Archives of Psychiatric Nursing 35 (2021) 563–570

Contents lists available at ScienceDirect

Archives of Psychiatric Nursing

journal homepage: www.elsevier.com/locate/apnu

Examination of the relationship between smartphone addiction and cyberchondria in adolescents

Selmin Köse [1], Merve Murat [*]

Department of Nursing, Health Sciences Faculty, Biruni University, Istanbul, Turkey

ARTICLE INFO

Keywords:
Smartphone addiction
Cyberchondria
Adolescent
Anxiety

ABSTRACT

In this descriptive and correlational study, it was aimed to examine the relationship between adolescents' smartphone addiction and cyberchondria. Data were obtained from 384 adolescent high school students in Istanbul between December 2020 and January 2021, using a Personal Information Form, the Smartphone Addiction Scale, and Cyberchondria Severity Scale. The data were collected through face-to-face interviews with the students. The adolescents' smartphone use duration was 3.67 ± 1.66 years. Almost all (97.9%) connected to the internet via smartphones and 39.3% spent 3–4 h per day on the internet. It was determined that 61.7% of them checked their phones as soon as they woke up in the morning and 75.3% of them before going to bed in the evening. For those whose smartphone use duration is high, their cyberchondria also increases. The authors suggest that nurses should understand smartphone addiction and cyberchondria to identify and apply nursing interventions when necessary in adolescents.

Background

The development of technology and the increase in internet use has caused significant societal changes and continues to affect societies. This process, which started with desktop computers, has gained a different direction with hand-sized smartphones. Many transactions can be conducted in daily life with smartphones (Kwon et al., 2013). With the development of smartphones over the years, their use has also increased rapidly. In the United States, the time spent on social media with a smartphone was 1.5 h a day in 2012 and 3.5 h in 2017. However, according to Organization for Economic Co-operation and Development (OECD) data, it was stated that the average time spent on the internet for individuals aged 14–24 years was 4.5 h per day (OECDiLibrary, 2019). Considering the rate of internet use by age groups globally, it was determined that the group that spent the most time on the internet was adolescents and young adults (Alpaslan, Koçak, Avci, & Uzel Taş, 2015). With the introduction of social media tools, an increase is observed in internet time use. In 2019, individuals aged 18–24 years in America used social media tools at a rate of 70% and above. Considering the worldwide use of social media in adolescents in 2014, Switzerland ranked first with 96%, and Turkey was seventh with 88% (Roser, Ritchie, & Ortiz-Ospina, 2015). Adolescents use their smartphones for various purposes. These include following distance/online education, especially during the COVID-19 pandemic, supporting their personal development, staying in touch with friends, having fun using social media tools, and obtaining health information for themselves and/or their relatives. Smartphones and the internet are indispensable for adolescents who spend a great deal of time on the internet in their daily lives to achieve these goals (Alpaslan et al., 2015). In addition to their many advantages, the availability of smartphones at any time brings about behavioral addiction problems such as smartphone addiction (Kwon et al., 2013).

There is no diagnosis of smartphone addiction in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5). This situation, which is evaluated under the heading of behavioral addictions, is increasing today. In the studies, the rate of adolescents at risk of smartphone addiction was found as 30% in South Korea, and 62.6% in the Philippines (Buctot, Kim, & Kim, 2020; Cha & Seo, 2018; Lee & Lee, 2017).

With the development of information and communication technologies and the widespread use of smartphones, many research types are conducted on the internet throughout the day. Cyberchondria, which is a recent concept, is defined as the anxiety state about one's health due to the frequent behavior of obtaining information about health (McElroy & Shevlin, 2014). Although it seems an advantage that health-related data

* Corresponding author at: Biruni University, Health Sciences Faculty, Department of Nursing, Yıl Caddesi Protokol Yolu No: 45 34010 Topkapı, İstanbul, Turkey.
E-mail addresses: skose@biruni.edu.tr (S. Köse), mmurat@biruni.edu.tr (M. Murat).
[1] Department of Nursing, Health Sciences Faculty, Biruni University, Istanbul, Turkey 10. Yıl Caddesi Protokol Yolu No: 45 34010 Topkapı/İstanbul.

https://doi.org/10.1016/j.apnu.2021.08.009
Received 16 February 2021; Accepted 24 August 2021
Available online 30 August 2021

is easy, anonymous, and cheap to access via the internet, the information obtained can be inaccurate, contradictory, incomplete, and misleading. This situation causes an increase in the incidence of cyberchondria and the subsequent appearance of other mental disorders. With the increase in anxiety, fear, and stress levels of the individual, loss of function and obsessive-compulsive behaviors are observed in the following periods, and depressive symptoms appear (Fergus & Russell, 2016; Starcevic & Berle, 2013). As a result of a recent meta-analysis study, it was seen that individuals exhibiting cyberchondria behaviors had an increase in their health-related anxiety levels (McMullan, Berle, Arnáez, & Starcevic, 2019).

There are four basic dimensions under the concept of cyberchondria. These dimensions include spending excessive time on the internet to obtain health information, creating high levels of stress and anxiety due to the adverse effects of the information found, observing compulsive behaviors and affecting daily life activities because of these behaviors, and finally, seeking to feel safe. In particular, the fact that the internet's information is not accurate and reliable affects the individual's anxiety level about their health and increases the sense of unknown (Ejder Apay, Gurol, Ozdemir, & Uslu, 2020; McElroy & Shevlin, 2014). In addition to the feeling of the unknown, cyberchondria also affects the health economy. As a result of health research, individuals present to health institutions but try to reduce their concerns by presenting to more than one institution for the same problem (i.e. physician shopping) (McElroy & Shevlin, 2014).

