

# The Effect of Smartphone Addiction on Attention Level in High School Students

## Lise Öğrencilerinde Akıllı Telefon Bağımlılığının Dikkat Düzeyi Üzerine Etkisi

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### Abstract

**Objective:** Smartphones are electronic devices that have an important place in our lives today and provide many conveniences. However, it can cause many problems such as distraction and social isolation. The aim of this study is to investigate the effect of smartphone use on attention levels in high school students.

**Method:** In the study, the smartphone addiction scale and Mesulam's cancellation tests were applied to 100 students; 68 female, and 32 male. The obtained data were evaluated by statistical methods.

**Results:** The average level of addiction was determined as 30.41 points. As the duration of smartphone use has increased, phone addiction has increased. Smartphone addiction was found the highest in the 90-120 mn. group ( $34.25 \pm 17.85$ ) and the lowest in the 1-30 mn. group ( $14.50 \pm 3.53$ ). In addition, according to the findings of attention tests, distraction occurs as smartphone use time increases, and it has been determined that this distraction is more in males than females.

**Conclusion:** The use of smartphones may have a negative effect on the level of attention of high school students, who are the target audience of the smartphone market and are preparing for an important exam. Limiting smartphone use, especially social media, which increases smartphone addiction, can have a positive effect on the level of attention.

**Keywords:** Smartphones, attention, smartphone addiction, cancellation test

### Öz

**Amaç:** Akıllı telefonlar günümüzde artık hayatımızda önemli yer teşkil eden ve beraberinde birçok kolaylık sağlayan elektronik aletlerdir. Ancak beraberinde dikkat dağınıklığı, sosyal izolasyon gibi birçok probleme neden olabilmektedir. Çalışmadaki amaç, lise öğrencilerinde akıllı telefon kullanımının dikkat düzeyi üzerine etkisini araştırmaktır.

**Yöntem:** Çalışmada 68 kadın, 32 erkek olmak üzere 100 öğrenciye akıllı telefon bağımlılık ölçeği ve Mesulam işaretleme testleri uygulanmıştır. Elde edilen veriler istatistiksel yöntemler ile değerlendirilmiştir.

**Bulgular:** Ortalama bağımlılık düzeyi 30,41 puan olarak belirlenmiştir. Akıllı telefon kullanım süresi arttıkça telefon bağımlılığı da artmıştır. Akıllı telefon bağımlılığı en yüksek 90-120 dakika grubunda ( $34,25 \pm 17,85$ ), en düşük ise 1-30 dakika grubunda ( $14,50 \pm 3,53$ ) bulunmuştur. Ayrıca dikkat testleri bulgularına göre, telefon kullanım süresi arttıkça dikkat dağınıklığı gerçekleştiği ve erkeklerde bu dikkat dağınıklığının kadınlara göre daha fazla olduğu tespit edilmiştir.

**Sonuç:** Akıllı telefon pazarının hedef kitlesi olan ve önemli bir sınava hazırlanan lise öğrencilerinde akıllı telefon kullanımının dikkat düzeyi üzerine negatif etkisi olabilir. Akıllı telefon bağımlılığını arttıran başta sosyal medya kullanımı olmak üzere telefon kullanımının sınırlandırılması, dikkat düzeyi üzerine pozitif etki edebilir.

**Anahtar kelimeler:** Akıllı telefon, dikkat, telefon bağımlılığı, işaretleme testi

## Introduction

Smartphones can perform many functions such as calling and messaging, internet access, video communication, video and audio recording, sharing, calculator, listening to music, and installing any wanted application (1). Smartphones are now “a symbol of identity and style reflection” for young people (2). Smartphones, which have become a part of our daily lives, also cause various problems.

In the literature, it has been determined that usage and addiction of smartphone increase especially among adolescents. Adolescents use their smartphones for different purposes such as social media, entertainment, studying, and the internet (3). 31.3% of the children (6-15 age) in Türkiye who use the Internet regularly stated that they use social media. It was observed that 77.7% of children use social media almost every day, 16.5% at least once a week, and 5.8% less than once a week in the 6-15 age group using social media (4). 81% of people over the age of 14 in Germany and 90% of those in this age group in the UK have a smartphone. This amount is likely to increase in the coming years. For example, the number of smartphone users in the United States is predicted to rise to 285.3 million by 2023 (5). According to “Digital 2022 in Turkey”, the report which was prepared by “We are social and Hootsuite” states that the internet and social media statistics shows 68.9 million active social media users, which constitute 80.8 percent of the population (6). The average daily use of social media in Türkiye is 2.5 hours. Smartphones are used extensively to access social media as their advantages such as easiness at portability, widescreen, and internet access; students spend more time with these devices than it should be and this causes problems at its usage (7). Individuals with smartphone addiction experience deterioration in their social relations, decrease in school success, and in their academic performance.

