Fear of COVID-19 and Smartphone Addiction Among Turkish Adolescents: Mitigating Role of Resilience

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Abstract
The objective of the present study is to examine the mediating effect of resilience on the association between fear of COVID-19 and smartphone addiction in the era of COVID-19. Participants included 508 Turkish adolescents (53.9% girls; M = 17.78 ± 1.11 years) attending high schools or supplementary schools and completed measures of fear of COVID-19, smartphone addiction, and resilience. Girls reported higher scores on fear of COVID-19 and smartphone addiction and lower scores on resilience than their peers. Findings indicated that fear of COVID-19 significantly predicted resilience and smartphone addiction. Resilience also significantly predicted smartphone addiction. Mediation analysis showed that resilience partially mediated the relationship of fear of COVID-19 with smartphone addiction. Overall, current results suggest that high levels of fear of COVID-19 fuel the development of smartphone symptoms through reduced resilience. The fear of the COVID-19-smartphone addiction association appeared to be partially explained through resilience.

Keywords
fear of COVID-19, smartphone addiction, resilience, coronavirus, Turkish adolescents

Introduction
On December 31, 2019, World Health Organization (2020) announced novel viral pneumonia originating in China. According to statistics published by the Center for Systems Science and Engineering at Johns Hopkins (2020), as of July 19, 2022, there were 564,723,690 confirmed cases and 6,373,584 confirmed deaths from this coronavirus disease, known as COVID-19, across the globe. In Turkey, there were 15,297,539 confirmed cases of COVID-19 and 99,088 deaths. COVID-19 has quickly affected almost all aspects of daily life such as working or studying from home, shopping online, and practicing social distancing from other people who are not from one’s household. Undoubtedly, such changes have profound impacts on the psychological health of young adults.

Preventive measures against COVID-19 severely affected youths’ independence and autonomy (Nagata, 2020). Young adults typically tend to spend less time with their parents and more time with friends and romantic partners. By implementing measures like social distancing, young adults may be separated from their friends and romantic partners. After a certain period of living independently in students’ accommodations, students have returned home, and as such feel that they have reverted. The pandemic has adversely affected students’ extracurricular activities such as sports, and arts (Nagata, 2020).

The COVID-19 pandemic poses a high risk to public health. The implemented measures may have adverse effects on mental health such as excessive fear and anxiety (Zhai & Du, 2020). In essence, fear is a functional human defense mechanism that is essential for survival and involves some biological processes of preparation for a response to potentially threatening stimuli or events. However, excessive feelings of fear can be detrimental and have the potential to increase the risk of the development of different psychiatric disorders, including stress and anxiety disorders (Shin & Liberzon, 2010). Very recently, fear of COVID-19 has attracted much attention as a potential factor affecting mental health and behavioral outcomes within the context of pandemic (Yıldırım et al., 2021). Evidence from the current pandemic shows that fear is likely to heighten the levels of anxiety and stress in public and deepens the symptoms of individuals with preexisting mental health disorders (Çiçek et al., 2020; Shigemura et al., 2020; Tanhan et al., 2020). Research also indicated that individuals suffering from pandemic-specific fear tend to experience heightened levels of anxiety, depression, and stress (Ahorsu et al., 2020; Yıldırım et al., 2020, 2021).
Smartphone addiction is often defined as excessive use of one’s smartphone with interference in school, work, or socially (Billieux et al., 2015). The estimated rates of smartphone addiction vary between anywhere just above 0% and 35%, with one study documenting 48% among college universities (Aljomaa et al., 2016). Although the long-term impacts of COVID-19 on youth health remain unknown (Evans et al., 2020), the changes in the ways of how we communicate will perhaps continue long even after the pandemic has resolved. Since the beginning of the pandemic, people have spent a lot of time using digital devices (e.g., smartphones, computers, and tablets) as a way to communicate with one another and stay connected during the current health crisis. Even though using smartphones allows adolescents to access mental health information and support at a low cost anywhere and anytime (Grist et al., 2018), excessive use of smartphone addiction may lead to anxiety and depression among young adults (Matar Boumosleh & Jaalouk, 2017). Young adults are more vulnerable to the adverse effects of smartphones than their senior counterparts.

