

## Research

# The mediating role of problematic TikTok use and loneliness in the relationship between mindfulness and psychological resilience in adolescents

Yusuf Akyil<sup>1</sup> · Tuncay Oral<sup>2</sup>

Received: 2 August 2024 / Accepted: 9 December 2024

Published online: 18 December 2024

© The Author(s) 2024 [OPEN](#)

## Abstract

Throughout life, individuals encounter many different upsetting events. The concepts of psychological resilience and mindfulness come to the fore in the situations encountered. The dynamics of these concepts and the extent to which they are related to loneliness and problematic TikTok use demonstrate the importance of the research. The aim of this study was to test the mediating role of problematic TikTok use and loneliness in the relationship between mindfulness and psychological resilience in adolescents. In the study, Mindfulness Scale, UCLA Loneliness Scale, Brief Psychological Resilience Scale, and Problematic TikTok Use Scale were administered to 354 students (236 girls and 118 boys) with an average age of 14.7 years who were studying in different high schools in Turkey. The data were tested using Pearson product-moment correlation coefficient and structural equation modeling analyses. The results of the study showed that problematic TikTok use and loneliness had a partial mediating role in the relationship between mindfulness and psychological resilience in adolescents. In the model with serial mediation, it was concluded that individuals with high levels of mindfulness had low levels of loneliness and problematic TikTok use and high levels of psychological resilience. Mindfulness predicts psychological resilience directly and indirectly through problematic TikTok use and loneliness. This situation can be interpreted as the impairment of psychological resilience, the level of mindfulness can be impaired by TikTok use and individuals can become lonely. This result was discussed in the light of theoretical and empirical data.

**Keywords** Mindfulness · Psychological resilience · Problematic TikTok use · Loneliness · Adolescent

## 1 Introduction

Our mind tends to constantly think about what happened in the past or what might happen in the future, and so it generates new thoughts every moment. Mindfulness allows us to distance ourselves from the thoughts our mind generates. Several philosophical, spiritual and psychological traditions speak of mindfulness as vital to creating, maintaining and enhancing well-being [1, 2]. The concept of mindfulness, as described by Kabat-Zinn [1], refers to a process in which experiences occur moment by moment in the focus of attention. Mindfulness is characterized as understanding and accepting the experiences of the moment gently and without judgment. In this context, it is stated that the main center of mindfulness is to observe the moment with an accepting attitude and curiosity, regardless of whether the experience is good or bad [3]. Neff [4] explained mindfulness as trying to understand and interpret these situations without judgment

---

✉ Tuncay Oral, [toral@pau.edu.tr](mailto:toral@pau.edu.tr) | <sup>1</sup>Ministry of National Education, 34310 Istanbul, Türkiye. <sup>2</sup>Department of Child Care and Youth Services, Pamukkale University, 20160 Denizli, Türkiye.



instead of avoiding negative situations that occur in the person. This action helps the person to become aware of the negative feelings and thoughts they encounter. In addition, starting to think about oneself in a healthy way makes it easier to focus on the problem instead of the situations that cause discomfort. Although mindfulness includes remembering past experiences, it does not mean focusing on these experiences and getting away from the moment. In mindfulness, the individual can move from negative criticism and judgment to self-understanding and acceptance. In addition, the individual increases his/her compassion towards himself/herself [5]. By gaining mindfulness, it becomes easier for us to cope with various thoughts and emotions that capture us from time to time and attack our mind, the mind can be calmed, and thus our relationship with our thoughts and emotions is stretched [6]. It also gives us great power to cope with worries, fears and negative emotions. This may mean that there is a relationship between mindfulness and psychological resilience. As a matter of fact, both correlational studies [7] and longitudinal studies [8] found a significant positive relationship between mindfulness and psychological resilience. Psychological resilience refers to the individual's ability to withstand, overcome and maintain development against stressors encountered in life [9]. In addition, this concept is also described as the ability to cope with negative disasters and traumas and adapt to new phenomena [10]. Research suggests that individuals with high psychological resilience are more dynamic when faced with chronic events, adverse disasters and pandemic conditions and are less affected by such traumas [11–14]. The concept of psychological resilience is inversely related to undesirable emotions such as stress, anxiety, depression and loneliness. If a person has high psychological resilience, they can cope with stress and loneliness more easily [15, 16].

