in the same class, school, gender, and age group, and who scored "49 and below" on the Young Internet Addiction Scale (non-Internet addicted individuals). The selection of controls was done randomly. In the planning phase of the study, a total of 141 adolescents were included, consisting of the existing 71 cases (adolescents with PIU) and the selected 70 controls (adolescents without PIU).

Participants provided written informed consent for data collection. The study protocol was approved by the ethics committee of the University of Health Sciences (registration number: 21/785).

Quantitative Measurement Tools

In the quantitative phase of this study, Young Internet Addiction Scale (YIAS), State – Trait Anxiety Inventory (STAI), and Personal Information Form were used for data collection.

Young Internet Addiction Scale: Young, based on the Diagnostic and Statistical Manual of Mental Disorders (Fourth Edition) criteria for "pathological gambling," developed a 20-item self-report scale (Young, 1998). The scale consists of Likert-type statements, including "never," "rarely," "occasionally," "often," "very often," and "always." Participants rate these statements on a scale of 0, 1, 2, 3, 4, or 5. Those who score "80 and above" are considered "pathological Internet users," those who score between "50 and 79" are labeled as "limited symptom users," and those who score "49 and below" are categorized as "nonsymptomatic users." Bayraktar translated the scale into Turkish and found a Cronbach's alpha value of 0.91 and a Spearman – Brown value of 0.87, indicating that the scale is reliable (Bayraktar, 2001).

Spielberger State – Trait Anxiety Inventory: The STAI was developed by Spielberger and colleagues, and the Turkish validity and reliability studies were conducted by Öner. The inventory consists of a total of 40 items. "State Anxiety" comprises 20 items, assessing a person's momentary feelings, while "Trait Anxiety" also contains 20 items, evaluating how the person has felt during the past week. The responses are scored on a scale ranging from 0 to 4. The Likert-type questions in the "State anxiety" inventory include "not at all," "somewhat," "much," and "very much." In contrast, the "Trait Anxiety" Inventory includes the responses "almost never," "sometimes," "often," and "almost always" (Spielberger et al., 1970). The inventory consists of both positively and negatively worded items. Negative feelings are included in the positively worded items, and positive feelings are included in the negatively worded ones. The "State Anxiety" Inventory has 10 reversed items (items 1, 2, 5, 8, 10, 11, 15, 16, 19, and 20), while the "Trait Anxiety" Inventory has seven reversed items (items 21, 26, 27, 30, 33, 36, and 39). Öner and Le Compte found the Cronbach's alpha value for the translated scale to be 0.83 – 0.87 for "Trait Anxiety" and 0.94 – 0.96 for "State Anxiety" (Öner & Le Compte, 1983).

Personal Information Form: The Personal Information Form was created by researchers to determine the participants' mother/father's education level, mother/father employment status, number of children in the family, family type, economic level of the family, having a separate room, body mass index (BMI) percentile, sleep patterns, adequate and balanced nutrition, daily Internet usage time, sharing on social media, liking what is shared on social media, postponing eating while using the Internet, and considering oneself addicted to the Internet, a change in Internet use before and during the pandemic, spending time without Internet, weekly allowance amount, leisure time activities, purpose of Internet use, place of receiving information about Internet use, experiencing health problems related to Internet use, website use, social networking site membership, and state – trait anxiety.

Statistical Analysis

Statistical Package for the Social Sciences, version 22.0 (IBM SPSS Corp.; Armonk, NY, USA) software package was used for statistical analysis. The statistical analysis was performed on 71 cases (PIU) and 70 controls [normal Internet use (NIU)] groups. Continuous variables were assessed for normal distribution using kurtosis and skewness. The chi-square test was used for the comparison of categorical variables. After conducting single significance tests, independent variables showing significant differences, as well as independent variables with $p < .05$, were included in the binary logistic regression analysis to determine risk factors affecting Internet addiction. The forward likelihood

ratio (LR) method was used for separating important risk factors in the model. The classification and regression tree (CART) analysis was employed to determine the variables that effectively distinguish between PIU and NIU with Internet addiction. The statistical significance level was accepted as $p < .05$.

Results

The research group had an average age of 15.50 ± 1.3 years, and 30.5% of them were male. The case and control groups were similar in terms of class, school, gender and age group. There were no significant differences between the two groups regarding sociodemographic characteristics such as parental education level, parental employment status, mother and father are alive, number of siblings, family type, family's economic level, having a separate room, and BMI percentiles (Table 1).

When evaluating the relationship between the habits and Internet usage of the case and control groups, the following findings were observed: regarding "regular sleep," there was a statistically significant difference between the two groups ($p < .01$). About 70.4% of the cases had irregular sleep compared to 47.1% of the control group. Irregular sleep increased the risk of PIU by 2.7 times [odds ratio (OR) = 2.67; 95% CI: 1.33 – 5.33]. Regarding "sufficient balanced nutrition," there was a statistically significant difference between the two groups ($p < .001$). About 71.8% of the cases had insufficient and unbalanced nutrition compared to 37.1% of the control group. Insufficient and

Table 1.
Distribution of Sociodemographic Characteristics of the Case and Control Groups in the Study