There is inappropriate or excessive use of smartphones which has become a global phenomenon now. It can negatively affect daily life, disrupt social functionality, and/or cause psychological and/or behavioral problems (8). Although there are advantages in using smartphones, high rate of addiction symptoms have emerged, especially among adolescents. Smartphone addiction is higher in individuals aged 10 to 20 years compared to individuals aged 20 to 30 years (9). Studies in the literature report that smartphone addiction causes mental, physical, and neurological problems. Some of the difficulties smartphones can cause are; headaches, eye-watering, focusing problems, and asociality (10). It supports that smartphones, in which social media use is at the forefront, are likely to lead to negative psychological well-being in early adolescence. A possible link between smartphone addiction with depression has been demonstrated (9).

The American Psychiatric Association defines addiction as “a complex condition, a brain disease, manifested by the use of compulsive substances with harmful consequences”. Regardless of whether addiction is substance or behavior related, there are some elements of addiction; feeling different, a preoccupation with behavior, after acute engagement in addictive behavior, loss of control, and negative consequences. Negative consequences has often been used as a criterion for identifying dependence on the addictive behavior (11). Attention is a behavioral and cognitive process that perceives a particular stimulus. Attention is a phenomenon that ensures the survival, learning, and development of the individual since he was born. Attention plays a vital role in distinguishing between relevant and irrelevant stimuli (12).

Many studies show that the effect of smartphone addiction may cause both physical and mental problems. For this reason, this study is aimed to investigate the effect of smartphone use on the attention level of young people. With the current study about smartphone addiction, attention level and the effect of smartphone addiction on attention in high school students were determined and brought to the literature. The reason why these young people were determined as the target audience; is their preparation for the university exam, which is an important point in their lives and requires high level attention and concentration.

The hypotheses of our study are that smartphone addiction causes attention deficit in high school adolescents; smartphone addiction among adolescents is increasing especially for the use of social media and the internet; as smartphone use time increases, smartphone addiction increases; as the duration of smartphone using increases, attention deficit increases; there is a gender difference in the effect of smartphone use on attention level.

## Method

### Sample

The sample of the study consists of high school students who study in private and public schools in Aksaray/Turkiye and use smartphones. In total, data were gathered in 5 high schools. 3 of these are private high schools and 2 are public high schools. One of the public high schools is "the social science high school" and the other is "the vocational and technical Anatolian high school". Private high schools provide general education including science and social education. Ethical approval was obtained from Aksaray University Human Research Ethics Committee (Protocol no: 2020/13-41). All the students were involved in the test voluntarily. At the beginning of the test, consent was obtained from the "informed consent form". A total of 105 students were interviewed face-to-face. However, a total of 5 students including those who did not use a smartphone (n=1), did not want to fill out the consent form (n=2) and did not answer the scales as explained (n=2) were excluded from the study.

The G\*Power 3.1. program was used to calculate the minimum sample size. While calculating the sample size, attention level was taken as our primary outcome variable. According to the two-sided hypothesis control and Mann-Whiney U test, the sample size calculated for the medium effect size (d=0.55) was found to be 106. For the calculations, the error level was 0.05, the critical t value we obtained for the minimum 80% power was found to be 1.983 and the statistical power was 0.80. The study was completed with 100 students, 68 female and 32 male.

### Measures

After signing the informed consent form, participants answered the scales and demographic questions (age, gender, smartphone use and duration of use) listed below. It took an average of 5-10 minutes to complete all answers. Students were first given the "Smartphone Addiction Scale- Short Version (SAS-SV)" and then the "Cancelled Attention Test (CAT)". The data were collected through face-to-face interviews by visiting schools by the researcher himself. An official determined by the school administration accompanied the researcher at this time. Before the tests, necessary explanations were given to the students by the researcher either verbally or in written form.