The sub-reasons causing cyberchondria include excessive phone use time, lack of correct internet use information, and the inability to question the information's accuracy (Starcevic & Aboujaoude, 2015). According to the 5th stage of Erikson's psychosocial development theory, which is called identity versus confusion, adolescents become individuals and gain an identity, which is why adolescents' internet use in this term can be controlled by authority figures such as families and teachers (Faltýnková, Blinka, Ševčíková, & Husarova, 2020). Health professionals, especially nurses and physicians specializing in child and adolescent psychiatry, have an essential role in explaining cyberchondria to adolescents and how families behave (West, Kornhaber, Visentin, Thapa, & Cleary, 2020).

Given that cyberchondria is a new concept, there are limited studies in the literature explaining the concept and the related factors. Therefore, this study aimed to examine the relationship between adolescents' smartphone addiction and cyberchondria.

Research Questions:

RQ 1. What is the smartphone use level of adolescents?

RQ 2. What are the cyberchondria levels of adolescents?

RQ 3. How does the smartphone use of adolescents affect cyberchondria levels?

Methods

Design

The study design was descriptive correlational and cross-sectional. The study was conducted with high school-aged adolescents in Istanbul between December 2nd, 2020, and January 15th, 2021, to examine the relationship between adolescents' cyberchondria and smartphone addiction levels.

Participants

The study population consisted of adolescents who studied in a high school in Istanbul ($N = 798$). Although it was aimed to reach the entire population, a sample calculation was made for the study reliability. The study sample was determined as 260 students with a 95% confidence interval, 0.05 error level, and 0.95 representation power by power analysis. Three hundred ninety-five students participated in the study, 11 students were excluded due to missing data, and the research was completed with 384 students. Among the criteria for participation in the study, the parents and the student had to consent to participation in the research, they had to be a high school student at the designated institution, and they must have answered all questions thoroughly.

Procedure

The data were collected through face-to-face interviews with the high school students. After the students were informed about the study, they were asked to answer the questions. No personal information about the students was requested.

Instrumentation

a. ***Personal Information Form***: In line with the literature, the researchers created the personal information form with two-parts and 13 questions; part one consisted of sociodemographic characteristics (e.g. age, sex, class, economic status), and part two determined the smartphone addiction status and asked cyberchondria questions (e.g. daily phone use, daily internet duration, frequency of searches about health) (Ayar et al., 2017; Bati, Mandiracioglu, Govsa, & Çam, 2018; Fergus & Spada, 2017; Yildiz Durak, 2019).

b. ***Smartphone Addiction Scale (SAS)***: The SAS was developed by Kwon et al. (2013) to study the presence and level of smartphone addiction. Demirci, Orhan, Demirdas, Akpinar, and Sert (2014) conducted the scale' Turkish validity and reliability study. The scale is a 6-point Likert-type scale and consists of 33 items. The items are scored as 1 (definitely not) to 6 (absolutely yes), and there are no reverse-scored items. The scores that can be obtained from the scale range between 33 and 198. Higher scores on the scale indicate greater smartphone addiction. There are six sub-dimensions in the Kwon et al. study, and there are seven sub-dimensions in the Demirci et al. study. The Cronbach's alpha coefficient of the original scale was 0.96. In the study of Demirci et al., the Cronbach's alpha coefficient of the scale was 0.94, and the sub-dimensions Cronbach's alpha coefficient values were as follows: disturbing daily life and tolerance = 0.91, withdrawal symptoms = 0.89, positive anticipation = 0.83, cyberspace-oriented relationships = 0.82, overuse = 0.69, social network dependence = 0.82, physical symptoms = 0.57, respectively (Demirci et al., 2014; Kwon et al., 2013). For the use of scale, permission was obtained from Demirci et al. In this study, the scale Cronbach's alpha coefficient was 0.95, and the Cronbach's alpha coefficient values of the sub-dimensions varied between 0.89, 0.90, 0.84, 0.85, 0.74, 0.72, and 0.67, respectively.

c. ***Cyberchondria Severity Scale (CSS)***: The aim of the Cyberchondria Severity Scale (CSS), which was developed by McElroy and Shevlin in 2014 and adapted into Turkish by Ejder Apay et al. in 2020, is to determine anxiety levels about one's health and behaviors as a result of excessive online search for health information. CSS items include one's cognitive, emotional, and behavioral reactions related to online searches and perceived medical conditions. The scale consists of 33 items, it a 5-point Likert type and is scored between 1 (never) and 5 (always). The scale consists of five sub-dimensions named "compulsion," "distress," "excessiveness," "reassurance," and "mistrust." The lowest score that can be obtained from the scale is 33, and the highest score is 165, the higher the total score, the greater the severity of cyberchondria. In the scale's original study, the Cronbach alpha coefficient was 0.94, and the subscale Cronbach's alpha coefficients were as follows: compulsion = 0.95, distress = 0.92, excessiveness = 0.85, reassurance = 0.89, and mistrust = 0.75. In the study of Ejder Apay et al. (2020), the Cronbach alpha coefficient of the scale was 0.91; the subscale Cronbach alpha coefficients, in the same order, were 0.86, 0.78, 0.83, 0.75, and 0.59 (Ejder Apay et al., 2020; McElroy & Shevlin, 2014). Permission was obtained from Ejder Apay et al. to use the scale in the study. In this study, the Cronbach alpha coefficient of the scale was 0.91, and the Cronbach

alpha coefficients of the subscales were 0.88, 0.87, 0.76, 0.82, and 0.53, respectively.

Data analysis

The Statistical Package for the Social Sciences v. 24.0 (SPSS - IBM Corporation, New York, NY, USA) program was used for the study's statistical analysis. Percentage, mean, frequency, minimum-maximum values were examined for descriptive analysis. The normal distribution status was evaluated using the Kolmogorov-Smirnov and Shapiro-Wilk tests, and it was determined that the data not fit normal distribution ($p < 0.05$). For non-normally-distributed data, the Mann Whitney-*U* test was used for pairwise comparison, and the Kruskal Wallis-H test was used for comparison of two or more groups. For the post-hoc analysis of the data, Bonferroni correction was used to adjust for multiple comparisons, and later the Mann-Whitney U test was used for pairwise comparisons. Spearman's rank correlation coefficient (Spearman ρ) was used for non-parametric measurements of correlation. The results were evaluated at a 95% confidence interval and $p < 0.05$ as the statistical significance level.