Studies have shown that smartphone addiction is related to difficulty in performing daily activities, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, and tolerance (Kwon et al., 2013), preoccupation, inability to control craving, disregard of harmful consequences, productivity loss, and feeling anxious and lost (Bian & Leung, 2015). A cross-sectional study conducted in a sample of 319 university students (mean age = 20.5 years) from Turkey showed that smartphone addiction was positively associated with depression, anxiety, and sleep quality. Compared to males, females reported higher levels of smartphone addiction. In comparison to the low smartphone use group, high smartphone use group suffered from depression, anxiety, and daytime dysfunction (Demiciri et al., 2015). Fear of missing out was found to significantly predict smartphone addiction as well as mediate the impact of sensation seeking and smartphone addiction (Wang et al., 2019). Smartphone addiction was also negatively related to academic performance and satisfaction with life and positively related to stress (Samaha & Hawi, 2016). Taken together, these results suggest that smartphone addiction is not only associated with mental health problems including depression and anxiety but also is related to physical health symptoms such as poor sleep quality.

The experience of COVID-19 fear and other possible mental health problems induced by the COVID-19 pandemic necessitates the development and implementation of effective strategies that can contribute to the functioning of individuals in the face of adversity like the current health crisis. To date, studies have shown that psychological resources such as resilience can significantly mitigate the levels of fear and psychological distress (Yıldırım, 2019). The concept of resilience is viewed as a process, a trait, an outcome, or a broad conceptual domain that comprises all these ideas (Luthar, 2006; Masten, 2018; Masten & Cicchetti, 2016). Resilience is defined as the ability to bounce back or recover from stress in the face of adversity (Smith et al., 2008). Numerous empirical studies have shown that a high level of resilience is associated with low levels of negative indicators of mental health (e.g., anxiety, depression, and negative emotions), and associated with high levels of positive indicators of mental health (e.g., satisfaction with life, subjective well-being, and positive emotions) (Hu et al., 2015). In a cross-sectional study with adolescents aged 13–17 years, resilience was found to mediate the associations between stress, and symptoms of depression and anxiety (Anyan & Hjemdal, 2016). Furthermore, empirical research has shown that higher resilience significantly negatively predicted smartphone addiction (Jun & Jo, 2016). According to Jun and Jo (2016), intervention programs focusing on building resilience can reduce smartphone addiction in students. Resilience can buffer the adverse impacts of COVID-19-related stressors on mental health outcomes (Yıldırım & Arslan, 2020).

The purpose of this study was to examine the associations between fear of COVID-19, smartphone addiction, and resilience in Turkish adolescents. Specifically, this study hypothesized that (1) fear of COVID-19 would be positively associated with smartphone addiction and negatively associated with resilience; (2) resilience would be negatively associated with smartphone addiction, and (3) resilience would mediate the links between fear of COVID-19 and smartphone addiction. A hypothetical model of the association among the study variables is presented in Figure 2.

Method

Participants

Participants were 508 students enrolled in supplementary schools which provide additional educational support for students who also attend public schools or have already completed high school in Turkey. They were comprised of 53.9% girls and 46.1% boys and ranged in age between 16 and 21 years ($M = 17.78$, $SD = 1.11$). All participants were volunteers and were not paid for their involvement in the study.

Measures

Fear of COVID-19 scale (FCV-19S; Ahorsu et al., 2020): The FCV-19S is a 7-item self-report questionnaire developed to assess fear of COVID-19. Items are rated on a 5-item Likert point response ranging from 1 (strongly disagree) to 5 (strongly agree). A sample item is “I am most afraid of coronavirus-19.”

Scores can vary from 7 to 35, with higher scores indicating greater fear of COVID-19. The psychometric properties of the Turkish FCV-19S were found to be good (Satici et al., 2020). Cronbach’s alpha in the current sample was 0.87.

Smartphone Addiction Scale (SAS; Kwon et al., 2013): The SAS is a 10-item self-report measure used to assess smartphone addiction. The 10 items are rated on a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). A sample item is “Missing planned work due to smartphone use.” Scores can range between 6 and 60, with higher scores indicating a higher tendency to smartphone addiction. In Turkish, the SAS has demonstrated good psychometric
properties (Noyan et al., 2015). Cronbach’s alpha in the current sample was 0.86.

**Brief Resilience Scale** (BRS; Smith et al., 2008): The BRS is a 6-item self-report scale developed to assess the ability to “bounce back” from adversity. Each item is rated on a 5-point Likert response ranging from 1 (strongly disagree) to 5 (strongly agree). A sample item is “I tend to bounce back quickly after hard times.” A scale score, which ranges between 6 and 30, can be obtained by summing all items after reversing negatively worded items. Higher scores demonstrate a higher ability of resilience to bounce back from stress. The BRS showed good evidence of reliability and validity in Turkish (Doğan, 2015; Yıldırım, 2019). Cronbach’s alpha in the current sample was 0.79.