#### Smartphone Addiction Scale-Short Version

SAS-SV is a self-assessment tool to measure the "smartphone addiction" of adolescents with a single sub-dimension. The original version of the scale (13) consists of 10 items with a 6-point Likert scale (1: I strongly disagree, 6: I strongly agree). The range of points that can be obtained from this scale is between 10 and 60. The Turkish version of the SAS-SV was made by Şata and Karip (1). When the psychometric properties of the scale were examined, the Cronbach  $\alpha$  coefficient calculated for reliability was found to be 0.91. For proof of validity, correlations between SAS-SV and smartphone addiction scale, smartphone addiction propensity scale and internet addiction scale-short version were examined. In the process of adapting this scale for Turkish adolescents, they were based on the scale adaptation and development directives specified in the "International Testing Commission (ITC) Guidebook: The Process of Adapting a Psychological Measurement Tool" (1).

#### Cancelled Attention Test

The CAT developed by Weintraub and Mesulam (1985), based on target detection and marking, provides the opportunity to identify and evaluate the phenomenon of neglect quantitatively. The test evaluates the motor aspect of visual neglect syndrome; The motor component of visual neglect requires the behaviors of searching, scanning and finding the stimulus (14). It is accepted that CAT basically measures behaviors such as continuous attention measurement, visual scanning, reaction speed, activation, and inhibition of hasty responses (15,16). In the adult sample of the CAT Turkish Form; In the reliability study conducted with the 9-month test-retest method, the correlation coefficients obtained for the time scores calculated from the

four subtests ranged from 0.80 to 0.81. The reliability coefficients calculated for the four subtests in the number of marked targets, the number of missed targets and the total number of errors were in the range of 0.32 to 0.57. Among the test scores, only the correlation coefficient for the number of wrong targets marked was not significant. According to the findings they obtained, it is revealed that the CAT Turkish Form is a reliable measurement tool, especially in terms of time scores (14).

The CAT is a test with 60 target letters/signs on each page. It was required to have the letter "A" in the letter tests and the symbol " " in the symbol tests. The test started with the start command. The students were asked to say "done" as soon as they thought they had finished the test. After the marking is finished; The completion times of the tests, the number of correct, the number of mistakes, and the number of missed target numbers in the tests were noted.

## Statistical Analysis

SPSS 26.0 (SPSS Inc., Chicago, IL, USA) package program was used to evaluate the data obtained for this study. Shapiro Wilk normality test and Levene's homogeneity test were used to controlling the parametric test assumptions. Student's t test (for letter tests) or Mann Whitney U (for sign tests) test was used for the comparison of continuous variables between two independent groups. For summarizing all analysis results, Mean±St. Deviation and Median - Width of Change, frequency distributions and percentages were used for categorical variables. For the analysis results,  $p < 0.05$  was taken as statistical significance level.

## Results

A total of 100 students, 68 female and 32 male, studying at different high schools in Aksaray/Turkiye province were involved in the research. Demographic data of the students participating in the study are given in Table 1.

**Table 1. Demographic data for the participants**

Variable		n	%
Gender	Female	68	68.0%
	Male	32	32.0%
Age	16-17	33	33.0%
	18-19	67	67.0%

According to the distribution of the usage purpose of the smartphone; the most common use is for the social media. It has been determined that almost all of the students ( $n=98$ ) use social media for about 75 minutes (mn.). The distribution of smartphone using time by purpose is shown in Table 2.

**Table 2. Distribution of smartphone usage time by the purpose of use**

Smartphone usage time (mn.)	n	Social Media (mn.)	Game (mn.)	Others (mn.)*
1-30	2	2.50	0.00	20.00
31-60	4	47.50	0.00	12.50
61-90	25	45.40	5.40	33.80
91-120	28	51.25	19.82	40.71
>120	41	115.41	25.61	73.10
Mean	100	74.97	17.40	50.72

mn.: minute; \*: others: content browsing on the internet, listening to music, news, etc.

The smartphone addiction scale consists of 10 items and has a 6-Likert scale. Accordingly, the range of values to be obtained from this scale is between 10 and 60. The higher the score on the scale, the higher the addiction to smartphones is considered (1). The average level of addiction was determined as 30,41

points. Smartphone addiction was found the highest in the 90-120 mn. group and the lowest in the 1-30 mn. group. Almost half of the participants (n=41) use the smartphone for more than 120 mn. (Table 3). The duration of smartphone use in male participants was 31 mn. and above.

