Arrival Date: 01.01.2023 | **Published Date:** 30.04.2023 | **Vol:** 8, **Issue:** 2 | **pp:** 311-321 | **Doi Number:** http://doi.org/10.5281/zenodo.7922470

THE EFFECT OF INTERNET ADDICTION ON DAYTIME SLEEPINESS AND QUALITY OF LIFE IN ADOLESCENTS

ERGENLERDE İNTERNET BAĞIMLILIĞININ GÜNDÜZ UYKULULUK VE YAŞAM KALITESI ÜZERINE ETKISI

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ABSTRACT

Objective: This study was conducted to determine the effect of internet addiction on daytime sleepiness and quality of life in adolescents.

Method: The population of the study consisted of a total of 427 (7th and 8th grade) students who attended the Şehit Nihat Şener Secondary School in Adana province between January and March 2022. The study was conducted with 342 students without sample selection. The data were collected using the "Socio-demographic Data Form", "Problematic Internet Usage Scale-Adolescent", "Paediatric Quality of Life Inventory", and Paediatric Daytime Sleepiness Scale. The data were analysed using Kruskal-Wallis, Mann-Whitney U and multiple regression tests. Necessary permissions were obtained to conduct the study.

Findings: A statistical significant difference was found between the mean scores of PIUS-A, PDSS, and PedsQL in terms of the days and time intervals in which adolescents frequently used the internet, the duration of daily use of the internet, use of phone-tablet in bed, and parental supervision of internet use ($p < 0.05$). The statistical estimates for the regression model run to analyse the effects of the Problematic Internet Usage Scale-Adolescent and its subscales on daytime sleepiness and quality of life indicated that the model was significant and applicable ($p < 0.001$).

Conclusion: This study revealed that problematic internet use by the adolescents negatively affected daytime sleepiness and quality of life.

Keywords: Adolescent, Internet, Sleepiness, Quality of Life.

ÖZET

Amaç: Bu araştırma ergenlerde internet bağımlılığının gündüz uykululuk ve yaşam kalitesi üzerine etkisini belirlemek amacı ile yapılmıştır.

Yöntem: Araştırmanın evrenini Adana ilinde bulunan Şehit Nihat Şener Ortaokulunda Ocak-Mart 2022 tarihleri arasında eğitimlerine devam eden toplam 427 (7. ve 8. sınıf) öğrenci oluşturmuştur. Araştırmada örneklem seçimine gidilmeyerek 342 öğrenci ile araştırma yürütülmüştür. Verilerin toplanmasında "Sosyodemografik Veri Formu, Problemli İnternet Kullanımı-Ergen Ölçeği, Çocuklar İçin Yaşam Kalitesi Ölçeği ve Pediatrik Gündüz Uykululuğu Ölçeği" uygulanmıştır. Verilerin değerlendirilmesinde Kruskal-Wallis, Mann-Whitney U ve çoklu regresyon testleri kullanılmıştır. Araştırmanın yürütülebilmesi için gerekli izinler alınmıştır.

Bulgular: Ergenlerin interneti sık kullandığı günler ve saat aralıkları, interneti günlük kulanım süresi, yatakta telefon-tablet kullanma ve ebeveynlerin internet kullanımını denetleme durumlarına göre PİKÖ-E, PGUÖ ve ÇİYKÖ puan ortalamaları arasında istatistiksel olarak önemlilik belirlenmiştir ($p < 0.05$). Problemli İnternet Kullanımı-Ergen Ölçeği ve alt boyutlarının gündüz uykululuk ve yaşam kalitesi üzerine etkileri için yapılan regresyon modeline ilişkin istatistiksel tahminler, modelin anlamlı ve kullanılabilir olduğunu göstermektedir ($p < 0.001$).

Sonuç: Bu çalışmada ergenlerin problemli internet kullanımının gündüz uykululuk ve yaşam kalitesini olumsuz etkilediği belirlenmiştir.

Anahtar Kelimeler: Ergenler, Internet, Uykululuk, Yaşam Kalitesi.