Human subjects approval statement

The Biruni University Non-Invasive Ethics Committee evaluated the research, and approval was obtained on November 30th, 2020 (Decision No.: 2020/45-05). Before asking the research questions, the purpose of the study was explained to the students. Also, the researchers reminded the students that the data would be used only for scientific research, and that participation was voluntary. The study was conducted in compliance with the principles of the Helsinki Declaration.

Results

The mean age of the participants 14.68 ± 1.05 years and 61.5% were women. Some 61.2% of the participants' income was equal to their expenses, and 48.2% stated that their academic success was good.

The average smartphone use duration of the participants was 3.67 ± 1.66 years. Almost all (97.9%) connected to the internet via smartphones and 39.3% spent 3–4 h per day on the internet. Most students' smartphone use aims were to join the class online, research their homework, and communicate with their friends. It was determined that 61.7% of the students checked their phones as soon as they woke in the morning and 75.3% before going to bed in the evening, only 23.4% completely turned off their phones at night. Some 8.1% had a chronic disease, and 44.3% of those with health problems made an appointment with a physician. The majority (80.7%) of them researched about their health on the internet, 49% of whom mostly sought information about signs and symptoms and of diseases. It was determined that only 5.7% trusted information on the internet, and 46.9% increased their health-related research online during the COVID-19 pandemic (Table 1).

The mean score of the CSS was 75.92 ± 20.61. The mean CSS sub-dimension scores were as follows: compulsion = 14.2, distress = 19.7, excessiveness = 16.9, reassurance = 14.7, and mistrust = 10.3. The mean score of SAS was 88.83 ± 33.10. The mean SAS sub-dimension scores were as follows: disturbing daily life and tolerance = 22.9, withdrawal symptoms = 15.0, positive anticipation = 15.7, cyberspace-oriented relationships = 8.6, overuse = 11.1, social network dependence = 5.1, and physical symptoms = 7.7 (Table 2).

When the adolescents' SAS scores were compared in terms of sex, family income, behaviors when health problems occurred, the frequency of health-related research on the internet, and anxiety levels, it was determined that there was no significant difference between them ($p > 0.05$). When the mean internet use duration and smartphone addiction' scores were compared, it was found that adolescents' mean smartphone addiction scores were higher among those who used the smartphone for 7 h or more per day than those who used smartphones for less than 7 h

Table 1
Participants characteristics of smartphone use and cyberchondria (N = 384).

Variables	Yes	No
	n (%)	n (%)
Internet access via?[a]		
Smartphones	376 (97.9)	8 (2.1)
Tablet	140 (36.5)	244 (63.5)
Computer	292 (76.0)	92 (24.0)
For what purposes do you use your smartphone/tablet/computer?[a]		
Joining to classes/research homework	360 (93.8)	24 (6.3)
Communicating with friends	352 (91.7)	32 (8.3)
Surfing on social media	282 (73.4)	102 (26.6)
Reading online books & magazines	115 (29.9)	269 (70.1)
Playing online games	260 (67.7)	124 (32.3)
Watching TV series or movies	306 (79.7)	78 (20.3)
Shopping	199 (51.8)	185 (48.2)
	n	%
Time duration per day on the internet		
0–2 h	129	33.6
3–4 h	151	39.3
5–6 h	83	21.6
7 h or above	21	5.5
As soon as you get up in the morning, would you check your phone in bed?		
Yes	237	61.7
No	147	38.3
Would you check your phone in bed before going to bed?		
Yes	289	75.3
No	95	24.7
Would you turn off your phone completely at night?		
Yes	90	23.4
No	294	76.6
Do you have any chronic illnesses?		
Yes	31	8.1
No	353	91.9
When having any health problems		
I wait for it to pass	29	7.6
I apply what I know	22	5.7
I search on the internet	55	14.3
I consult my friend, family or people I know	108	28.1
I make an appointment with the doctor	170	44.3
Do you research your health on the internet?		
Yes	310	80.7
No	74	19.3
Would you be worried when you research about your health on the internet? (n = 310)		
Yes	181	58.4
No	129	41.6
What is your most frequent health-related research on the internet? (n = 310)		
About drug/medicine	23	7.4
About signs/symptoms	152	49.0
About drug use information	24	7.7
About treatment methods	45	14.5
About health-related (such as drug, diagnosis, examination) fee information	11	3.5
About alternative treatment methods	26	8.4
About other people's experiences on the subject I research	29	9.4
Do you trust the information you find on the internet?		
It is true, I trust.	22	5.7
It is not true, I do not trust.	83	21,6
I am indecisive.	279	72.7
My health-related research on the internet during the COVID-19 pandemic		

(*continued on next page*)

Table 1 (*continued*)

Variables	Yes	No
	n (%)	n (%)
Increased	180	46.9
It did not change	200	52.1
Decreased	4	1.0

[a] (More than one option can be marked.)

Table 2
Distribution from smartphone addiction and cyberchondria severity scales' scores (N = 384).