**Procedure**

This cross-sectional study was carried out online over a span of 4 weeks from September 7 to October 4, 2020. Google documents were utilized as a platform to design the online survey. A unique URL was created and distributed to participants. Prior to taking part in the survey, participants were asked to provide their consent. They had to indicate their willingness to participate by answering a yes–no question. After confirmation of this critical question, the participant was directed to complete the self-report online survey. The survey URL was disseminated to students with help of their teachers who were informed about the purpose of the study and asked to obtain children’s assent and parental consent from students under the age of 18 years. All participants were assured that their responses would be confidential and anonymous and used purely for research purposes. The presentation order of individual questionnaires was the same across the participants. The study protocol was approved by the Batman University Research Ethics Board (Ethics code: 2020/3-21).

**Data Analysis**

All analyses were conducted in IBM SPSS 24 using Process macro v.3.4 and AMOS 24. Descriptive data were first presented for the study variables. Pearson’s correlation was run between fear of COVID-19, smartphone addiction, and resilience. An independent sample t-test was carried out to compare the gender on levels of the study variables. For the Turkish FCV-19S, the psychometric properties to establish the utility of the scale among young adults were examined. Multiple indices were utilized to assess model fit including comparative fit index (CFI) and Tucker–Lewis index (TLI) > 0.9; and root-mean-square error of approximation (RMSEA) and standardized root-mean-square residual (SRMR) < 0.08 (Hu & Bentler, 1998). According to the recommendations of Darlington and Hayes (2017), regression diagnostics were performed. Parallel mediational analysis with Process Model 4 (Hayes, 2018) was performed to test the mediational role of resilience in the link between fear of COVID-19 and smartphone addiction. The indirect effect was computed by calculating bias-corrected 95% confidence intervals (CIs) with 10,000 random bootstrap samples. Decision regarding statistical significance of the indirect effect was reached when zero was not included in the lower and upper bounds of the CIs (Hayes, 2018).

**Results**

**Confirmatory factor analysis**

First, we tested whether the factor structure of FCV-19S can be verified among adolescents. The initial model indicated poor data model fit statistics ($\chi^2 = 209.36, df = 14, p < .001$, CFI = 0.87, TLI = 0.81, SRMR = 0.07, RMSEA = 0.17). Based on modification indices, we drew covariances between items 3–6 and 6–7. Following this procedure, the model was significantly improved by providing satisfactory data model fit statistics ($\chi^2 = 73.65, df = 12, p < .001$, CFI = 0.96, TLI = .93, SRMR = .04, RMSEA = .10). Standardized path estimates which ranged between .55 and .77 are shown in Figure 1.

**Preliminary analyses**

Findings from the preliminary analyses demonstrated that skewness values ranged from −.15 to.59 and kurtosis scores were between −0.17 and −.29 (Table 1), suggesting that all variables were normally distributed (Field, 2009). Pearson correlation analysis indicated that fear of COVID-19 had a positive correlation smartphone addiction ($r = .26, p < .001$). However, it was negatively associated with resilience ($r = -.30, p < .001$). Furthermore, smartphone was negatively related to resilience ($r = -.28, p < .001$).

Independent sample t-test revealed that girls reported higher levels of fear of COVID-19 ($M = 16.83$ vs. 14.94) and smartphone addiction ($M = 28.83$ vs. 26.91) and low level of resilience ($M = 17.27$ vs. 19.32) when compared with boys (Table 2).

**Mediation analysis**

Following the preliminary analyses, a mediation analysis was performed to test the mediating effect of resilience on the relationship of fear of COVID-19 with smartphone addiction (Table 3). Standardized regression estimates showed that fear of COVID-19 was a negative predictor of resilience ($\beta = -.30, p < .01)$ and explained 9% of variance in resilience. Resilience was a negative predictor of smartphone addiction ($\beta = -.22, p < .01$), while fear of COVID-19 was a positive predictor of smartphone addiction ($\beta = .20, p < .01$; see Figure 2). Indirect effect of fear of COVID-19 on smartphone addiction through resilience was significant, [effect = .10, 95% CI (.05–.16)] (Table 3). Resilience had a partial mediating role in the relation between fear of COVID-19 and smartphone addiction (Table 4).

**Discussion**

The purpose of this study was to examine whether resilience mediated the association between fear of COVID-19 and smartphone addiction among adolescents preparing for a high-stakes
The findings supported our predictions and were in accordance with theoretical expectations. Fear of COVID-19 was positively associated with smartphone addiction and negatively related to resilience. Resilience was negatively associated with smartphone addiction. A significant indirect relationship was found between fear of COVID-19 and smartphone addiction through resilience.