	Case (PIU)		Control (NIU)		Test Statistic and Significance	OR	95% CI
	71	%	70	%			
Mother's education level							
Primary school and below	48	67.6	51	72.9	$\chi^2 = 0.248$, $p = .619$	1.28	0.62 – 2.65
Secondary school and above	23	32.4	19	27.1			
Father's education level ($n = 69$)							
Primary school and below	33	46.5	39	55.7	$\chi^2 = 1.045$, $p = .307$	1.41	0.72 – 2.77
Secondary school and above	36	50.7	30	42.9			
Mother's employment status							
Not working	67	94.4	69	98.6	Fisher's exact test, $p = .366$	4.11	0.44 – 37.81
Working	4	5.6	1	1.4			
Father's employment status ($n = 69$)							
Not working	2	2.8	7	10	Fisher's exact test, $p = .165$	3.78	0.75 – 18.90
Working	67	94.4	62	88.6			
Mother and father are alive							
They are both alive.	69	97.2	69	98.6	Fisher's exact test, $p = 1.000$	2.00	0.17 – 22.57
The father is not alive	2	2.8	1	1.4			
Number of children in the family							
One or two children	21	29.6	24	34.3	$\chi^2 = 0.176$, $p = .675$	1.24	0.61 – 2.52
Three or more children	50	70.4	46	65.7			
Family type							
Nuclear family	55	77.5	60	85.7	$\chi^2 = 1.094$, $p = .296$	1.74	0.73 – 4.16
Others	16	22.5	10	14.3			
Family economic level							
Income equals expenditure	41	57.7	43	61.4	$\chi^2 = 0.198$, $p = .656$	1.16	0.59 – 2.28
Others	30	42.3	27	38.6			
Separate room							
There is	55	77.5	57	81.4	$\chi^2 = 0.140$, $p = .709$	1.27	0.56 – 2.89
None	16	22.5	13	18.6			
BMI percentiles							
Normal	46	64.8	52	74.3	$\chi^2 = 1.085$, $p = .298$	1.57	0.76 – 3.23
Others	25	35.2	18	25.7			

Note: BMI = Body mass index; NIU = Normal Internet use; OR = Odds ratio; PIU = Problematic Internet use.

unbalanced nutrition increased the risk of PIU by 4.3 times (OR = 4.31; 95% CI: 2.12 – 8.76).

There was a statistically significant difference between the two groups in terms of "daily Internet usage time" ($p < .001$). About 60.6% of the cases used the Internet for 5 hours or more per day, while only 20% of the control group did the same. Having a daily Internet usage time of "5 hours or more" increased the risk of PIU by 6.1 times (OR = 6.14; 95% CI: 2.88 – 13.06). There was a statistically significant difference between the two groups regarding "making social media posts" ($p < .05$). About 88.7% of the cases made social media posts, while 72.9% of the control group did the same. Making social media posts increased the risk of PIU by 2.9 times (OR = 2.93; 95% CI: 1.18 – 7.25). There was a statistically significant difference between the two groups in terms of "clicking/liking shared content on social media" ($p < .001$). About 95.8% of the cases clicked/liked shared content, while 71.4% of the control group did the same. Clicking/liking shared content on social media increased the risk of PIU by 9 times (OR = 9.06; 95% CI: 2.55 – 32.19). There was a statistically significant difference between the two groups regarding "postponing meals" ($p < .001$). About 69% of the cases postponed meals, while 37.1% of the control group did the same. Postponing meals while using the Internet increased the risk of PIU by 3.8 times (OR = 3.76; 95% CI: 1.87 – 7.58). There was a statistically significant difference between the two groups in terms of "perceiving oneself as Internet addicted" ($p < .001$). About 90.1% of the cases perceived themselves as Internet addicted, while 62.9% of the control group did the same. Perceiving oneself as Internet addicted increased the risk of PIU by 5.4 times (OR = 5.40; 95% CI: 2.15 – 13.53).

There was a statistically significant difference between the two groups in terms of "experiencing changes in Internet usage before and during the pandemic" ($p < .05$). About 77.5% of the cases experienced changes in Internet usage, while 60% of the control group did the same. Experiencing changes in Internet usage before and during the pandemic increased the risk of PIU by 2.2 times (OR = 2.29; 95% CI: 1.10 – 4.77). There was a statistically significant difference between the two groups regarding "inability to spend time without the Internet" ($p < .05$). About 29.6% of the cases could not spend time without the Internet, while 12.9% of the control group had the same issue. Inability to spend time without the Internet increased the risk of PIU by 2.8 times (OR = 2.84; 95% CI: 1.19 – 6.76). There was a statistically significant difference between the two groups in terms of "weekly allowance amount" ($p < .01$). About 47.9% of the cases had a weekly allowance of more than 51 Turkish liras (TL), while the same was true for 25.7% of the control group. Having a weekly allowance of "more than 51 TL" increased the risk of PIU by 2.6 times (OR = 2.65; 95% CI: 1.30 – 5.40) (Table 2).

When evaluating the relationship between leisure activities and Internet usage in the case and control groups, it was determined that "reading books" (OR = 0.33; 95% CI: 0.16 – 0.68; $p < .01$) is a factor that reduces the risk of PIU. About 23.9% of the PIU group and 48.6% of the control group engaged in reading books as a leisure activity. However, there were no statistically significant differences between the two groups in terms of "playing digital games" ($p = .052$), "watching movies/series/television (TV)" ($p = .052$), "listening to music" ($p = .670$), and "engaging in sports activities" ($p = .471$) (Table 3).

When evaluating the relationship between Internet usage purposes and Internet usage in the case and control groups, it was found that using the Internet for "doing homework, studying" purposes (OR = 0.27; 95% CI: 0.13 – 0.55; $p < .001$) is a factor that reduces the risk of PIU. About 42.3% of the PIU group and 72.9% of the control group used the Internet for homework and studying. There is a statistically significant difference between the two groups regarding "using following social media" ($p < .01$). About 78.9% of the PIU group and 55.7% of the control group used the Internet for following social media. Using social media for following increases the risk of PIU by 3 times (OR = 2.96; 95% CI: 1.41 – 6.21). There was a statistically significant difference between the two groups in terms of "engaging in online chatting" ($p < .001$). About 59.2% of the PIU group and 27.1% of the control group were involved in online chatting. Engaging in online chatting increases the risk of PIU by 3.9 times (OR = 3.88; 95% CI: 1.91 – 7.89). There were no statistically significant differences between the two groups in terms of "checking e-mail" ($p = .288$), "playing games" ($p = .051$), "listening to music, watching movies and videos" ($p = .056$), and "shopping" ($p = .474$) (Table 3).