Scales	Min.	Max.	Mean(SD)	Item
Cyberchondria Severity Scale	33	134	75.92 (20.61)	33
• Compulsion subdimension	8	36	14.2 (6.2)	8
• Distress subdimension	9	42	19.7 (7.6)	9
• Excessiveness subdimension	6	30	16.9 (5.3)	6
• Reassurance subdimension	6	30	14.7 (5.6)	6
• Mistrust subdimension	4	20	10.3 (3.0)	4
Smartphone Addiction Scale	33	198	88.83 (33.10)	33
• Disturbing daily life and tolerance subdimension	8	48	22.9 (9.5)	8
• Withdrawal symptoms subdimension	6	36	15.0 (7.4)	7
• Positive anticipation subdimension	5	30	15.7 (6.0)	5
• Cyberspace-oriented relationships subdimension	4	24	8.6 (4.8)	4
• Overuse subdimension	4	24	11.1 (4.8)	4
• Social network dependence subdimension	2	12	5.1 (2.8)	2
• Physical symptoms subdimension	3	18	7.7 (3.4)	3

($p < 0.01$). Smartphone addiction was high in individuals who used their smartphones to browse social media and for online shopping ($p < 0.05$). In addition, when examining the situation of checking the phone before getting up in the morning and before going to bed and turning off the phone completely at bedtime, it was found that the mean scores of the SAS were high ($p < 0.05$). Adolescents with a high mean score regarding the reliability of the information they found through health-related research on the internet had high smartphone addiction levels ($p < 0.05$). During the COVID-19 pandemic, it was determined that adolescents who did more research on health on the internet had increased smartphone addiction levels compared with adolescents who did less research and whose research levels did not change ($p < 0.01$) (Table 3).

When the CSS scores of the adolescents were compared in terms of sex, daily internet use, checking their phones before going to bed, and turning off their phones completely, no significant difference was found ($p > 0.05$). When the CSS mean scores of adolescents were compared according to their families' economic status, the mean scores of adolescents with a higher income were higher than the other groups ($p < 0.01$). It was determined that the mean CSS scores of adolescents who said "I would search on the internet when I had a health problem" increased compared with the other groups ($p < 0.01$). Individuals with a health-related research frequency of 2 times per week or more on the internet were found to have a higher cyberchondria level than the other groups ($p < 0.001$). Adolescents who relied on the information they find on the internet had higher CSS mean scores than those who do not trust the information or were undecided ($p < 0.01$). During the COVID-19 pandemic, adolescents whose frequency of health-related research on the internet increased had higher CSS mean scores than those whose research frequency did not change or decreased ($p < 0.01$) (Table 3).

As a result of the Spearman's rank correlation coefficient analysis performed to determine the relationship between the smartphone addiction scale and the cyberchondria severity scale scores, a moderately positive and statistically significant relationship was found between the scores ($r = 0.599$; $p < 0.05$) (Table 4).

Table 3
Comparison of the participants' characteristics with the smartphone addiction scale and cyberchondria severity scale mean scores (N = 384).

Variables		Smartphone Addiction Scale (SAS)		Cyberchondria Severity Scale (CSS)	
		Mean (SD)	Test p	Mean (SD)	Test p
Sex					
Female		89.9 (34.1)	16.85[a] 0.056	76.6 (19.6)	16.73[a] 0.491
Male		87.0 (31.4)		74.8 (22.0)	
Family income					
Less than income		87.7 (33.3)	0.619[b] 0.734	74.7 (20.2)	2.330[b] 0.012
Income is equal to expenses		89.7 (33.3)		76.1 (21.1)	
More than income		84.3 (28.3)		82.0 (15.6)	
Time duration per day on the Internet					
0–2 h		75.5 (28.5)	4.177[b] <0.001	74.6 (20.1)	1.398[b] 0.497
3–4 h		88.3 (31.5)		75.4 (19.3)	
5–6 h		104.4 (30.5)		78.1 (23.1)	
7 h and above		112.0 (41.6)		78.3 (21.5)	
For what purposes do you use your smartphone/tablet/computer?					
Joining classes/research homework	Yes	88.7 (33.1)	4.135[a] 0.725	76.3 (20.5)	35.24[a] 0.131
	No	89.9 (33.1)		69.9 (21.5)	
Communicating with friends	Yes	89.6 (33.0)	4.685[a] 0.115	76.1 (20.8)	52.83[a] 0.561
	No	79.8 (33.0)		73.9 (18.3)	
Surfing social media	Yes	91.4 (32.4)	1.184[a] 0.008	75.6 (20.2)	14.05[a] 0.735
	No	81.7 (33.9)		76.6 (21.7)	
Reading online books & magazines	Yes	87.8 (35.3)	1.475[a] 0.477	76.7 (21.2)	15.07[a] 0.692
	No	89.2 (32.1)		75.5 (20.3)	
Playing online games	Yes	89.4 (33.4)	1.569[a] 0.674	75.5 (21.6)	15.58[a] 0.596
	No	87.5 (32.5)		76.7 (18.3)	
Watching TV series or movies	Yes	89.2 (31.9)	1.122[a] 0.041	75.1 (20.1)	10.82[a] 0.026
	No	87.1 (37.3)		79.1 (22.2)	
Shopping	Yes	91.8 (32.6)	1.633[a] 0.049	76.2 (19.2)	17.81[a] 0.588
	No	85.5 (33.3)		75.5 (22.0)	
As soon as you get up in the morning, would you check your phone in bed?					
Yes		98.6 (31.6)	0.9486[a] <0.001	78.1 (20.2)	14.67[a] 0.010
No		73.0 (29.1)		72.2 (20.8)	
Would you check your phone in bed before going to bed in the evening?					
Yes		94.9 (32.1)	0.761[a] <0.001	76.8 (20.7)	12.48[a] 0.185
No		70.2 (28.7)		73.2 (20.0)	
Would you turn off your phone completely at night?					
Yes		78.7 (29.0)	1.025[a] 0.001	72.8 (19.9)	11.90[a] 0.149
No		91.9 (33.7)		76.8 (20.7)	

(*continued on next page*)

Table 3 (*continued*)