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Bu makaleye atıf yapmak için / Cite this article: Karasu A., Yılmaz T., Bulduklu B., Ateş S., Akıncı Aslan D., Eroğlu G., Karasu F. (2023). The Effect of Internet Addiction on Daytime Sleepiness and Quality of Life in Adolescents. *Gevher Nesibe Journal of Medical & Health Sciences*, 8(2), 311-321. http://doi.org/10.5281/zenodo.7922470

INTRODUCTION

Today, the internet has become a tool utilised in many different fields such as education, communication, information sharing and personal development of individuals. With the pandemic that the world has recently gone through, the prevalence of internet use and internet-based addictive behaviours has risen (Kovačić Petrović and et al. 2022). It is particularly noteworthy that adolescents spend more time on the internet for studying, playing online games, shopping, watching movies, interacting with social media and chatting (Dong and et al. 2020).

"Internet Addiction Syndrome" refers to the inability of adolescents to live without the internet and their feeling of unrelieved discomfort when they do not access the internet (Diotaiuti and et al. 2022). Technological devices such as smartphones and tablets, which facilitate internet access and use, make it easier for adolescents to access the internet during the day and before bedtime. The widespread accessibility of such devices has exposed adolescents to the risk of internet addiction (Anusha Prabhakaran and et al. 2016; Kuss and Lopez-Fernandez, 2016). It has been reported that internet addiction among adolescents is correlated with adverse outcomes in different domains such as physical (Eliacik and et al. 2016) and poor mental (Ostovar and et al. 2016) health, academic hardships (Mohamed and Bernouss, 2020), substance abuse (Evren and et al. 2014) social isolation (Tateno and et al. 2019) and low self-esteem (Woods and Scott, 2016). It has also been reported that internet addiction is associated with poor sleep quality and sleep disorders (Koças et al. 2018; Shin, 2015; Wolniczak and et al. 2013), and adolescents who use the internet have difficulty in falling asleep and awakening more frequently at night (Singh, 2018).

Being a key factor in the development of adolescents, sleep contributes to their physical and mental health (Kokka and et al. 2021). Internet addiction has been reported to be associated with problems such as insomnia and daytime sleepiness in adolescents (Choi and et al. 2009). Daytime sleepiness is the state of feeling tired during the day due to insufficient sleep at night and being inclined to sleep (Demirbaş and Kutlu, 2020). Adolescents with internet addiction go to bed late and awaken late. They experience a shortening in the duration of sleep at night, an extension in the sleeping latency and frequent awakening at night, as well as pronounced daytime sleepiness (Tereshchenko and et al. 2021). It has also been reported that internet addiction in adolescents is correlated with low quality of life by triggering emotional isolation in adolescents (Cruz and et al. 2018). Besides, physical problems that result from overuse of the internet may directly influence the quality of life negatively (Yu and Shek, 2018).

Determination of the physical, psychological and life-related negative effects of internet addiction in adolescents and identification of other predictive factors stand out as an important issue. In this sense, this study was planned to examine the effect of internet addiction on daytime sleepiness and quality of life in adolescents. Based on this scope, the following questions were sought to be responded in this study:

1. Is there any difference between the socio-demographic characteristics of adolescents and their levels of internet addiction, daytime sleepiness and quality of life?
2. What are the levels of internet addiction, daytime sleepiness and quality of life in adolescents?
3. Is there any correlation between the levels of internet addiction, daytime sleepiness and quality of life?

MATERIALS AND METHODS

Population and Sample

The population of the study consisted of 7th and 8th-grade students (totally 427) who attended the Şehit Nihat Şener Secondary School in Adana province between January and March 2022. The study was conducted with 342 students who volunteered to participate in the study and targeted to reach the entire population without sample selection. The participation rate was 80%.

Inclusion criteria are

- Being between the ages of 12-18,
- Attending the related school,
- Having an informed consent form signed by their parents.

Data Collection Tools

The data were collected using the "Socio-demographic Data Form", "Problematic Internet Usage Scale -Adolescent", "Paediatric Quality of Life Inventory", and Paediatric Daytime Sleepiness Scale.

Socio-demographic Data Form: The researcher developed this form with 19 questions on demographic characteristics of the adolescents and their internet use characteristics (age, gender, number of siblings, parents' education level, parents' employment status, family income, grade, school achievement, availability of internet access at home, availability of a personal computer, availability of a personal phone, internet sources, days and time intervals of frequent internet use, duration of daily internet use, phone-tablet use in bed, and parental supervision of internet use).