When the information sources for Internet usage of the case and control groups were evaluated regarding obtaining knowledge, it was determined that learning from "school lessons" (OR = 0.35; 95% CI: 0.15 – 0.82; $p < .05$) was a factor that reduces the prevalence of PIU. Among those with PIU, 14.1% learned from school lessons, while in the control group, this percentage was 31.4%. There is also a statistically significant difference between the two groups regarding Internet usage for "self-learning" ($p < .05$). About 67.6% of individuals with PIU self-learned using the Internet, while in the control group, this percentage was 45.7%. Self-learning from the Internet increases the risk of PIU by 2.5 times (OR = 2.47; 95% CI: 1.25 – 4.91). There were no statistically significant differences between the two groups regarding learning Internet usage from Internet cafes ($p = .493$), written materials ($p = .800$), school friends ($p = .114$), outside-of-school friends ($p = .166$), courses ($p = 1.000$), and family members ($p = .161$) (Table 4).

When the relationship between the occurrence of health problems related to Internet usage and Internet usage patterns of the case and control groups were evaluated, a statistically significant difference was observed in terms of experiencing "sleep" problems ($p < .001$). About 74.6% of individuals with PIU experienced sleep problems, while in the control group, this percentage was 44.3%. Experiencing sleep problems increases the risk of PIU by 3.7 times (OR = 3.70; 95% CI: 1.81 – 7.55). There was a statistically significant difference between the two groups in terms of experiencing "physical" problems ($p < .01$). About 42.3% of individuals with PIU experienced physical problems, while in the control group, this percentage was 20%. Experiencing physical problems increases the risk of PIU by 2.9 times (OR = 2.92; 95% CI: 1.38 – 6.20). A statistically significant difference was also observed between the two groups in terms of experiencing "psychological" problems ($p < .05$). Experiencing psychological problems increases the risk of PIU by 3.6 times (OR = 3.62; 95% CI: 1.34 – 9.77). Moreover, there was a statistically significant difference between the two groups in terms of experiencing "any health problem" ($p < .01$). Experiencing any health problem increases

Table 2.
Habits and Internet Usage Status of the Case and Control Groups in the Study

	Case (PIU)		Control (NIU)		Test Statistic and Significance	OR	95% CI
	71	%	70	%			
Regular sleep							
No	50	70.4	33	47.1	$\chi^2 = 7.889$, $p = .005^{**}$	2.67	1.33 – 5.33
Yes	21	29.6	37	52.9			
Adequate and balanced nutrition							
No	51	71.8	26	37.1	$\chi^2 = 17.111$, $p < .001^{**}$	4.31	2.12 – 8.76
Yes	20	28.2	44	62.9			
Daily Internet usage time							
5 hours and more	43	60.6	14	20	$\chi^2 = 24.082$, $p < .001^{**}$	6.14	2.88 – 13.06
0 – 4 hours	28	39.4	56	80			
Sharing on social media							
Yes	63	88.7	51	72.9	$\chi^2 = 4.758$, $p = .029^{*}$	2.93	1.18 – 7.25
No	8	11.3	19	27.1			
Liking/clicking what is shared on social media							
Yes	68	95.8	50	71.4	$\chi^2 = 13.305$, $p < .001^{**}$	9.06	2.55 – 32.19
No	3	4.2	20	28.6			
Postponing eating while using the Internet							
Yes	49	69	26	37.1	$\chi^2 = 14.380$, $p < .001^{**}$	3.76	1.87 – 7.58
No	22	31	44	62.9			
Seeing yourself as an Internet addict							
Yes	64	90.1	44	62.9	$\chi^2 = 13.154$, $p < .001^{**}$	5.40	2.15 – 13.53
No	7	9.9	26	37.1			
Changes in Internet use before and during the pandemic							
Yes	55	77.5	42	60	$\chi^2 = 4.228$, $p = .040^{*}$	2.29	1.10 – 4.77
No	16	22.5	28	40			
Spending time without Internet							
Yes	50	70.4	61	87.1	$\chi^2 = 4.927$, $p = .026^{*}$	2.84	0.19 – 6.76
No	21	29.6	9	12.9			
Weekly allowance							
More than 51 TL	34	47.9	18	25.7	$\chi^2 = 7.444$, $p = .006^{**}$	2.65	1.30 – 5.40
0 – 50 TL	37	52.1	52	74.3			

Note: $^{*}p < .05$, $^{**}p < .01$.
NIU = Normal Internet use; OR = Odds ratio; PIU = Problematic Internet use; TL = Turkish liras.

the risk of PIU by 4.5 times (OR = 4.56; 95% CI: 1.59 – 13.12). However, there was no statistically significant difference between the groups concerning "eye" problems ($p = .770$) (Table 4).

When the Internet usage and social media membership statuses of the case and control groups were evaluated, there was a statistically significant difference between the two groups in terms of using "education" sites (OR = 0.26; 95% CI: 0.12 – 0.56; $p < .01$) and "science and technology" sites (OR = 0.27; 95% CI: 0.09 – 0.81; $p < .05$) were identified as factors that decrease the risk of PIU. Among those with PIU, 21.1% used education sites, while in the control group, 50% used them. Similarly, 7% of those with PIU used science and technology sites, while in the control group, 21.4% used them. The use of "game" ($p = .068$), "film" ($p = .444$), "music" ($p = .349$), "chat" ($p = .072$), "newspaper/magazine" ($p = .234$), and "sports" ($p = .688$) sites did not show a statistically significant difference between the two groups (Table 5).