**Table 3. The findings of smartphone addiction level**

Smartphone usage time (mn.)	n	Mean±Std.D	Median-Range
1-30	2	14.50±3.53	14.50-5.00
31-60	4	24.25±11.79	23.00-25.00
61-90	25	28.96±7.03	27.00-27.00
91-120	28	34.25±17.85	31.50-81.00
>120	41	30.05±10.80	28.00-45.00

mn.: minute, Std.D: standard deviation

Participants completed the regular sign test (RST), irregular sign test (IST), regular letter test (RLT), and irregular letter test (ILT) in the printed version of the CAT with an average of 68.77 seconds (sc), 62.89 sc, 72.2 sc, and 83.23 sc, respectively. According to the findings from the RST; as the duration of smartphone use increased in both females and males, there was an increase in RST completion times. In male participants, as the phone usage time increases, there is an increase in the number of both false and missed targets in the RST test. However, as the duration of phone use among female participants increases, there is confusion in the number of both false and missed targets in the RST test (Table 4).

**Table 4. Findings of the Regular Sign Test**

Smartphone usage time (mn.)		Female		Male		p
		Mean±Std.D	Median-Range	Mean±Std.D	Median-Range	
1-30	True	48.00±1.41	48.00-2.00	0.00±0.00	0.00-0.00	NA
	False	0.00±0.00	0.00-0.00	0.00±0.00	0.00-0.00	NA
	Missing	12.00±1.41	12.00-2.00	0.00±0.00	0.00-0.00	NA
	Time	50.5±2.12	50.5-3.00	0.00±0.00	0.00-0.00	NA
31-60	True	57.50±2.12	57,5-3	60.00±0.00	60.00-0.00	0.238
	False	1.50±0.71	1.50-1.00	0.00±0.00	0.00-0.00	0.344
	Missing	2.50±2.12	2.50-3.00	0.00±0.00	0.00-0.00	0.238
	Time	55.50±7.78	55.50-11.00	68.00±9.90	68.00-14.00	0.295
61-90	True	57.17±2.53	57.50-7,00	59.14±0.69	59.00-2.00	0.056
	False	0.61±1.04	0.00-3.00	0.43±0.53	0.00-1.00	0.064
	Missing	2.83±2.53	2.50-7.00	0.86±0.69	1.00-2.00	0.056
	Time	61.72±11.38	61.00-46.00	76.29±12.79	74.00-31.00	0.011*
91-120	True	58.31±1.75	59.00-5.00	57.67±3.35	59.00-10.00	0.541
	False	0.00±0.00	0.00-0.00	0.80±1.42	0.00-5.00	0.054
	Missing	1.69±1.75	1.00-5.00	2.33±3.35	1.00-10.00	0.541
	Time	72.08±15.24	70.00-57.00	80.07±23.11	79.00-77.00	0.298
>121	True	57.88±2.22	59.00-8.0	59.25±0.89	59.50-2.00	0.010*
	False	0.67±1.49	0.00-5.00	0.38±0.74	0.00-2.00	0.597
	Missing	2.12±2.22	1.00-8.00	0.75±0.89	0.50-2.00	0.097
	Time	64.36±15.48	61.00-72.00	77.75±11.65	78.50-28.00	0.028*

mn.: minute, Std.D.: standard deviation, \*: p<0.05, Mann-Whitney U.

According to the findings from the IST; as the smartphone usage time increased, variability (increase-decrease) was observed in the test completion time. While the number of false markings in males was only

found in the >121 mn. and above group, it was absent in the other groups. In females, while there is no false marking in the 1-30 mn. group, it is present in other groups. The number of missed targets that females overlook is higher than that of males. Especially in the group of >121 mn., this difference is statistically significant ( $p=0,011$ ) (Table 5).