Problematic Internet Usage Scale -Adolescent (PIUS-A): Ceyhan and Ceyhan (2014) conducted the validity and reliability study of the scale on adolescents. The five-point Likert-type scale consists of 27 items and three subscales. The subscales of the scale are "Negative Consequences of the Internet", "Excessive Use" and "Social Benefit/Social Comfort". The items 7 and 10 of the scale are reversely scored. Total score of the scale ranges from 27 to 135 and higher scores indicate a high level of problematic internet use. The Cronbach's alpha coefficient was found to be 0.93, 0.93, 0.76 and 0.78 respectively for the overall scale, the "Negative Consequences of the Internet" subscale, "Excessive Use" subscale, and "Social Benefit/Social Comfort" subscale (Ceyhan and Ceyhan, 2014). In this study, Cronbach's alpha coefficient was calculated as 0.90 for the overall scale, and as 0.89, 0.71, and 0.72 for the subscales of "Negative Consequences of the Internet", "Excessive Use", and "Social Benefit/Social Comfort", respectively.

Paediatric Daytime Sleepiness Scale (PDSS): The scale is a special tool that was first used to assess daytime sleepiness in children and adolescents between the ages of 12 and 18. Bektaş et al., (2016) conducted the validity and reliability study of the Turkish version of the scale. The five-point Likert-type scale consists of eight items and a score of 0-32 points can be achieved from the scale. As the score of the scale increases, so does the level of daytime sleepiness. The Cronbach's alpha coefficient of the scale was found to be 0.79 (Bektas and et al. 2016). In this study, Cronbach's alpha coefficient was calculated as 0.72.

Paediatric Quality of Life Inventory (PedsQL): The scale was developed by Varni et al., (1999) to assess the health-related quality of life of children and adolescents aged 2-18 years (Varni, Seid and Rode, 1999). The PedsQL, as one of the general qualities of life scales, has 23 items and is appropriate for use in large populations such as schools and hospitals and in children and adolescents who are both healthy and ill. The items are scored between 0-100. If the respondents respond the question as "never", they get a score of 100 points; if they rate it as "rarely", they get a score of 75; if they rate it as "sometimes", they get a score of 50; if they rate it as "frequently", they get a score of 25; and if they rate it as "almost always", they get a score of 0. Memik et al., (2007) conducted the Turkish validity and reliability study of the PedsQL for the age group of 2-18 years (Çakın-Memik and et al. 2007). The higher the total score in the PedsQL, the better the perception of quality of life related to health. Scoring is based on 3 domains. Firstly, the total score of the scale (TSS), secondly, the total score of physical functioning (TSPF), and thirdly, the total score of psychosocial health (TSoPH), including the scores of items that assess emotional, social and school functioning, are calculated (Varni, Seid and Kurtin, 2001). The Cronbach's alpha coefficient of the PedsQL was found to be 0.93 (Varni, Seid and Rode, 1999; Eiser, Mohay and Morse, 2000). In this study, Cronbach's alpha coefficient for the total scale was calculated as 0.87.

Data Collection

After the necessary permissions were obtained, the researchers applied all the questionnaires and scales included in the study to the participants through face-to-face interview between January and March 2022. It took approximately 20 minutes to fill out the questionnaire.

Data Analysis

The data were analysed using SPSS 24.0 statistical software. In the statistical analysis, whether or not the data were normally distributed was assessed using the Kolmogorov-Smirnov test and it was determined that the data were not normally distributed. As well as the descriptive statistics such as percentage, frequency, mean, standard deviation, and minimum and maximum values, Kruskal-Wallis, Mann-Whitney U and multiple regression tests were used in the independent groups. Dunn's test, one

of the post-hoc multiple comparison tests, was used to find out which group was responsible for the significance of the independent variables. Cronbach's alpha coefficient for internal consistency was calculated and the significance level was accepted as $p< 0.05$.

Ethical Considerations

The Ethics Committee (21.12.2021, Ethics Committee No:13/54) approval and institutional permission were obtained to conduct the study. Written consent of the parents was obtained in writing before the data collection. The study was designed and conducted in accordance with the Principles of the Declaration of Helsinki.