The confirmatory factor analysis showed that the single factor structure of the FCV-19S with a high internal consistency can be replicated in Turkish adolescents. This suggests that the Turkish version of the FCV-19S is a reliable and valid instrument to assess the fear of COVID-19 among Turkish adolescents. Since evidence is limited regarding the factor structure of the FCV-19S in adolescents, the current finding is not consistent with the results of Masuyama et al. (2020) who provided a bi-factor model including emotional response factor and physiological response factors, with high internal consistency reliability and moderately good construct validity among Japanese adolescents. However, the results are consistent with those of previous studies conducted on adults (Alyami et al.,

| Variable            | Min | Max | Mean | SD  | Skew | Kurt. | α   |
|---------------------|-----|-----|------|-----|------|-------|-----|
| 1. Fear of COVID-19 | 7   | 35  | 15.96| 6.60| 0.59 | -0.29 | .87 |
| 2. Smartphone addiction | 10  | 59  | 27.94| 10.26| 0.48 | -0.17 | .86 |
| 3. Resilience      | 6   | 30  | 18.21| 5.21| -0.15| -0.18 | .79 |

Note. **p < .01.
resilience was negatively associated with anxiety and stress. They may be better to deal with the symptoms of smartphone addiction. This result suggests that resilience was significantly and negatively related to resilience. This suggests that higher fear of COVID-19 is associated with higher smartphone addiction and lower resilience among adolescents. Finally, resilience was significantly and negatively correlated with smartphone addiction, meaning that less resilient adolescents tend to be more vulnerable to smartphone addiction. Even though significant relationships between fear, resilience, anxiety, and smartphone addiction have been documented (Matar Boumosleh & Jaalouk, 2017; Putwain & Best, 2011; Yildirim, 2019), these findings contributed to the extant literature in terms of fear of COVID-19 among adolescents.

In this study, compared to boys, girls tended to report a greater fear of COVID-19, and smartphone addiction while they reported lower resilience. These findings are consistent with previous studies. For example, prior evidence from the context of the COVID-19 pandemic demonstrated that females reported greater experience of fear, perceived risk, and vulnerability to COVID-19 compared to their counterparts (Yildirim et al., 2021). Moreover, females reported increased smartphone addiction scores (Choi et al., 2015), and decreased resilience scores (Leuner et al., 2004).

Mediation analysis first demonstrated that fear of COVID-19 had a significant positive direct effect on smartphone addiction and a significant negative direct effect on resilience. Adolescents with more fear of COVID-19 revealed a greater level of smartphone addiction and a lesser level of resilience. This is in line with earlier research, in which a higher level of fear was linked to the development of psychiatric disorders (Shigemura et al., 2020; Shin & Liberzon, 2010; Ahorsu et al., 2020). Higher fear of COVID-19 was also linked to decreased resilience (Yildirim et al., 2021). Second, the results showed that resilience had a significant negative direct effect on smartphone addiction. This result suggests that resilient adolescents may tend to experience less smartphone addiction. They may be better to deal with the symptoms of smartphone addiction. Previous studies have demonstrated that resilience was negatively associated with anxiety and stress (Trigueros et al., 2020). Finally, our last hypothesis stated that resilience would mediate the links between fear of COVID-19 and smartphone addiction. The result of this study supported our hypothesis. That is, adolescents with a high level of fear of COVID-19 are less resilient, which in turn leads them to experience greater symptoms of smartphone addiction. These findings are in accordance with previous studies. In the context of the current pandemic, resilience mediated the relationships between coronavirus fear and mental health outcomes such as depression, anxiety, and stress (Yildirim et al., 2021; Yildirim et al., 2020). Resilience may help students to cope with their symptoms of smartphone addiction by mitigating the effect of fear of COVID-19. Resilience may be necessary to deal with the fear that derives from this pandemic. Support for this explanation can be found in previous studies which showed that resilience mediated the association between stressors and mental health outcomes in adolescents (Anyán & Hjemdal, 2016). Academic resilience fully mediated the relationship between family conversation orientation and anxiety in high school students (Akbari et al., 2014). Although evidence is limited, studies have shown that individuals who are dependent on their smartphones have difficulties in performing their daily activities and withdrawal (Kwon et al., 2013), paying little attention to harmful consequences, productivity loss, and feeling anxious (Bian & Leung, 2015), mental health disorders (Demirci et al., 2015), and experience greater fear (Wang et al., 2019). Resilience seems to be important in mitigating the negative impact of fear of COVID-19 on smartphone addiction among adolescents.