Variables	Smartphone Addiction Scale (SAS)		Cyberchondria Severity Scale (CSS)	
	Mean (SD)	Test p	Mean (SD)	Test p
Do you research your health on the internet?				
Yes	91.2 (32.9)	8.922[a] 0.003	78.6 (19.5)	6.877[a] <0.001
No	78.6 (31.9)		64.6 (21.3)	
Frequency of health-related research on the Internet				
Once a day	78.5 (36.0)	3.922[b] 0.560	10.1 (2.9)	16.778[b] 0.005
Twice a day or above	95.6 (32.3)		10.3 (3.2)	
Once a week	97.3 (32.2)		9.7 (2.8)	
Twice a week or above	96.4 (3.5)		11.5 (3.6)	
Once a month	30.1 (31.8)		10.6 (2.6)	
Twice a month or above	89.2 (33.2)		10.2 (2.6)	
Do you trust the information you find on the internet?				
It is true, I trust.	116.4 (30.5)	1.565[b] <0.001	89.6 (23.9)	7.565[b] 0.023
It is not true, I do not trust.	88.2 (32.7)		75.3 (19.0)	
I am indecisive.	83.5 (31.8)		74.0 (23.4)	
Would you be worried when you research your health on the Internet?				
Yes	94.2 (33.8)	10.225[a] 0.062	82.5 (17.3)	8.412[a] <0.001
No	87.0 (31.2)		73.1 (21.0)	
My health-related research on the internet during the COVID-19 pandemic				
Increased	97.8 (34.1)	2.731[b] <0.001	84.3 (18.0)	6.007[b] <0.001
It did not change	80.4 (29.7)		68.2 (19.7)	
Decreased	103.0 (39.3)		79.2 (24.3)	

Post-hoc comparisons: Bonferroni Correction, $p < 0.005$.
[a] Mann-Whitney *U* test.
[b] Kruskal Wallis-H test.

Table 4
Correlation between cyberchondria and smart phone addiction (N = 384).

	n	r	p
Smartphone Addiction Scale Cyberchondria Severity Scale	384	0.599	<0.001

Spearman's rank correlation coefficient, $p < 0.001$.

Discussion

In the study, no significant relationship was found between smartphone addiction and sex. No significant relationship was found in the studies conducted by Pearson and Hussain (2016) and Aljomaa, Al. Qudah, Albursan, Bakhiet, and Abduljabbar (2016), and the study results support our findings (Aljomaa et al., 2016; Pearson & Hussain, 2016). However, studies are reporting that there is a statistically significant difference in terms of sex. A significant relationship was found between smartphone addiction by Chen et al. (2017), Cakir and Oguz (2017), Lee and Lee (2017), and Kim et al. (2019) and sex. Significantly, the level of smartphone addiction is higher in women than in men (Cakir & Oguz, 2017; Chen et al., 2017; Kim et al., 2019; Lee & Lee, 2017). Also, in the studies of Zou, Xia, Zou, Chen, and Wen (2019), and Dong, Yang, Lu, and Hao (2020), a significant relationship was found between smartphone addiction and sex, and it was observed that the level of smartphone addiction was higher in males than in females (Dong et al., 2020; Zou et al., 2019). This may be because everyone can access smartphones with little effect of sex, and the functions of smartphones can appeal to both women and men.

In the study, no significant relationship was found between family income and smartphone addiction. The study results of Cha and Seo (2018) support our findings (Cha & Seo, 2018). In the literature, there are contradictory studies with statistically significant but weak or strong relationships (Akturk, Budak, Gultekin, & Ozdemir, 2018; Fischer-Grote, Kothgassner, & Felnhofer, 2019). The increase in smartphone production with developing technology and the fact that some smartphones are available for little cost and they can be bought by everyone has made it easier to procure them. Therefore, children, adolescents, and families with low economic incomes have smartphones. Also, in the study conducted by Carbonell, Oberst, and Beranuy (2013), some parents reported that they gave smartphones to their children to check on them. Regardless of the family's economic status, this situation makes it easier for adolescents to have smartphones because many parents are eager to buy phones for their children for safety reasons (Carbonell et al., 2013). For this reason, the study result could not establish a relation between smartphone addiction levels and the economic status of families.

Considering the students' purposes of smartphone use, it was found that a high proportion used them to join classes (93.8%) and to communicate with friends (91.7%). In the study of Ayar et al. (2017), 40.3% of adolescents used their phones to surf the internet and communicate with their friends; in the study of Cha and Seo (2018), 34.4% of adolescents used their phones to surf the internet; Haug et al. (2015) reported that adolescents had phones to be online on social networks (67.3%) and listen to music (17.8) (Ayar et al., 2017; Cha & Seo, 2018; Haug et al., 2015). Students need to be aware of how they use smartphones. When smartphones are not used correctly, they negatively affect the social and academic lives of students. Students' daily lives are interrupted, especially by receiving instant notifications and messages and continuously checking the phone (Ayar et al., 2017; Cha & Seo, 2018; Faltýnková et al., 2020). The use of mobile phones for joining classes in this study had the highest ratio due to distance education because the data were collected during the COVID-19 pandemic.

In the study, a significant relation was found between the time spent on the internet and smartphone addiction. In the study of Ayar et al. (2017), it was found that 27.6% of the students spent an average of 5 to 14 h per day using their smartphone, and 23.1% spent more than 40 h per week on the internet; Haug et al. (2015) reported that 33.0% of adolescents spent 3–4 h per day on the internet (Ayar et al., 2017; Haug et al., 2015). It was found that adolescents spent an average of 6 h per day on the internet in Chun's (2018) study and an average of 15 h per week in Cassidy-Bushrow, Johnson, Peters, Burmeister, and Joseph (2015) study (Cassidy-Bushrow et al., 2015; Chun, 2018).