RESULTS

Table 1. Comparison of the socio-demographic characteristics of the adolescents with their PIUS-A, PDSS, and PedsQL total mean scores (n=342)

		PIUS-A Total		PDSS		PedsQL Total	
	n (%)	**Mean± SD**	**Statistics Significance between groups/p**	**Mean± SD**	**Statistics Significance between groups/p**	**Mean± SD**	**Statistics Significance between groups/p**
Age (12.92±0.76)							
12 years (A1)	96 (28.1)	58.55±20.21		13.09±4.84		79.13±13.47	
13 years (A2)	176 (51.5)	62.93±21.22	***0.038** A1-A2/0.041	13.95±5.67	*0.562	77.49±15.40	*0.108
≥ 14 years (A3)	70 (20.4)	64.68±18.61		13.55±4.81		73.49±17.53	
Gender							
Female	168 (49.1)	62.77±21.34	**0.701	14.27±5.36	****0.031**	73.44±16.67	****<0.001**
Male	174 (50.9)	61.37±19.69		13.01±5.14		80.70±13.26	
Number of siblings (2.02±1.30)							
None	18 (5.3)	58.94±18.75		12.11±4.44		75.69±19.79	
One or two siblings	233 (68.1)	61.77±20.54	*0.722	13.51±5.37	*0.233	78.18±15.01	*0.077
≥ three sibling	91 (26.6)	63.40±20.85		14.24±5.17		74.74±15.47	
Education of mothers							
Illiterate	33 (9.6)	64.96±20.53		13.24±4.52		74.91±17.78	
Primary School	183 (53.5)	61.53±20.88	**0.438	13.68±5.47	*0.889	77.41±16.05	*0.855
High School	100 (29.3)	63.10±19.81		13.84±5.28		77.33±14.12	
≥ University	26 (7.6)	58.07±20.74		12.96±4.98		77.25±13.21	
Education of fathers							
Illiterate	19 (5.6)	68.31±20.33		13.36±5.48		72.31±17.83	
Primary School	167 (48.8)	61.52±20.77	**0.489	13.12±5.40	*0.172	76.82±16.16	*0.565
High School	119 (34.8)	62.36±20.59		14.48±5.15		77.91±13.98	
≥ University	37 (10.8)	60.27±19.23		13.29±4.88		78.52±15.40	
Employment of mothers							
Employed	65 (19.0)	65.61±18.76	***0.044**	13.52±5.53	**0.923	75.41±15.22	**0.153
Unemployed	277 (81.0)	61.22±20.83		13.65±5.23		77.54±15.49	
Employment of fathers							
Employed	304 (88.9)	62.01±20.27	*0.948	13.72±5.24	**0.461	77.54±14.91	**0.333
Unemployed	38 (11.1)	62.39±22.58		12.86±5.56		73.87±19.07	

Family Income							
Good	87 (25.4)	63.56±20.35		14.12±4.46		77.96±13.67	
Moderate	216 (63.2)	61.00±20.38	*0.424	13.25±5.51	*0.157	77.68±15.11	*0.347
Poor	39 (11.4)	64.58±21.56		14.61±5.58		72.25±19.93	
Grade							
7. Grade	208 (60.8)	61.37±21.15	**0.209	13.78±5.24	**0.541	79.49±13.02	**0.006
8. Grade	134 (39.2)	63.13±19.48		13.38±5.34		73.47±18.03	
School Achievement							
Good (A1)	132 (38.6)	58.61±20.24	**0.001 A1-A3/0.001 A2-A3/0.030	12.90±4.95	*0.140	79.64±14.78	*<0.001 A2-A3/0.003 A1-A3/<0.001
Moderate (A2)	190 (55.6)	62.94±19.89		14.02±5.44		76.86±14.77	
Poor (A3)	20 (5.8)	76.45±21.78		14.65±5.57		63.13±18.78	

PIUS-A= Problematic Internet Usage Scale -Adolescent PDSS= Paediatric Daytime Sleepiness Scale PedsQL = Paediatric Quality of Life Inventory. Mean=Mean, SD=Standard Deviation. *KW=Kruskal-Wallis test. **Z=Mann-Whitney U test. p<0.05.

Table 2. A comparison of the internet use characteristics of the adolescents with their PIUS-A, PDSS, and PedsQL total mean scores (n=342)