When the social media use was evaluated in terms of PIU, there was a statistically significant difference between the two groups in being a member of "Instagram" ($p < .01$) and "Twitter" ($p < .01$). Among those with PIU, 91.5% were members of Instagram, while in the control group, 71.4% were members. Being an Instagram member increased the risk of PIU by 4.3 times (OR: 4.33; 95% CI: 1.62 – 11.59). Similarly, 50.7% of those with PIU were members of Twitter, while in the control group, 27.1% were members, and

Table 3.
Leisure Time Activities and Purpose of İnternet Use of the Case and Control Groups in the Study

		Case (PIU)	Control (NIU)	Test Statistic and Significance	OR	95% CI
		71 (%)	70 (%)			
Leisure time activities						
Reading a book	No	54 (76.1)	36 (51.4)	$\chi^2 = 9.260$, $p = .002$**	0.33	0.16 – 0.68
	Yes	17 (23.9)	34 (48.6)			
Digital gaming	No	43 (60.6)	54 (77.1)	$\chi^2 = 3.774$, $p = .052$	2.19	1.05 – 4.57
	Yes	28 (39.4)	16 (22.9)			
Watching films/series/TV	No	32 (45.1)	43 (61.4)	$\chi^2 = 3.788$, $p = .052$	1.94	0.99 – 3.79
	Yes	39 (54.9)	27 (38.6)			
Listening to music	No	35 (49.3)	32 (45.7)	$\chi^2 = 0.181$, $p = .670$	1.15	0.59 – 2.23
	Yes	36 (50.7)	38 (54.3)			
Doing sports activities	No	61 (85.9)	57 (81.4)	$\chi^2 = 0.520$, $p = .471$	0.71	0.29 – 1.76
	Yes	10 (14.1)	13 (18.6)			
Purpose of using the Internet						
Doing homework, studying	No	41 (57.7)	19 (27.1)	$\chi^2 = 13.505$, $p < .001$**	0.27	0.13 – 0.55
	Yes	30 (42.3)	51 (72.9)			
Checking e-mail	No	61 (85.9)	65 (92.9)	$\chi^2 = 1.131$, $p = .288$	2.13	0.68 – 6.59
	Yes	10 (14.1)	5 (7.1)			
Game play	No	33 (46.5)	44 (62.9)	$\chi^2 = 3.815$, $p = .051$	1.94	0.99 – 3.81
	Yes	38 (53.5)	26 (37.1)			
Following social media	No	15 (21.1)	31 (44.3)	$\chi^2 = 7.579$, $p = .006$**	2.96	1.41 – 6.21
	Yes	56 (78.9)	39 (55.7)			
Virtual chat	No	29 (40.8)	51 (72.9)	$\chi^2 = 14.716$, $p < .001$**	3.88	1.91 – 7.89
	Yes	42 (59.2)	19 (27.1)			
Listening to music, watching films and videos	No	15 (21.1)	26 (37.1)	$\chi^2 = 3.642$, $p = .056$	2.20	1.04 – 4.66
	Yes	56 (78.9)	44 (62.9)			
Shopping	No	50 (70.4)	54 (77.1)	$\chi^2 = 0.512$, $p = .474$	1.41	0.66 – 3.01
	Yes	21 (29.6)	16 (22.9)			

Note: In this table, more than one option is selected.*$p < .05$, **$p < .01$.
NIU = Normal Internet use; OR = Odds ratio; PIU = Problematic Internet use; TV = Television.

being a Twitter member increased the risk of PIU by 2.8 times (OR: 2.76; 95% CI: 1.36 – 5.57). However, there was no statistically significant difference between the two groups in terms of being a member of Facebook ($p = .665$), YouTube ($p = 1.000$), and other platforms such as TikTok, Telegram, Snapchat, and WhatsApp ($p = .215$) (Table 5).

The relationship between the anxiety levels and Internet usage of the case and control groups was evaluated, and it was found that as the scores for "State Anxiety" and "Trait Anxiety" inventories increased, the prevalence of PIU also increased (Figure 1).

The variables that were significant in single analyses for the factors thought to be related to PIU were evaluated with binary logistic regression (forward LR) model. The independent variables explained the dependent variable [being a case (PIU)] by approximately 45.2% (Nagelkerke, $R^2 = .452$). According to the available data, its selectivity was 78.6% [control (NIU)] and sensitivity was 77.5% [case (PIU)]. Correct classification was found to be 78% for the whole group.

The variables entered into the model indicated that among those with a daily internet usage of '5 hours or more,' compared to those with '0-4 hours' of usage, the odds ratio (OR) for problematic internet usage (PIU) risk was 4.86 (OR=4.86; 95% CI, 2.04-11.57; p<0.001). For those who perceived themselves as internet addicted, compared to those who didn't, the OR for PIU risk was 4.29 (OR=4.29; 95% CI, 1.44-12.74; p<0.01). Among those who used the internet for virtual chatting purposes, compared to those who didn't, the OR for PIU risk was 2.73 (OR=2.73; 95% CI, 1.12-6.64; p<0.005). For individuals who did not use science and technology websites, compared to users, the OR for PIU risk was 5.35 (OR=5.35; 95% CI, 1.50-19.03; p<0.05). Additionally, a one-unit increase in the total score of the "Persistent Anxiety" inventory was associated with a 1.06-fold (OR=1.06; 95% CI, 1.01-1.11; p<0.05) higher risk of problematic internet usage (PIU)

Table 4.
The Place Where the Case and Control Groups Received Information About Internet Use and the Status of Experiencing Health Problems