**Table 5. Findings of the Irregular Sign Test**

Smartphone usage time (mn.)		Female		Male		p
		Mean±Std.D	Median-Range	Mean±Std.D	Median-Range	
1-30	True	49.00±1.41	49.00-2.00	0.00±0.00	0.00-0.00	NA
	False	0.00±0.00	0.00-0.00	0.00±0.00	0.00-0.00	NA
	Missing	11.00±1.41	11.00-2.00	0.00±0.00	0.00-0.00	NA
	Time	47.00±1.41	47.00-2.00	0.00±0.00	0.00-0.00	NA
31-60	True	56.50±0.71	56.50-1.00	57.00±2.83	57.00-4.00	0.831
	False	0.50±0.71	0.50-1.00	0.00±0.00	0.00-0.00	0.433
	Missing	3.50±0.71	3.50-1.00	3.00±2.83	3.00-4.00	0.831
	Time	58.50±16.26	58.50-23.00	64.50±3.54	64.50-5.00	0.661
61-90	True	57.83±2.31	58.50-8.00	58.57±1.90	59.00-5.00	0.461
	False	0.28±0.67	0.00-2.00	0.00±0.00	0.00-0.00	0.290
	Missing	2.17±2.31	150-8.00	1.43±1.90	1.00-5.00	0.461
	Time	62.67±12.25	59.00-39.00	70.00±11.50	68.00-37.00	0.185
91-120	True	57.38±3.18	58.00-11.00	58.27±2.58	60.00-9.00	0.425
	False	0.15±0.38	0.00-1.00	0.00±0.00	0.00-0.00	0.124
	Missing	2.62±3.18	2.00-11.00	1.73±2.58	0.00-9.00	0.425
	Time	56.08±8.36	52.00-30.00	62.53±17.71	63.00-73.00	0.240
>121	True	58.06±2.00	59.00-6.00	59.38±0.92	60.00-2.00	0.079
	False	0.39±0.70	0.00-3.00	0.13±0.35	0.00-1.00	0.304
	Missing	1.94±2.00	1.00-6.00	0.63±0.92	0.00-2.00	0.011*
	Time	65.61±16.01	62.00-79.00	62.38±11.56	62.00-31.00	0.524

mn.: minute, Std.D.: standard deviation, \*:  $p<0.05$ , Mann-Whitney U.

According to the findings from the RLT; as the duration of smartphone use increased in both females and males, RLT completion time increased (except for the 61-90 mn. group in females and 91-120 mn. group in males). In the group 61-90 mn., the test completion time of males was significantly higher than that of females statistically ( $p=0,031$ ). The number of truly marked targets decreased as phone using time increased for both females and males. The highest number of correct marked targets in both females and males was determined in the 31-60 mn. group. There is no statistically significant difference between females and males when comparing the number of correctly marked and missed targets (Table 6).

According to the findings from the ILT; as the duration of smartphone use increased in both females and males, there was an increase in ILT completion times, albeit non-linearly. In the 61-90 mn. group, the test completion time of males was significantly higher than that of females statistically ( $p=0,046$ ). The highest number of truly marked targets in both females and males was determined in the 31-60 mn group. No correlation was found between the duration of smartphone use and the number of missed in both females and males. However, in general, a higher number of missed targets were detected in the number of usages of 61 mn. and more. Similarly, no correlation was found between the number of false marked targets and the smartphone using time (Table 7).



**Table 6. Findings of the Regular Letter Test**

Smartphone usage time (mn.)		Female		Male		p
		Mean±Std.D	Median-Range	Mean±Std.D	Median-Range	
1-30	True	53.50±9.19	53.50-13.00	0.00±0.00	0.00-0.00	NA
	False	0.50±0.71	0.50-1.00	0.00±0.00	0.00-0.00	NA
	Missing	6.50±9.19	6.50-13.00	0.00±0.00	0.00-0.00	NA
	Time	63.50±13.44	63.5-19.00	0.00±0.00	0.00-0.00	NA
31-60	True	58.50±2.12	58.50-3.00	56.50±2.12	56.50-3.00	0.445
	False	2.00±2.83	2.00-4.00	0.50±0.71	0.50-1.00	0.543
	Missing	1.50±2.12	1.50-3.00	1.00±1.41	1.00-2.00	0.808
	Time	65.00±4.24	65.00-6.00	73.00±7.07	73.00-10.00	0.304
61-90	True	53.89±5.53	53.50-16.00	52.14±3.13	53.00-10.00	0.442
	False	0.67±1.24	0.00-5.00	0.29±0.49	0.00-1.00	0.442
	Missing	5.00±5.41	2.50-16.00	7.86±3.13	7.00-10.00	0.205
	Time	71.44±6.28	71.00-22.00	80.71±14.29	83.00-34.00	0.031*
91-120	True	56.38±4.17	58.00-12.00	55.13±5.89	56.00-22.00	0.529
	False	0.15±0.55	0.00-2.00	1.07±1.87	0.00-7.00	0.102
	Missing	3.62±4.17	2.00-12.00	4.87±5.89	4.00-22.00	0.529
	Time	70.38±11.49	67.00-33.00	74.53±11.13	76.00-32.00	0.341
>121	True	55.39±3.61	56.00-13.00	54.00±2.73	53.50-7.00	0.313
	False	0.30±1.26	0.00-7.00	0.25±0.46	0.00-1.00	0.908
	Missing	4.61±3.61	4.00-13.00	6.00±2.73	6.50-7.00	0.313
	Time	71.55±14.07	69.00-56.00	71.50±13.58	74.50-41.00	0.993