		PIUS-A Total		PDSS		PedsQL Total	
	n (%)	**Mean± SD**	**Statistics Significance between groups/p**	**Mean± SD**	**Statistics Significance between groups/p**	**Mean± SD**	**Statistics Significance between groups/p**
Availability of internet at Home							
Yes	320 (93.6)	62.12±20.60	**0.905	13.64±5.32	**0.963	77.20±15.60	**0.421
No	22 (6.4)	61.09±19.38		13.50±4.76		76.13±13.20	
Availability of Personal Computer							
Yes	120 (35.1)	61.73±22.80	**0.426	12.95±5.29	**0.075	79.30±13.68	**0.058
No	222 (64.9)	62.23±19.20		14.00±5.25		75.96±16.22	
Availability of Personal Phone							
Yes	170 (49.7)	64.20±20.88	**0.031	13.61±5.26	**0.796	76.16±14.95	**0.102
No	172 (50.3)	59.94±19.95		13.65±5.31		78.10±15.90	
Internet Connection tools							
Personal Computer	51 (14.9)	59.84±21.31		12.35±4.77		79.07±14.70	
Tablet	58 (17.0)	60.81±19.07	*0.491	13.87±5.42	*0.131	79.25±12.28	*0.401
Smart Phone	233 (68.1)	62.85±20.70		13.84±5.33		76.18±16.25	
Days of Frequent Internet Use							
Weekdays (A1)	25 (7.3)	54.40±19.22	*<0.001	11.04±5.76	*<0.001	78.91±16.63	*0.001 A1-A3/0.001
Weekend (A2)	181 (52.9)	55.50±15.59	A1-A3/<0.001	13.02±5.05	A1-A3/<0.001	79.47±14.80	
Always (A3)	136 (39.8)	72.19±22.37	A2-A3/<0.001	14.91±5.21	A2-A3/<0.001	73.70±15.52	
Time Intervals When the Internet is Mostly Used							
6:00-12:00 hours (A1)	9 (2.6)	67.33±14.31		13.88±3.05		73.67±15.52	
12:00-15:00 hours (A2)	75 (21.9)	60.01±17.88	*0.001	13.41±4.37	*0.017	77.11±15.77	*<0.001
15:00-18:00 hours (A3)	120 (35.2)	58.95±19.20	A3-A6/<0.001	12.95±5.18	A2-A6/0.042	80.76±13.61	A2-A6/0.007
18:00-21:00 hours (A4)	80 (23.4)	61.02±20.14	A2-A6/0.002	13.71±5.81	A3-A6/0.003	76.82±15.42	A3-A6/<0.001
21:00-24:00 hours (A5)	37 (10.8)	65.05±22.29	A4-A6/0.002	13.75±5.82		75.52±14.67	A4-A6/0.007
24:00-06:00 hours (A6)	21 (6.1)	83.52±24.90		17.61±5.21		62.03±17.07	
Duration of Daily Internet Usage							
< 1 hour (A1)	68 (19.9)	54.07±18.52		12.50±4.74		79.01±15.07	
1-3 hours (A2)	159 (46.5)	57.48±16.59	*<0.001	13.01±4.75	*<0.001	80.10±14.29	*<0.001
4-6 hours (A3)	60 (17.5)	64.35±18.98		14.05±5.80		77.68±12.47	
7-9 hours (A4)	29 (8.5)	79.65±21.51		14.82±5.51		67.05±17.21	
≥ 10 hours (A5)	26 (7.6)	86.03±20.73		18.03±5.98		64.04±17.05	

Use of Phone-Tablet in Bed							
Yes	168 (49.1)	68.21±21.60	**<0.001	14.70±5.01	**<0.001	75.12±15.21	**0.004
No	174 (50.9)	56.12±17.49		12.59±5.34		79.08±15.46	
Parental Supervision of Internet Use							
Yes	261 (76.3)	59.44±19.78	**<0.001	13.19±4.97	**0.020	78.74±14.51	**<0.001
No	81 (23.7)	70.48±20.64		15.03±5.98		71.96±17.20	

PIUS-A= Problematic Internet Usage Scale -Adolescent PDSS= Paediatric Daytime Sleepiness Scale PedsQL = Paediatric Quality of Life Inventory. Mean=Mean, SD=Standard Deviation. *KW=Kruskal-Wallis test. **Z=Mann-Whitney U test. p<0.05.

It was found that 93.6% of the adolescents stated that they had internet at home, 35.1% of them stated that they had a personal computer, 49.7% of them stated that they had their own phone, 68.1% of them stated that they connected to the internet mostly via phone, 52.9% of them stated that they used the internet mostly at weekends, 35.2% of them stated that they used the internet between 15 and 18 hours, 46.5% of them stated that their internet usage time ranged between 1 and 3 hours, 49.1% stated that they used a phone or tablet in bed, and 76.3% stated that their internet use was supervised by their parents.