		Case (PIU)	Control (NIU)	Test Statistic and Significance	OR	95% CI
		71 (%)	70 (%)			
A place to get information about the use of the Internet						
Lesson at school	No	61 (85.9)	48 (68.6)	$\chi^2 = 5.044$, $p = .024^*$	0.35	0.15 – 0.82
	Yes	10 (14.1)	22 (31.4)			
Internet cafe	No	65 (91.5)	67 (95.7)	Fisher's exact test, $p = .493$	2.06	0.49 – 8.59
	Yes	6 (8.5)	3 (4.3)			
Internet-related written materials	No	58 (81.7)	55 (78.6)	$\chi^2 = 0.064$, $p = .800$	0.82	0.35 – 1.88
	Yes	13 (18.3)	15 (21.4)			
Friend at school	No	51 (71.8)	59 (84.3)	$\chi^2 = 2.503$, $p = .114$	2.10	0.92 – 4.80
	Yes	20 (28.2)	11 (15.7)			
Friends outside school	No	57 (80.3)	63 (90)	$\chi^2 = 1.916$, $p = .166$	2.21	0.83 – 5.86
	Yes	14 (19.7)	7 (10)			
By yourself	No	23 (32.4)	38 (54.3)	$\chi^2 = 6.019$, $p = .014^*$	2.47	1.25 – 4.91
	Yes	48 (67.6)	32 (45.7)			
Course	No	70 (98.6)	69 (98.6)	Fisher's exact test, $p = 1.000$	0.98	0.06 – 16.07
	Yes	1 (1.4)	1 (1.4)			
Family members	No	57 (80.3)	48 (68.6)	$\chi^2 = 1.964$, $p = .161$	0.53	0.24 – 1.16
	Yes	14 (19.7)	22 (31.4)			
Health problems related to Internet use						
Eye problem	Yes	26 (36.6)	23 (32.9)	$\chi^2 = 0.085$, $p = .770$	1.18	0.59 – 2.36
	No	45 (63.4)	47 (67.1)			
Sleep problems	Yes	53 (74.6)	31 (44.3)	$\chi^2 = 13.492$, $p < .001^{**}$	3.70	1.81 – 7.55
	No	18 (25.4)	39 (55.7)			
Physical problem	Yes	30 (42.3)	14 (20)	$\chi^2 = 7.128$, $p = .008^{**}$	2.92	1.38 – 6.20
	No	41 (57.7)	56 (80)			
Psychological problem	Yes	18 (25.4)	6 (8.6)	$\chi^2 = 5.890$, $p = .015^*$	3.62	1.34 – 9.77
	No	53 (74.6)	64 (91.4)			
Do not experience any problems	Yes	5 (7)	18 (25.7)	$\chi^2 = 7.686$, $p = .006^{**}$	4.56	1.59 – 13.12
	No	66 (93)	52 (74.3)			

Note: In this table, more than one option is selected.*$p < .05$, **$p < .01$.
NIU = Normal Internet use; OR = Odds ratio; PIU = Problematic Internet use.

(Table 6).The variables entered into the model indicated that among those with a daily internet usage of '5 hours or more,' compared to those with '0-4 hours' of usage, the odds ratio (OR) for problematic internet usage (PIU) risk was 4.86 (OR = 4.86; 95% CI, 2.04-11.57; $p < 0.001$). For those who perceived themselves as internet addicted, compared to those who didn't, the OR for PIU risk was 4.29 (OR = 4.29; 95% CI, 1.44-12.74; $p < 0.01$). Among those who used the internet for virtual chatting purposes, compared to those who didn't, the OR for PIU risk was 2.73 (OR = 2.73; 95% CI, 1.12-6.64; $p < 0.005$). For individuals who did not use science and technology websites, compared to users, the OR for PIU risk was 5.35 (OR = 5.35; 95% CI, 1.50-19.03; $p < 0.05$). Additionally, a one-unit increase in the total score of the "Persistent Anxiety" inventory was associated with a 1.06-fold (OR = 1.06; 95% CI, 1.01-1.11; $p < 0.05$) higher risk of problematic internet usage (PIU) (Table 6).

In this study, factors associated with PIU were analyzed through single-factor statistical tests, and then these significant variables were evaluated using CART analysis. In Figure 2, the variables predicting the PIU group were examined, and daily Internet usage hours, the type of Internet sites used, experiencing sleep problems and physical problems related to Internet usage, and the regularity of sleep were found to be predictors. Daily Internet usage hours were identified as the most important predictor for the PIU group ($p < .001$, $\chi^2 = 24.08$) and were constrained by two nodes. According to the results, in node 2, the majority of the IAS group (75.4%) used the Internet for 5 hours or more daily. Under this

Table 5.
Internet Site Usage and Social Networking Site Membership of the Case and Control Groups in the Study

		Case (PIU)	Control (NIU)	Test Statistic and Significance	OR	95% CI
		71 (%)	70 (%)			
Using a website						
Game	No	37 (52.1)	48 (68.6)	$\chi^2 = 3.330$, $p = .068$	2.00	1.00 – 3.98
	Yes	34 (47.9)	22 (31.4)			
Film	No	35 (49.3)	40 (57.1)	$\chi^2 = 0.585$, $p = .444$	1.37	0.70 – 2.66
	Yes	36 (50.7)	30 (42.9)			
Music	No	23 (32.4)	29 (41.4)	$\chi^2 = 0.878$, $p = .349$	1.47	0.74 – 2.93
	Yes	48 (67.6)	41 (58.6)			
Chat	No	35 (49.3)	46 (65.7)	$\chi^2 = 3.244$, $p = .072$	1.97	1.00 – 3.88
	Yes	36 (50.7)	24 (34.3)			
Education	No	56 (78.9)	35 (50)	$\chi^2 = 11.609$, $p = .001^{**}$	0.26	0.12 – 0.56
	Yes	15 (21.1)	35 (50)			
Newspaper/magazine	No	67 (94.4)	61 (87.1)	$\chi^2 = 1.419$, $p = .234$	0.40	0.11 – 1.38
	Yes	4 (5.6)	9 (12.9)			
Sport	No	57 (80.3)	59 (84.3)	$\chi^2 = 0.162$, $p = .688$	1.31	0.55 – 3.14
	Yes	14 (19.7)	11 (15.7)			
Science and technology	No	66 (93)	55 (78.6)	$\chi^2 = 4.870$, $p = .027^{*}$	0.27	0.09 – 0.81
	Yes	5 (7)	5 (21.4)			
Social networking site membership						
Facebook	No	54 (76.1)	50 (71.4)	$\chi^2 = 0.188$, $p = .665$	1.27	0.59-2.69
	Yes	17 (23.9)	20 (28.6)			
Instagram	No	6 (8.5)	20 (28.6)	$\chi^2 = 8.198$, $p = .004^{**}$	4.33	1.62 – 11.59
	Yes	65 (91.5)	50 (71.4)			
YouTube	No	24 (33.8)	23 (32.9)	$\chi^2 = 0.000$, $p = 1.000$	1.04	0.51 – 2.10
	Yes	47 (66.2)	47 (67.1)			
Twitter	No	35 (49.3)	51 (72.9)	$\chi^2 = 7.264$, $p = .007^{**}$	2.76	1.36 – 5.57
	Yes	36 (50.7)	19 (27.1)			
Other (TikTok, Telegram, Snapchat, WhatsApp)	No	64 (90.1)	57 (81.4)	$\chi^2 = 1.541$, $p = .215$	2.08	0.77 – 5.58
	Yes	7 (9.9)	13 (18.6)			