Many adolescents check their smartphones frequently to stay connected in social life. Inability to be online in social networks, especially when the phone runs out of battery and/or disconnects the internet, is referred to as “nomophobia” in the literature, increasing the individual's stress levels. In this study, a significance was found between students' checking their phones immediately before getting up in the morning and before going to bed at night and not turning off the phone completely at night and smartphone addiction. In Haug et al.'s study (2015), the rate of checking phones within 5 min after getting up in the morning was 39.5%, and the rate of checking between 6 and 30 min was 36.7% (Haug et al., 2015). In Toh, Howie, Coenen, and Straker's (2019) study, it was stated that students checked their social media networks in the morning after the alarm was turned off, frequently during the day, and just before going to sleep (Toh et al., 2019).

Due to the COVID-19 pandemic, digital technology products in daily life are increasing in line with social distancing and quarantine measures. The transfer of education to digital platforms for students has

caused a mandatory increase in telephone and internet use (Murthy, 2020). In this study, significant results were found between smartphone addiction and the frequency of health-related research on the internet during the COVID-19 pandemic. Similar to our study's findings, Dong et al. (2020) determined that there was excessive use of mobile phones and the internet to deal with stress and uncertainty during the COVID-19 pandemic. The adolescents' smartphone use increased from 32% to 50%, and their frequency of checking the phone increased from 50% to 87% (Dong et al., 2020).

In the present study, the relationship between smartphone addiction and cyberchondria of adolescents was evaluated. It was determined that almost all of the adolescents participating in the study (97.9%) accessed the internet via smartphones and used them frequently during the day. In Ayar et al.'s study, it was determined that 76.3% of the participants accessed the internet with their smartphones (Ayar et al., 2017). The total mean SAS score for smartphone addiction was found at a high level (88.83 ± 33.10) in our study. In the literature, the mean SAS smartphone score was 90.03 ± 29.71 in Cakir and Oguz's (2017) study, and 81.84 ± 41.04 in Yildiz Durak's (2019) study (Cakir & Oguz, 2017; Yildiz Durak, 2019). Also, the smartphone addiction ratio was 16.9% in Haug et al.'s (2015) study, and 22.8% in Zou et al.'s (2019) study (Haug et al., 2015; Zou et al., 2019).

In the present study, no relationship was found between cyberchondria levels and sex, and time duration on the internet. There are conflicting results between cyberchondria and sex in the literature. Bajcar and Babiak's (2019) findings support our findings (Bajcar & Babiak, 2019). In Barke, Bleichhardt, Rief, and Doering's (2016) study, it was found that the mean CSS score of women was higher than in men. By contrast, in Bati et al.'s (2018) study, it was found that men had higher scores in the "compulsion" and "mistrust" sub-dimensions than women, but when the CSS total score was evaluated, no significant difference was found (Barke et al., 2016; Bati et al., 2018).

In the study, a significant relationship was found between the level of cyberchondria and family income. It has been determined that individuals in higher socioeconomic groups seek more health information than individuals in lower socioeconomic groups (Eichenberg & Schott, 2019; Wangler & Jansky, 2020). It may be because the higher socioeconomic group pays more attention to their health and needs or attempts to correct knowledge (*such as diagnosis or treatment*) with cyberchondria and make themselves confident.

Adolescents' internet use per day has an increasing effect on cyberchondria. In the study, it was determined that there is a significant relationship between cyberchondria levels and the rate of research about health on the internet, regardless of their health problem (80.7%). Also, a significant relationship was found between the level of cyberchondria and the frequency of researching twice or more per week on the internet. Bati et al. (2018) determined that 14.2% of students performed health-related research on the internet, and 25% researched health once per week (Bati et al., 2018).

In the study, it was determined that the more the adolescents trusted the information they found on the internet, the higher their mean CSS score, and their anxiety levels increased correspondingly. In Fergus and Dolan's (2014) study, the rate of those who experienced anxiety during the research on the internet (N = 430) was 31.4% (Fergus & Dolan, 2014). In Eichenberg and Schott's study (2019), it was found that individuals who researched about health on the internet had higher anxiety (Eichenberg & Schott, 2019). In Starcevic, Baggio, Berle, Khazaal, and Viswasam's (2019) study, a significant relationship was found between cyberchondria and health anxiety (Starcevic et al., 2019).

During the COVID-19 pandemic, international and national restrictions were started to prevent the infection from spreading. Measures such as social distancing, home quarantine, mask-wearing, and hand hygiene were implemented. Information about COVID-19 was followed via online systems (such as social media, telephone, television, and internet) during this period. This information increases the frequency of research about health in individuals and anxiety due to lack of information. The present study supports findings in the literature; a significant relationship was determined between the cyberchondria level and the frequency of online health-related research during the COVID-19 pandemic. Farooq, Laato, and Islam (2020) also found that following the news about COVID-19 on social media increased the anxiety levels associated with it (Farooq et al., 2020).

In the present study, individuals with high mean smartphone addiction scores were found to have higher mean cyberchondria severity scores (r = 0.599). The concept of problematic internet use includes stress-induced new behaviors after excessive and uncontrollable internet use. In the literature, the problematic internet use scale, internet addiction scale, smartphone addiction scale, and compulsive internet use scales are used to determine problematic internet use. Fergus and Dolan (2014), Fergus and Spada (2017), and Starcevic et al. (2019) found similar results, finding a relationship between problematic internet use and cyberchondria (Fergus & Dolan, 2014; Fergus & Spada, 2017; Starcevic et al., 2019; Vismara et al., 2020).

Limitations

This research is essential in terms of examining the relationship between smartphone addiction and cyberchondria of adolescents. Despite its contribution to the literature, there are some limitations to the research. First, the findings were obtained from students studying at one Anatolian High School in Istanbul. Therefore, the generalizability of the findings is limited. Secondly, due to the cross-sectional design of the study, it does not reveal a cause-effect relationship. However, an increased rate of smartphone addiction increases cyberchondria behavior.