A statistical significant difference was found between the adolescents' PIUS-A total mean scores in terms of having their own cell phones, the days and time intervals when they frequently used the internet, the duration of daily use of the internet, the use of cell phones and tablets in bed, and parental supervision of internet use ($p<0.05$). A statistically significant difference was found between the adolescents' PDSS and PedsQL total mean scores in terms of the days and time intervals in which adolescents frequently used the internet, the duration of daily use of the internet, use of phone-tablet in bed, and parental supervision of internet use ($p<0.05$) (Table 2).

Table 3. Distribution of the total mean scores and minimum-maximum values of PIUS-A and its subscales, PDSS, and PedsQL and its subscales

	Mean	SD	Minimum-Maximum Score obtained
Total PIUS-A	62.06	20.50	27-126
Negative Consequences of the Internet	28.39	12.19	14-70
Excessive Use	17.19	5.33	6-30
Social Benefit/Social Comfort	16.47	6.22	6-35
PDSS	13.63	5.28	1-31
Total PedsQL	77.13	15.44	17.39-100
TSPF	77.99	17.31	12.50-100
TSoPH	76.68	17.04	6.67-100
EFS	65.26	24.61	0-100
SFS	82.82	20.97	0-100
ScFS	81.95	20.58	0-100

Mean =Mean. SD= Standard deviation. PIUS-A= Problematic Internet Usage Scale -Adolescent PDSS= Paediatric Daytime Sleepiness Scale PedsQL: Paediatric Quality of Life Inventory, TSPF: Total Score of Physical Functioning, TSoPH Total Score of Psychosocial Health, EFS Emotional Functioning Score, SFS: Social Functioning Score, ScFS: School Functioning Score.

For all of the adolescents who participated in the study, the PIUS-A total mean score was calculated as 62.06±20.50 and their mean scores were 28.39±12.19 for the "Negative Consequences of the Internet" subscale, 17.19±5.33 for the "Excessive Use" subscale, and 16.47±6.22 "Social Benefit/Social Comfort" subscale. Their PDSS mean score was 13.63±5.28. Their PedsQL total mean score was 77.13±15.44 and their mean scores were 77.99±17.31 for "TSPF" subscale, 76.68±17.04 for "TSoPH" subscale, 65.26±24.61 for "EFS" subscale, 82.82±20.97 for "SFS" subscale, and 91.95±20.58 for "ScFS" subscale (Table 3).

When the analysis results from the regression model run to demonstrate the effects of internet use (PIUS total) on daytime sleepiness and quality of life were reviewed, the statistical estimates for the regression model showed that the model was significant and applicable ($F=67.895$, $p<0.001$). Daytime sleepiness and quality of life accounted for 37% of the total variance in internet use levels.

When the t-test results for the significance of the regression coefficient in the regression model were examined; it could be asserted that the rise in the level of daytime sleepiness (t=8.099, p< 0.001) and the impairment in the level of quality of life (t=-9.775, p<0.001) of the adolescents were due to the statistical increase in the total score of PIUS-A. The standardised regression coefficient (β) revealed that the "*quality of life inventory*" (PedsQL total) was the most important predictive variable on internet use (Table 4).

When the analysis results from the regression model run to demonstrate the effects of "Negative Consequences of the Internet" on daytime sleepiness and quality of life were examined, the statistical estimates for the regression model showed that the model was significant and applicable (F=55.432, p<0.001). Daytime sleepiness and quality of life accounted for 32.4% of the total variance in the levels of negative consequences of the internet. When the t-test results for the significance of the regression coefficient in the regression model were examined; it could be argued that the rise in the level of daytime sleepiness (t=6.323, p< 0.001) and the impairment in the level of quality of life (t=-9.667, p<0.001) of the adolescents were due to the statistical increase in the score of "Negative Consequences of the Internet" subscale. The standardised regression coefficient (β) indicated that the "quality of life inventory" (PedsQL total) was the most important predictive variable on internet use (Table 4).