Note: In this table, more than one option has been selected.$^{*}p < .05$, $^{**}p < .01$.
NIU = Normal Internet use; OR = Odds ratio; PIU = Problematic Internet use.

node, the majority of those using the Internet for 5 hours or more did not use science and technology websites (82.7%) and had irregular sleep patterns (90%), indicating an PIU group. In node 1, it was observed that the PIU group (33.3%) used the Internet for 0 – 4 hours daily. It was observed that the PIU group was the majority (76.9%) who had sleep problems due to Internet use (50%) and the majority (76.9%) who had physical problems due to Internet use (50%) below those with 0 – 4 hours of daily Internet use. In addition, it was seen that the minority (15%) who did not have sleep problems due to Internet use below the daily Internet usage hours of 0 – 4 hours and the minority (30%) who did not use educational sites in Internet site use were PIU group.

Furthermore, the risk table obtained from the analysis showed that CART achieved a 78.7% (standard error = 0.034) correct classification rate, indicating its relatively high accuracy in predicting PIU.

Discussion

In a study conducted with 546 high school students in Izmir, it was found that those with disrupted sleep patterns had higher Internet addiction, and a statistically significant difference was observed in the analysis (Doğan, 2013). This may be because the blue light on the digital screen decreases the production of a hormone called melatonin in adolescents and impairs sleep quality by delaying falling asleep. This suggests that it may be necessary to restrict Internet use at certain times of the day to prevent the development of PIU in adolescents. An association between Internet addiction and eating attitudes has been reported

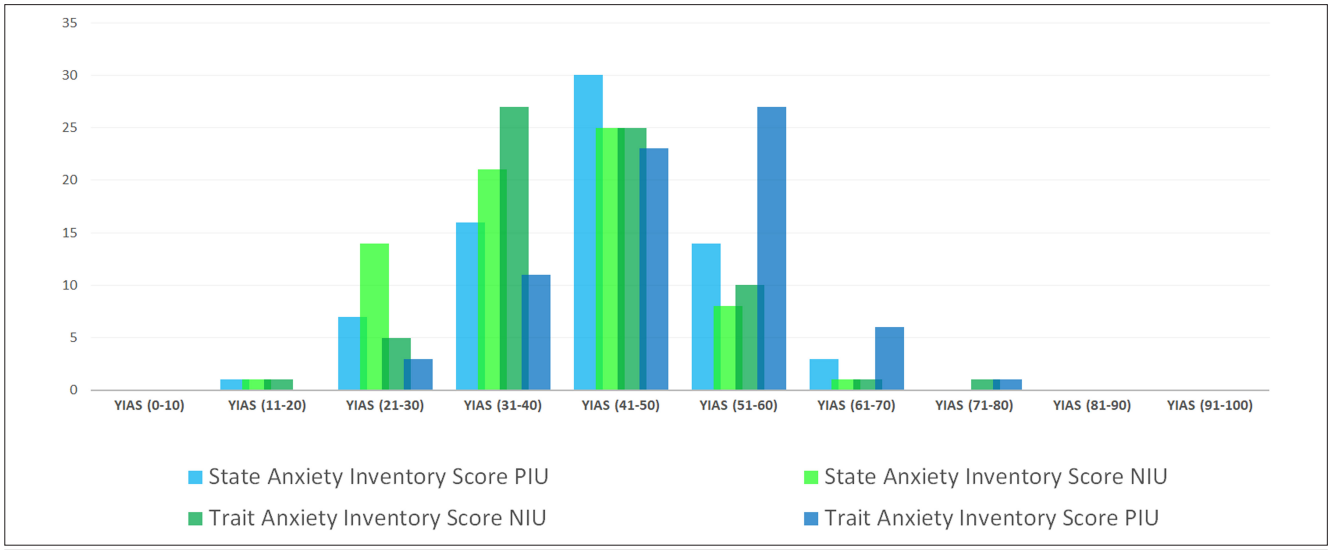

Figure 1. The Relationship Between the YIAS and STAI. STAI = State – Trait Anxiety Inventory; YIAS = Young Internet Addiction Scale.

(Dalgalı, 2016). As a result of staying on the Internet for a long time, adolescents may have problems in meeting their basic needs, and as a result, they may become obese and underweight individuals. Considering that this situation may pave the way for chronic diseases (diabetes, blood pressure, etc.) in the future, it may be important for the adolescent's family to take supervisory measures in the name of protection. Students were reported to use the Internet mostly for sharing purposes (Uslu, 2019). Today, young people use the Internet mostly for social networking. Local social networks were reported to be used as a tool for tracking their lives (Özhan, 2019). It may be that adolescents are obsessed with getting "likes" in their social media posts and are unhappy when they cannot get them. In terms of public mental health, it is thought that it is necessary to identify these adolescents and evaluate their psychological conditions. In a case – control study conducted with 75 adolescents in Istanbul, it was

Table 6.
Independent Variables Affecting Problematic Internet Use

	B	**Wald**	***p***	**Expr (*B*)**	**95% CI**
Constant	–3.519	8.673	.003**	0.03	-
Daily Internet usage hours					
5 hours and more	1.583	12.820	.001**	4.86	2.04 – 11.57
0 – 4 hours				1	
Seeing yourself as an Internet addict					
Yes	1.457	6.892	.009**	4.29	1.44 – 12.74
No				1	
The purpose of Internet use is "virtual chatting"					
Yes	1.007	4.965	.026*	2.73	1.12 – 6.64
No				1	
Using "science and technology" as a website					
No	1.678	6.718	.010*	5.35	1.50 – 19.03
Yes				1	
"Trait Anxiety" Inventory total score					
	0.061	6.407	.011*	1.06	1.01 – 1.11