The present study suffers from several limitations that offer directions for future studies. First, the use of an online sample did not allow the investigation of the study variables in the context of clinical diagnoses. Therefore, the current study exclusively relied on the use of self-report questionnaires to assess the study variables, and as such assessment of diagnostic threshold based on such self-report questionnaires may lack the specificity and sensitivity in comparison with diagnoses derived from “gold standard” clinical interviews. Future research should consider utilizing a standard diagnostic clinical interview as well as more diverse self-report smartphone addiction questionnaires to better assess smartphone addiction symptoms. Second, this study used a cross-sectional design. The examination of causal relationships is much more difficult with a cross-sectional design than with a longitudinal design. Future research should conduct a longitudinal design to provide a better understanding of the stability of the mechanism that underlies fear of COVID-19, smartphone addiction, and resilience. Lastly, involvement in the study was voluntary; as such, there is the possibility of selection bias. The results of this study may not be generalizable due to sociocultural differences.

Despite the abovementioned limitations, the current study contributes to the extant literature in several ways. First, this study is among the first to simultaneously examine the interlinks between fear of COVID-19, smartphone addiction, and resilience within the context of current pandemic. Second,

| Table 2. Gender Differences Across the Study Variables. |
|----------------|-----|-----|-----|-----|-----|-----|
| Variable       | Group | N   | Mean | SD  | t    | df  | p    |
| Fear of COVID-19 | Girls | 274 | 16.83 | 6.42 | 3.25 | 506 | .00 |
|                | Boys  | 234 | 14.94 | 6.68 |      |     |     |
| Smartphone addiction | Girls | 274 | 28.83 | 10.59 | 2.11 | 506 | .04 |
|                 | Boys  | 234 | 26.91 | 9.78 |      |     |     |
| Resilience      | Girls | 274 | 17.27 | 5.19 | -4.52 | 506 | .00 |
|                 | Boys  | 234 | 19.32 | 5.01 |      |     |     |
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**Declaration of Conflicting Interests**

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**Ethical Approval**

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Ethics approval has been obtained before conducting the research. The study protocol was approved by the Batman University Research Ethics Board (Ethics code: 2020/3-21).

**Informed Consent**

Consent was obtained from all participants included in the study.

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**Table 3. Unstandardized Coefficients for the Proposed Mediation Model.**

| Antecedent          | M (resilience) | Y (smartphone addiction) |
|---------------------|----------------|--------------------------|
|                     | Coeff. | SE | t    | p    | Coeff. | SE | t    | p    |
| X (fear of COVID-19)| -0.23  | 0.03 | -7.01 | <.001| 0.31   | 0.07 | 4.49 | <.001|
| M (resilience)     | —      | —   | —    | —    | -0.43  | 0.09 | -5.02| <.001|
| Constant            | 21.96  | 0.58 | 37.98| <.001| 30.96  | 2.21 | 14.03| <.001|

Note. Coeff = unstandardized coefficient; M = mediator variable; SE = standard error; X = independent variable; Y = dependent variable.

**Table 4. Standardized Indirect Effect of Fear of COVID-19 on Smartphone Addiction.**

| Path                  | Effect | BootSE | BootLLCI | BootULCI |
|-----------------------|--------|--------|----------|----------|
| Total indirect effect | .41    | .07    | .28      | .54      |
| Resilience            | .10    | .03    | .05      | .16      |

Note. Number of bootstrap samples for percentile bootstrap confidence intervals: 10,000.

Adolescents are prone to fear, anxiety and depression during the COVID-19 outbreak. High levels of fear and other associated risk factors can have long-term effects on adolescents’ mental health. Protective targets are needed within the context of the related factors. Mental health providers, school counselors, and educators should provide evidence-based information to adolescents about the impacts of fear of COVID-19 on smartphone addiction Early intervention and prevention programs that focus on building resilience are needed to mitigate the impacts of fear of COVID-19 on smartphone addiction. Timely online psychological support should be given to adolescents who are at high risk of COVID-19-related fear or other stressors. Moreover, planning activities for students and encouraging them to engage in virtual social activities are important to mitigate the development symptoms of fear and smartphone addiction during the pandemic.

This study demonstrated that fear of COVID-19 is a significant individual difference factor that is associated with smartphone addiction and resilience. This study also reported that the association between fear of COVID-19 and smartphone addiction was mediated by resilience which can be incorporated into the consideration of effective prevention and promotion programs aiming to mitigate the impact of fear of COVID-19 on smartphone addiction.
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