Table 4. Results of the regression analysis between the total mean scores of PIUS-A and its subscales, PDSS, and PedsQL and its subscales

Dependent Variable	Independent Variable	*B*	*SD*	*β*	*t*	*p**
PIUS-A Total	(Fixed)	79.585	6.168		12.902	**<0.001**
	PDSS	1.454	0.180	0.375	8.099	**<0.001**
	PedsQL Total	-0.570	0.062	-0.475	-9.775	**<0.001**
	TSPF	-0.157	0.063	-0.133	-2.488	**0.013**
	TSoPH	-0.327	0.066	-0.272	-4.957	**<0.001**
	R=0.613	***R^2=0.376***	***Adjusted R^2=0.370***	***F=67.895***	***p<0.001***	***Durbin-Watson=0.910***
Negative Consequences of the Internet	(Fixed)	42.679	3.803		11.223	**<0.001**
	PDSS	0.700	0.111	0.303	6.323	**<0.001**
	PedsQL Total	-0.395	0.037	-0.469	-9.667	**<0.001**
	TSPF	-0.121	0.039	-0.172	-3.119	**0.002**
	TSoPH	-0.187	0.041	-0.261	-4.598	**<0.001**
	R=0.574	***R^2=0.330***	***Adjusted R^2=0.324***	***F=55.432***	***p<0.001***	***Durbin-Watson=0.798***
Excessive Use	(Fixed)	17.291	1.758		9.838	**<0.001**
	PDSS	0.391	0.051	0.387	7.642	**<0.001**
	PedsQL Total	-0.120	0.018	-0.348	-6.841	**<0.001**
	TSPF	-0.023	0.018	-0.075	-1.280	0.201
	TSoPH	-0.047	0.019	-0.151	-2.519	**0.012**
	R=0.501	***R^2=0.251***	***Adjusted R^2=0.244***	***F=37.693***	***p<0.001***	***Durbin-Watson=1.496***
Social Benefit/Social Comfort	(Fixed)	19.615	2.074		9.459	**<0.001**
	PDSS	0.363	0.060	0.309	6.018	**<0.001**
	PedsQL Total	-0.155	0.020	-0.384	-7.659	**<0.001**
	TSPF	-0.013	0.021	-0.035	-0.594	0.553
	TSoPH	-0.093	0.022	-0.254	-4.178	**<0.001**
	R=0.484	***R^2=0.234***	***Adjusted R^2=0.227***	***F=34.413***	***p<0.001***	***Durbin-Watson=1.608***

PIUS-A= Problematic Internet Usage Scale -Adolescent PDSS= Paediatric Daytime Sleepiness Scale PedsQL: Paediatric Quality of Life Inventory, TSPF: Total Score of Physical Functioning, TSoPH Total Score of Psychosocial Health. SS= Standard Deviation. *Multiple Regression test. p<0.05.

When the analysis results from the regression model run to find the effects of "Excessive Use" on daytime sleepiness and quality of life were analysed, the statistical estimates for the regression model indicated that the model was significant and applicable (F=37.693, p<0.001). Daytime sleepiness and quality of life accounted for 24.4% of the total variance in the levels of negative consequences of the Internet. When the t-test results for the significance of the regression coefficient in the regression

model were examined, it could be asserted that the rise in the level of daytime sleepiness (t=7.642, p< 0.001) and the impairment in the level of quality of life (t=-6.841, p<0.001) of the adolescents were due to the statistical increase in the score of "Excessive Use" subscale. Based on the standardised regression coefficient (β) it was determined that daytime sleepiness (PDSS) was the most important predictive variable on internet use (Table 4).

When the analysis results from the regression model run to find the effects of "Social Benefit/Social Comfort" on daytime sleepiness and quality of life were examined, the statistical estimates for the regression model indicated that the model was significant and applicable (F=34.413, p<0.001). Daytime sleepiness and quality of life accounted for 22.7% of the total variance on the levels of negative consequences of the internet. When the t-test results for the significance of the regression coefficient in the regression model were examined, it could be asserted that the rise in the level of daytime sleepiness (t=6.018, p< 0.001) and the impairment in the level of quality of life (t=-7.659, p<0.001) of the adolescents were due to the statistical increase in the score of "Social Benefit/Social Comfort" subscale. Based on the standardised regression coefficient (β), it was observed that the "quality of life scale" (PedsQL total) was the most important predictive variable on internet use (Table 4).

DISCUSSION

Although risky behaviours often develop during adolescence, they are more likely to persist into adulthood. Problematic internet use among risky behaviours has occupied an important place among the leading causes of morbidity in adolescents (Kipping and et al. 2012). From this perspective, this study aimed to determine the effect of internet addiction on daytime sleepiness and quality of life in adolescents. This study revealed that the adolescents who reported poor school achievement had higher levels of problematic internet use and the quality-of-life levels of adolescents with poor school achievement were lower than those of the adolescents with moderate and good school achievement. The studies on adolescents in the literature indicated that those with high academic achievement had lower scores on internet addiction (Yavuz, 2018; Aksoy and Öztoprak, 2021). The studies have demonstrated that adolescents with problematic internet use exhibit more depression and anxiety symptoms (Della-Méa, Biffe and Ferreira, 2016) and thus problematic internet use negatively affects their quality of life (Cruz and et al. 2018). The findings are similar to the studies in the literature.