Note: The model includes "regular sleep status," "adequate and balanced diet," "daily Internet usage time," "sharing on social media," "liking/clicking what is shared on social media," "postponing eating while using the Internet," "seeing oneself as an Internet addict," "experiencing a change in Internet use before and during the pandemic," "spending time without Internet," "weekly allowance amount," reading books as leisure time activities," "the purpose of using the Internet is doing homework, studying, following social media, virtual chatting," "learning Internet use from school lessons and self-learning," "using games, chat, education, science and technology as Internet sites," "Instagram and Twitter social networking site membership," "having sleep problems, physical problems, psychological problems and health problems," "total score of State Anxiety Inventory and total score of Trait Anxiety Inventory" were included. Hosmer – Lemeshow = 0.943 (χ^2 = 2.856).*$p < .05$, **$p < .01$.

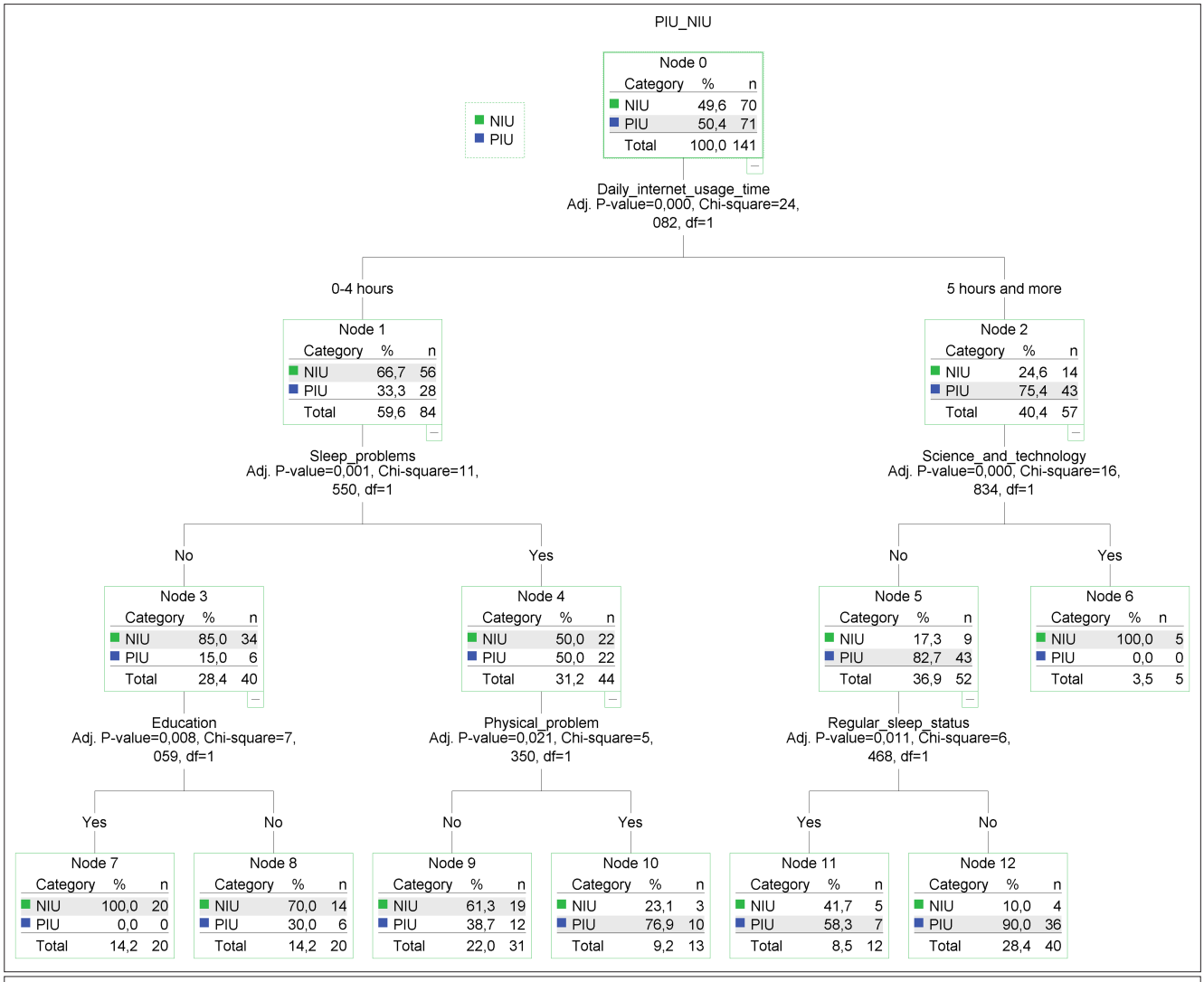

Figure 2. Classification Tree Model Used to Determine the PIU and NIU Status. NIU = Normal Internet use; PIU = Problematic Internet use.