Implications for school nurses

This research contributes to understanding the concepts of smartphone addiction and cyberchondria, the related factors, and the relationship between them among adolescents. Nurses who work in the field of child health, child-adolescent mental health, and school health need to understand smartphone addiction and cyberchondria to identify this behavior in children and adolescents and to apply nursing interventions when necessary. School administrators, teachers, and parents should adopt a multidisciplinary approach and be educated about smartphone addiction, behavioral addictions, cyberchondria, and obsessive-obsessive behaviors. Cooperation should be made with local child-adolescent mental health centers.

Conclusions

The study focuses on the relationship between smartphone addiction and cyberchondria and related factors. As the level of smartphone addiction increases, internet use, cyberchondria behavior, and related anxiety levels also increase. Future research should be designed longitudinally and evaluating smartphone addiction and cyberchondria's concepts and effects at the individual and community level. The physical, psychological, and sociologic effects of smartphone addiction and cyberchondria on health and well-being and their relationship with child and adolescent psychiatric disorders should be evaluated.

Source(s) of support in the form of grants, equipment, drugs, or all of these

None.

Ethical consideration

The Biruni University Non-Invasive Ethics Committee evaluated the research, and approval was obtained on November 30th, 2020 (Decision No.: 2020/45-05).

CRediT authorship contribution statement

All authors listed meet the authorship criteria.
Selmin Köse (SK), Merve Murat (MM).
Conception: SK, MM.
Design: SK, MM.
Supervision: SK.
Data Collection and/or Processing: MM, SK.
Analysis and/or Interpretation: MM.
Literature Review: MM, SK,
Writer: MM, SK.
Critical Review: SK.

A statement that the manuscript has been read and approved by all the authors.

The manuscript has been read and approved by all the authors.

Declaration of competing interest

Conflict of interest statement declared by the corresponding author on behalf of all authors:

The authors whose names are listed certify that they have not conflicted of interest statement about personal or professional relationships, any financial interests in this manuscript. The authors confirm their specific contributions to the work presented. The authors are in agreement on the conclusions, implications, or opinions stated in the manuscript reported. All authors give consent to submission and publication of the work. Furthermore, each author certifies that this material or similar material has not been and will not be submitted to or published in any other publication.

Acknowledgement

None.