This study revealed that adolescents who had their own phone and used the internet all the time had higher levels of problematic internet use. Furthermore, the adolescents who connected the internet all the time had high levels of daytime sleepiness and low quality of life. In one study, it was determined that adolescents with smartphones desired to stay online more as well as adolescents who had a higher frequency of internet use desired to stay online more (Pinarbaşi and Sağlam, 2020). Another study indicated that adolescents with smart cell phones had higher levels of problematic internet use (Güllü and Ceyhan, 2017). In their study on adolescents, Ekinci et al., (2014) found that the adolescents with high scores of internet addiction had sleep disorders. The results of this study revealed that the adolescents who used the internet for ≥ 10 hours per day had high levels of problematic internet use and daytime sleepiness and, in turn, had low quality of life levels. The studies on adolescents have reported that problematic internet use impairs their quality of life (Machimbarrena and et al. 2019; Foerster and Röösli, 2017). It is important to have an enhanced quality of life for several reasons as it is a major determinant of public health. Also, problematic internet use and prolonged sleep deprivation in adolescents may have negative effects on their quality of life, such as impairment of physical health, loss of school achievement, and a reduced ability to establish positive relationships with family members.

While problematic internet use and daytime sleepiness levels were found to be high in adolescents who used the internet mostly between 24:00 and 06:00 and with a phone-tablet in bed, their quality-of-life levels were found to be low. It was observed in a study that the use of technology by adolescents before sleep adversely affected their night sleep and daytime functioning (Kaur and Bhoday, 2017). Adolescents who use the internet go to bed late at night, need more time to fall asleep and awaken more frequently at night (Singh, 2015). In their study, Tereshchenko et al., (2021) determined that the levels of excessive daytime sleepiness were high in adolescents with internet addiction. According to the regression analysis, the level of problematic internet use in this study may negatively affect the level of daytime sleepiness and quality of life in adolescents. The findings of this

study are compatible with the literature. Healthy sleep is essential for human health and quality of life. Not only physical development and academic performance but also thinking, behaviour and emotional abilities are significantly affected by sleep for adolescents. They also suffer from anxiety, depressive disorders and suicidal ideation (Kaur and Bhoday, 2017; Beebe, 2011; Liu and et al. 2019).

In this study, it was found that the adolescents who were supervised for their internet use had low levels of problematic internet use and daytime sleepiness and high levels of quality of life. There are studies reporting that having a restrictive or supervising parent is protective against internet use in adolescents (Bleakley, Ellithorpe and Romer, 2016; Terras and Ramsay, 2016). In their studies, Ayas and Horzum (2013) reported the presence of internet abuse in adolescents as a result of the failure of parents with negligent parental attitudes to set limits for their children. Adolescents should be educated and supported to use the internet correctly in order to empower their social relationships and to be more successful in school life.

CONCLUSION

It was determined that the adolescents who reported poor school achievement, had a personal phone, used the internet all the time, used the internet for ≥ 10 hours per day and used a phone-tablet in bed had higher levels of problematic internet use. While the adolescents who access the internet all the time, use the internet for ≥ 10 hours per day and use a phone-tablet in bed had higher levels of daytime sleepiness, their quality-of-life levels were found to be lower. Problematic internet use by adolescents negatively affected their daytime sleepiness and quality of life. Families should be informed about the negative effects of problematic internet use on sleep and quality of life in adolescents. Having internet use under the supervision of parents and tracking the sleep habits of adolescents by parents can enable precautions to be taken for the dangers that may occur. Furthermore, school guidance programmes should include trainings on “mindful internet use”.

Acknowledgement

We thank all the nurses who voluntarily participated in the study.

Author Contributions

Plan, design: AK, TY, BB, SA; **Material, methods and data collection**: AK, DAA, GE; **Data analysis and comments:** AK, FK; **Writing and corrections:** AK, TY, BB, SA, DAA, GE, FK.

Conflict of interest

We declare that there is no conflict of interest in this study.

Funding

This study was not financially supported.

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