mn.: minute, Std.D.: standard deviation, \*: p&lt;0.05, Student's t test.

**Table 7. Findings of the Irregular Letter Test**

Smartphone usage time (mn.)		Female		Male		p
		Mean±Std.D	Median-Range	Mean±Std.D	Median-Range	
1-30	True	52.00±4.24	52.00-6.00	0.00±0.00	0.00-0.00	NA
	False	0.50±0.71	0.50-10	0.00±0.00	0.00-0.00	NA
	Missing	8.00±4.24	8.00-6.00	0.00±0.00	0.00-0.00	NA
	Time	59.50±0.71	59.50-1.00	0.00±0.00	0.00-0.00	NA
31-60	True	57.50±2.12	57.50-3.00	57.00±1.41	57.00-2.00	0.808
	False	0.00±0.00	0.00-0.00	0.00±0.00	0.00-0.00	NA
	Missing	2.50±2.12	2.50-3.00	3.00±1.41	3.00-2.00	0.808
	Time	76.50±20.51	76.50-29.00	77.50±3.54	77.5-5.00	0.952
61-90	True	51.28±7.78	54.00-26.00	49.86±8.36	54.00-23.00	0.691
	False	0.89±1.64	0.00-5.00	0.29±0.76	0.00-2.00	0.364
	Missing	8.72±7.78	6.00-26.00	10.14±8.36	6.00-23.00	0.691
	Time	80.67±16.31	75.00-50.00	96.29±17.40	90.00-44.00	0.046*
91-120	True	52.23±6.33	53.00-21.00	54.87±6.35	57.00-25.00	0.282
	False	0.62±0.77	0.00-2.00	1.20±2.31	0.00-9.00	0.391
	Missing	7.77±6.33	7.00-21.00	5.13±6.35	03.00-25.00	0.282
	Time	78.69±13.03	74.00-50.00	85.47±14.99	82.00-48.00	0.217
>121	True	53.64±5.45	55.00-19.00	52.75±4.56	54.00-14.00	0.674
	False	0.52±0.97	0.0-4.00	0.00±0.00	0.00-0.00	0.146
	Missing	6.36±5.45	5.00-19.00	7.25±4.56	06.00-14.00	0.674
	Time	84.15±16.05	80.00-58.00	86.00±21.55	83.50-67.00	0.786

mn.: minute, Std.D.: standard deviation, \*: p&lt;0.05, Student's t test.

## Discussion

Addiction is anything that can cause excitement for a person. Smartphones also cause addiction to the extent that they arouse excitement for individuals. According to the behaviorist approach, if satisfaction is achieved as a result of a behavior, individuals may choose to get satisfaction by doing this behavior in the future. Therefore, smartphones are also addictive elements having this feature (2). Addiction to smartphones or inappropriate use of smartphone devices have been increasingly featured in research by recent years, as smartphone technology is now more comfortable in its accessibility aspect (17). Evidence shows that when phone users receive any notification, they turn their attention to the smartphone, even if the device is set to vibrate or silent. Even if received notifications are not responded as significantly distracting (5). With the smartphone addiction scale we used in this study, the relationship between smartphone addiction and affective factors such as anxiety, motivation, and attention deficit can be examined. By using the related scale, the addiction of adolescents to smartphones can be examined longitudinally (1).