found that the PIU – control study conducted with 75..."group had more social media sharing, and a statistically significant difference was observed in the analysis (Ülgen, 2015). Social media addiction has been found to be significantly associated with a higher risk of eating behavior disorders and orthorexia nervosa tendencies (Yurtdaş-Depboylu et al., 2022). Due to PIU, the adolescent stays online for longer periods of time and does not get the nutrients he/she needs daily, that is, he/she postpones eating. This suggests that the adolescent may have metabolic diseases such as being overweight and obese, having chronic diseases and weak immune system in the future. A systematic review conducted by scanning the literature revealed that Internet addiction in adolescents increased significantly during the coronavirus disease 2019 (COVID-19) pandemic compared to the prepandemic period (Ay Yılmaz et al., 2022). There has been an excessive increase in Internet use during the COVID-19 pandemic. As a result of isolation, the adolescent, whose stay at home increased as a result of isolation, used the Internet both for studying and for socializing. In the research we conducted during the COVID-19 pandemic, we encountered an increase in Internet use. This is a situation we expect during pandemic periods, and there is still a lack of correct and appropriate use of the Internet. In other words, while it is a fact that the Internet makes our lives easier, it can also ruin our health and lives. It may be important to provide social support to adolescents who have not yet completed their development during this pandemic. In a study conducted with 1229 high school students in Isparta, it was found that Internet addiction was higher in those who did not engage in sports, drawing, social activities with friends, or listening to music. However, no statistically significant difference was observed. On the other hand, Internet addiction was higher in those who did not read books, did not use the Internet, or did not watch TV, and a statistically significant difference was found (Kocaman et al., 2017). Determining the purpose for which the students in our study use the Internet may be important for future studies and for the prevention of Internet addiction. Another study reported a significant difference between using the Internet for educational and informational purposes compared to using it for chat, news, music – film, games, and sexuality (Kayri et al., 2014). Leisure time utilization is different for each individual. Our aim should be to make positive health behaviors a way of life for adolescents. For this, supporting and

encouraging them to do sports and read books may be protective in Internet addiction. In addition, it was thought that the duration of playing games should be monitored and violent games should be banned under the supervision and control of their parents. The presence of PIU has been significantly associated with suicidal ideation, depression, and bipolar disorder (Park et al., 2013). In a study conducted with 669 adolescent students in Trabzon, Internet addiction was higher in those with depression and a significant difference was found in statistical analysis (Öner, 2015). In a study conducted with 529 high school students in Malatya, a low-level positive correlation between Internet addiction and continuous anxiety was found (Göldağ, 2017). An anxious adolescent may develop PIU by showing avoidance behavior. In this regard, it was thought that it would be important to provide adequate social support and to remove or eliminate situations that cause anxiety from the environment. In another study with 669 high school students in Trabzon, those who perceived themselves as Internet addicts had higher Internet addiction, and a statistically significant difference was observed in the analysis (Öner, 2015). Adolescents may overdo their Internet use and think that it is natural, and the fact that the Internet is used by everyone may not make them think that they may be addicted to the Internet. Therefore, it may be useful to give seminars on Internet addiction to students and their parents in schools from time to time. In a study conducted with 1175 high school students in Giresun, it was found that Internet addiction was higher in those who received a "monthly allowance of 200 TL and above," and a statistically significant difference was observed in the analysis (Çam & Nur, 2015). Economically well-off adolescents can spend their money by shopping, chatting, gambling, and playing games on the Internet. As a result, it is thought that adolescents may develop PIU. In a study with 391 adolescent students in Izmir, the majority of the students stated that a life without the Internet would be boring and unenjoyable (Gedik, 2020). Adolescents may see the Internet as a means of escape from the real world. Just as human beings cannot live without air, water and food, adolescents can no longer live without the Internet. Because he/she constantly mentally thinks about using the Internet, his/her hands go to the keys and he/she may think that life is meaningless. By asking the adolescent to focus on the things that are important in his/her life and showing him/her that he/she loses these values when he/she uses the Internet, he/she may realize that the Internet is not so important. In a study conducted with 1479 young people (aged 14 – 24 years) in the United Kingdom, it was reported that "Instagram" had the worst negative impact, followed by "Twitter" (Royal Society for Public Health, 2017). The findings obtained from these studies are supportive of the findings obtained in our research. Another study reported that Internet addiction negatively affected sleep quality (Çelebioğlu et al., 2020). Internet addiction was found to be higher in high school students who experienced physical pain while using the Internet (Doğan, 2013). In our research, it can be said that the blue light emitted by the Internet screen at night affects the physiological structure of the brain and that the brain, which cannot comprehend the day – night distinction, has effects such as sleep irregularity, delay in falling asleep, frequent sleep interruption and affects sleep quality badly, and that adolescents who cannot do physical activity because they are in front of the screen fall asleep later and are less physically tired. In addition, pain may occur in the hands and neck due to inactivity. It is thought that sleep hours should be determined for adolescents and Internet use should be under parental supervision.

Limitations, Directions/Suggestions for Future Research

Since the research included nested case – control design and involved the same researchers' previous prevalence study, and the population was high school students from four high schools in a selected district, Konya province, and all cases were identified and controls were selected from normal students determined in the same study, the results can be generalized to the population.

However, due to the retrospective nature of nested case – control studies, it is difficult to determine whether the factors considered to cause Internet addiction occurred before the outcome. The relationship between Internet addiction and risk factors is multifaceted. Internet addiction can exacerbate risk factors, and these risk factors can also increase Internet addiction. It is correct to say that having one may increase the risk of having the other.

Since the case and control groups in the research were matched one-to-one in terms of same class, school, gender and age group, there were no differences between the case and control groups in these variables, as expected.

In conclusion, Internet addiction/PIU is a significant problem that adversely affects public health. To protect society from this problem and ensure that individuals use the Internet within healthy limits, it is important to know and investigate both the risk factors and protective factors associated with-PIU, especially starting from childhood/adolescence. Reducing risk factors and increasing protective factors is a fundamental approach to dealing with public health problems. The time allocated to reading books, engaging in sports, and physical activities should be increased to prevent Internet addiction among children/adolescents. They should be encouraged to use the Internet for productive activities such as doing homework and studying rather than as consumers. They should be taught how to use the Internet more accurately from reliable sources, and their physical, mental, and social well-being should be protected from negative effects. Daily Internet usage should be kept under control. Parents and children should be provided with health education on this issue, and preventive and corrective activities should be implemented.

Ethics Committee Approval: Ethical committee approval was received from the Hamidiye Scientific Research Ethics Committee of University of Health Science (Approval no: 21/785, Date: 31.12.2021).

Informed Consent: Written informed consent was obtained from the participants who agreed to take part in the study.

Peer-review: Externally peer-reviewed.

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