References

Akturk, U., Budak, F., Gultekin, A., & Ozdemir, A. (2018). Comparison of smartphone addiction and loneliness in high school and university students. *Perspect Psychiatr Care, 54*(4), 564–570.
Aljomaa, S. S., Al. Qudah, M. F., Albursan, I. S., Bakhiet, S. F., & Abduljabbar, A. S. (2016). Smartphone addiction among university students in the light of some variables. *Computers in Human Behavior, 61*, 155–164.
Alpaslan, A. H., Koçak, U., Avci, K., & Uzel Taş, H. (2015). The association between internet addiction and disordered eating attitudes among Turkish high school students. *Eating and Weight Disorders, 20*(4), 441–448.
Ayar, D., Bektas, M., Bektas, I., Akdeniz Kudubes, A., Selekoglu Ok, Y., Sal Altan, S., & Celik, I. (2017). The effect of adolescents' internet addiction on smartphone addiction. *Journal of Addictions Nursing, 28*(4), 210–214.
Bajcar, B., & Babiak, J. (2019). Self-esteem and cyberchondria: the mediation effects of health anxiety and obsessive–compulsive symptoms in a community sample. *Current Psychology, 2019*.
Barke, A., Bleichhardt, G., Rief, W., & Doering, B. K. (2016). The Cyberchondria Severity Scale (CSS): German validation and development of a short form. *International Journal of Behavioral Medicine, 23*(5), 595–605.
Bati, A. H., Mandiracioglu, A., Govsa, F., & Çam, O. (2018). Health anxiety and cyberchondria among Ege University health science students. *Nurse Education Today, 71*, 169–173.
Buctot, D. B., Kim, N., & Kim, S. H. (2020). The role of nomophobia and smartphone addiction in the lifestyle profiles of junior and senior high school students in the Philippines. *Social Sciences & Humanities Open, 2*(1), 100035.
Cakir, O., & Oguz, E. (2017). The correlation between high school students' loneliness levels and smart phone addiction. *Mersin University Journal of the Faculty of Education, 13*(1), 418–429.
Carbonell, X., Oberst, U., & Beranuy, M. (2013). The cell phone in the twenty-first century: A risk for addiction or a necessary tool? In E. Inc (Ed.), *Principles of Addiction: Comprehensive Addictive Behaviors and Disorders* (pp. 901–909). San Diego: Academic Press.
Cassidy-Bushrow, A. E., Johnson, D. A., Peters, R. M., Burmeister, C., & Joseph, C. L. (2015). Time spent on the internet and adolescent blood pressure. *The Journal of School Nursing, 31*(5), 374–384.
Cha, S.-S., & Seo, B.-K. (2018). Smartphone use and smartphone addiction in middle school students in Korea: Prevalence, social networking service, and game use. *Health Psychology Open, 5*(1), Article 2055102918755046.
Chen, B., Liu, F., Ding, S., Ying, X., Wang, L., & Wen, Y. (2017). Gender differences in factors associated with smartphone addiction: A cross-sectional study among medical college students. *BMC Psychiatry, 17*(1), 341.
Chun, J. (2018). Conceptualizing effective interventions for smartphone addiction among Korean female adolescents. *Children and Youth Services Review, 84*, 35–39.
Demirci, K., Orhan, H., Demirdas, A., Akpinar, A., & Sert, H. (2014). Validity and reliability of the Turkish version of the smartphone addiction scale in a younger population. *Bulletin of Clinical Psychopharmacology, 24*(3), 226–234.
Dong, H., Yang, F., Lu, X., & Hao, W. (2020). Internet addiction and related psychological factors among children and adolescents in China during the Coronavirus disease 2019 (COVID-19) epidemic. *Frontiers in Psychiatry, 11*, Article 00751.
Eichenberg, C., & Schott, M. (2019). Use of web-based health services in individuals with and without symptoms of hypochondria: Survey study. *Journal of Medical Internet Research, 21*(6), Article e10980.
Ejder Apay, S., Gurol, A., Ozdemir, S., & Uslu, S. (2020). The reliability and validity of the cyberchondria severity scale for the Turkish Students. *Cukurova University Faculty of Education Journal, 49*(1), 430–450.
Faltýnková, A., Blinka, L., Ševčíková, A., & Husarova, D. (2020). The associations between family-related factors and excessive internet use in adolescents. *International Journal of Environmental Research and Public Health, 17*(5), 1754.
Farooq, A., Laato, S., & Islam, A. K. M. N. (2020). Impact of online information on self-isolation intention during the COVID-19 pandemic: Cross-sectional study. *Journal of Medical Internet Research, 22*(5), Article e19128.
Fergus, T. A., & Dolan, S. L. (2014). Problematic internet use and internet searches for medical information: The role of health anxiety. *Cyberpsychology, Behavior and Social Networking, 17*(12), 761–765.
Fergus, T. A., & Russell, L. H. (2016). Does cyberchondria overlap with health anxiety and obsessive-compulsive symptoms? An examination of latent structure and scale interrelations. *Journal of Anxiety Disorders, 38*, 88–94.
Fergus, T. A., & Spada, M. M. (2017). Cyberchondria: Examining relations with problematic Internet use and metacognitive beliefs. *Clinical Psychology & Psychotherapy, 24*(6), 1322–1330.
Fischer-Grote, L., Kothgassner, O. D., & Felnhofer, A. (2019). Risk factors for problematic smartphone use in children and adolescents: A review of existing literature. *Neuropsychiatrie, 33*(4), 179–190.
Haug, S., Castro, R. P., Kwon, M., Filler, A., Kowatsch, T., & Schaub, M. P. (2015). Smartphone use and smartphone addiction among young people in Switzerland. *Journal of Behavioral Addictions, 4*(4), 299–307.
Kim, S. G., Park, J., Kim, H. T., Pan, Z., Lee, Y., & McIntyre, R. S. (2019). The relationship between smartphone addiction and symptoms of depression, anxiety, and attention-deficit/hyperactivity in South Korean adolescents. *Annals of General Psychiatry, 18*, 1.
Kwon, M., Lee, J. Y., Won, W. Y., Park, J. W., Min, J. A., Hahn, C., … Kim, D. J. (2013). Development and validation of a smartphone addiction scale (SAS). *PLoS One, 8*(2), Article e56936.
Lee, C., & Lee, S. J. (2017). Prevalence and predictors of smartphone addiction proneness among Korean adolescents. *Children and Youth Services Review, 77*(C), 10–17.
McElroy, E., & Shevlin, M. (2014). The development and initial validation of the cyberchondria severity scale (CSS). *Journal of Anxiety Disorders, 28*(2), 259–265.
McMullan, R. D., Berle, D., Arnáez, S., & Starcevic, V. (2019). The relationships between health anxiety, online health information seeking, and cyberchondria: Systematic review and meta-analysis. *Journal of Affective Disorders, 245*, 270–278.
Murthy, P. (2020). How will Covid-19 influence addictive behaviours and their management? *Journal of Psychosocial Rehabilitation and Mental Health*, 1–3 (Advance online publication).
OECDiLibrary. (2019). Online activities. https://www.oecd-ilibrary.org/sites/205f8f17-en/index.html?itemId=/content/component/205f8f17-en.
Pearson, C., & Hussain, Z. (2016). Smartphone addiction and associated psychological factors. *Addicta: The Turkish Journal on Addictions, 3*, 193–207.
Roser, M., Ritchie, H., & Ortiz-Ospina, E. (2015). Internet. Retrieved from https://ourworldindata.org/internet.
Starcevic, V., & Aboujaoude, E. (2015). Cyberchondria, cyberbullying, cybersuicide, cybersex: "New" psychopathologies for the 21st century? *World Psychiatry, 14*(1), 97–100.
Starcevic, V., Baggio, S., Berle, D., Khazaal, Y., & Viswasam, K. (2019). Cyberchondria and its relationships with related constructs: A network analysis. *The Psychiatric Quarterly, 90*(3), 491–505.
Starcevic, V., & Berle, D. (2013). Cyberchondria: Towards a better understanding of excessive health-related Internet use. *Expert Review of Neurotherapeutics, 13*(2), 205–213.
Toh, S. H., Howie, E. K., Coenen, P., & Straker, L. M. (2019). "From the moment I wake up I will use it…every day, very hour": A qualitative study on the patterns of adolescents' mobile touch screen device use from adolescent and parent perspectives. *BMC Pediatrics, 19*(1), 30.
Vismara, M., Caricasole, V., Starcevic, V., Cinosi, E., Dell'Osso, B., Martinotti, G., & Fineberg, N. A. (2020). Is cyberchondria a new transdiagnostic digital compulsive syndrome? A systematic review of the evidence. *Comprehensive Psychiatry, 99*, 152167.
Wangler, J., & Jansky, M. (2020). General practitioners' challenges and strategies in dealing with Internet-related health anxieties-results of a qualitative study among primary care physicians in Germany. *Wien Med Wochenschr, 170*(13–14), 329–339.

West, S., Kornhaber, R., Visentin, D. C., Thapa, D. K., & Cleary, M. (2020). The role of the health professional supporting consumers who use "Dr Google". *Journal of Advanced Nursing, 76*(9), 2217–2219.

Yildiz Durak, H. (2019). Investigation of nomophobia and smartphone addiction predictors among adolescents in Turkey: Demographic variables and academic performance. *The Social Science Journal, 56*(4), 492–517.

Zou, Y., Xia, N., Zou, Y., Chen, Z., & Wen, Y. (2019). Smartphone addiction may be associated with adolescent hypertension: A cross-sectional study among junior school students in China. *BMC Pediatrics, 19*(1), 310.