Among the target age groups of communication technologies, one of the most important ones are school and university students (18). The students in our study group are students who have been studying and preparing for an important exam that may affect their future and that requires high level attention and concentration. It is important to determine to what extent phone addiction will affect the attention and concentration levels of these students. For these reasons, high school students, who are the most important target groups of the smartphone market and who have been studying and preparing for an important exam, were determined as the research group in our study.

The use of smartphones has advantages as well as disadvantages. The disadvantages come to the fore in the way the smartphone is used, especially by young people (18). As of 2015, it has been determined that 90% of young adults regularly use social media sites (19). Studies have found a significant relationship between excessive use of social media and attention problems (20). Salehan and Negahban (2013) stated in their study that social media applications significantly increased phone addiction (21). But there is a dilemma here; since it is easy to access smartphones, it makes it possible for individuals to stay active on social media (22). The students who were involved in our study spent more time on social media with their smartphones. The rate of social media usage was determined as 98%, similar to this high rate in the literature. In our study, the use of social media was determined as the most important factor in students' spending time with their smartphones. In addition, the level of phone addiction has increased in those who spend more time with their smartphones.

Based on target detection and marking, the CAT developed by Weintraub and Mesulam (1985) provides the opportunity to identify and evaluate the phenomenon of neglect quantitatively (14). Mesulam's CAT evaluates the motor aspect of the components of attention which it separates into sensory, motor, and motivation. Low performance on the test reflects unilateral neglect, lack of response modification, confusion in the spatial distribution of attention, and slowed overall response. In studies of the CAT test applied in Turkish society, it has been revealed that the test measures behaviors such as visual scanning, reaction speed, and capability to resist the destructive effects of hasty reactions (23).

To assess the subject's performance, the number of true or false targets detected is evaluated along with the time to complete the test (24). In both females and males participating in our study, there was an overall increase in test completion time as phone using time increased. Especially, the average time to complete all tests for males was found to be above the average of all participants. The highest time to complete the tests (except the RST) in females was found in the >121 mn. group with the highest phone using time. According to this result, it can be stated that there is a lack of attention in terms to complete the tests, especially when using the smartphone for more than 2 hours.

When all attention tests in males were evaluated together, 3 out of 4 tests showed that while there was no number of false markings up to 60 mn., the number of false was observed when using smartphone for a longer period of time. On the other hand, there was no correlation between the number of false markings



and the duration of smartphone use in the females. This finding shows that smartphone use may impair attention more in males than in females.

Taken together, it has been determined that males have more smartphone addiction than females, and accordingly, their attention is more impaired with more usage. In addition, it is predicted that as the duration of smartphone use in females increases, their attention may be distracted due to the increase in test completion time, which is an indicator of distraction. In particular, limiting the use of social media, which may cause both females and males to spend more time with their smartphones and become more addicted to the smartphone, may have a more positive effect in terms of attention.

The limitations of this study; First, 106 students were planned for the study, it could be completed with 100 participants due to the fact that face-to-face interviews coincided with the Covid-19 pandemic period and there were not enough students in schools due to social isolation. Second, this study was conducted with high school students in a single province (Aksaray/Turkiye) and the generalizability of the findings was limited. Accordingly, future studies should include different provinces. Third, this study only investigated the effect of smartphone addiction on attention level and did not evaluate addiction to other devices such as computers or televisions and the effects of these devices on attention level. Therefore, future research is needed to examine the effect of overall screen time on attention by including these devices.

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**Yazar Katkıları:** Tüm yazarlar ICMJE'in bir yazarda bulunmasını önerdiği tüm ölçütleri karşılamışlardır

**Etik Onay:** Bu çalışma için ilgili Etik Kuruldan etik onay alınmıştır.

**Hakem Değerlendirmesi:** Dış bağımsız.

**Çıkar Çatışması:** Yazarlar çıkar çatışması olmadığını beyan etmişlerdir.

**Finansal Destek:** Yazarlar finansal destek beyan etmemişlerdir.

**Author Contributions:** All authors met criteria recommended by ICMJE for being an author

**Ethical Approval:** Ethical approval was obtained for this study from relevant Ethics Committee.

**Peer-review:** Externally peer-reviewed.

**Conflict of Interest:** The authors have declared that there is no conflict of interest.

**Financial Disclosure:** Authors declared no financial support