Loneliness is a state of psychological distress felt as a result of a lack of interpersonal relationships and social interactions [17, 18]. The relationship between loneliness and problematic social networking site use (PSNSU) can be explained as a bidirectional interaction. Lonely individuals may turn to social media platforms more due to the desire for social connection, indicating that loneliness may predict PSNSU [19]. Social media becomes a tool that individuals use to compensate for social isolation [20]. However, PSNSU may also have a negative effect on loneliness; social media use may lead to decreased face-to-face interactions, social comparisons, and, accordingly, increased feelings of loneliness [21]. This bidirectional relationship suggests that loneliness and PSNSU form a cycle that feeds each other. Although loneliness is an emotion that may occur in different periods, it is especially risky for individuals in adolescence due to the communication problems they experience and the changing social environment conditions. In particular, it is quite likely that an individual who has not been able to establish his/her own group of friends and who has not received support from his/her family for various reasons and as a result has become estranged from his/her family may become lonely over time. Individuals in this period may feel loneliness when they cannot feel the presence of a social group or an individual around them from whom they can get a sense of closeness and belonging, where they can be sincere and safe, or when they do not perceive someone around them to whom they can convey their own feelings. When people feel lonely, they become prone to experiencing all kinds of psychological negativities. There are many studies showing that there are close relationships between the feeling of loneliness experienced by the individual and negative psychological indicators. In these studies, significant positive relationships were found between low life satisfaction, negative social behaviors, depression, low self-esteem, internet and social media addiction and loneliness [22–24]. Mindfulness can have a positive effect on problematic social media use because it allows individuals to notice the present moment without judgment. Mindfulness reduces automatic and impulsive reactions by increasing individuals' conscious awareness of their social media use [25]. In this way, individuals realize why they want to use social media platforms instead of unconsciously turning to them and develop a more controlled approach to this behavior [26]. In addition, mindfulness reduces the use of social media as an escape method as an effective tool in managing stress and negative emotions [27]. Thus, individuals can limit their social media use and develop a more balanced and controlled habit [25].

In this case, it can be said that individuals, in particular those in adolescence who spend a lot of time alone, use their smartphones and some social media applications on their smartphones to reduce their feeling of loneliness and make the time spent more enjoyable [28]. Today, interest in social media is increasing due to the desire for faster access to news and current information regardless of location, the opportunity to interact with people anywhere in the world, and the opportunity to access multiple channels in a single way [29]. The most popular social media application is YouTube (23.7%), followed by Facebook (23.6%) and TikTok (19.6%) in terms of time spent. The highest number of TikTok users live in Turkey, which comes right after India and the USA. Behind TikTok's popularity, people's desire to earn income is undeniable. TikTok users with at least 1000 followers can broadcast live broadcasts to their followers indefinitely, and in return, they can receive digital gifts from their followers during the live broadcast, which can later be converted into cash [30]. The average monthly TikTok usage time in Turkey is 18.8 h [31]. Problematic TikTok use is a behavioral pattern that occurs when individuals use the TikTok platform excessively and uncontrollably, and is consistent with research on the use of social media platforms. Users spending unplanned and impulsive long periods of time on TikTok can cause the individual to neglect their daily responsibilities,

experience a decline in academic success, and deteriorate social relationships [32]. Although such use usually begins with a search for short-term pleasure and relaxation, it can lead to addiction-like symptoms over time. Dual System Theory provides an effective framework for understanding this situation; according to this theory, human behavior is driven by two systems: System 1, which makes impulsive decisions, and System 2, which makes conscious decisions [33]. In TikTok use, System 1 encourages users to spend more time on the platform with constant notifications and new content, while System 2 has difficulty controlling these impulses. However, in problematic TikTok use, the control mechanism of System 2 weakens and individuals have difficulty limiting TikTok use. Over time, this loss of control leads to individuals becoming cognitively and behaviorally overly dependent on TikTok and leads to academic, social, and psychological problems [34]. Recently, TikTok, one of the social media platforms, has been a source of concern for mental health professionals due to its use by many people at high hours. It is observed that people spend excessive time on their own page to increase the number of followers, cannot control the time spent on the application; eventually, they get bored with real life and start to see their virtual identity as real and start to organize their lifestyle accordingly. Moreover, individuals with problematic TikTok use may feel nervous, restless, stressed and lonely when they cannot use it.

Adolescence is a difficult and stormy period in terms of mental health. While adolescents are trying to find their identity, they are also accepting physical changes and struggling with emotions in terms of mental health. The concept of mindfulness can be effective at this point in terms of controlling emotions. Adolescents' awareness of emotions shows that they can be more conscious individuals [35]. On the other hand, the importance of their psychological resilience increases in relation to many different situations encountered during this period. It is observed that adolescents who are psychologically resilient are happier afterwards [36].

The aim of this study was to examine the indirect predictors of mindfulness on resilience and to understand the mediating role of problematic TikTok use and loneliness in this relationship. Theoretically, mindfulness may support resilience by increasing individuals' ability to cope with stress and adversity [37]. However, the increased use of social media platforms among youth may lead to negative outcomes such as problematic use and loneliness [38]. Investigating how these negative effects predict the positive psychological benefits provided by mindfulness practices may help develop important strategies to increase the psychological well-being of youth. Therefore, this study aims to gain a deeper understanding of the predictors of mindfulness on resilience and to reveal the effect of social media use on this relationship. Therefore, the following hypotheses will be tested within the scope of the research.

H1. There is a positive relationship between mindfulness and psychological resilience.

H2. There is a mediating role of problematic TikTok use between mindfulness and psychological resilience.

H3. There is a mediating role of loneliness between mindfulness and psychological resilience.

H4. There is a serial mediation role of problematic TikTok use and loneliness between mindfulness and psychological resilience.

## 2 Methods

### 2.1 Participants and procedure

A total of 354 participants completed the consent form. The ages of the adolescents ranged from 14 to 18. In terms of gender distribution, there were 236 female and 118 male participants. The average age of the participants was 14.7 (SD: 1.007) years. The participants included in the study were reached online through the convenience sampling method. A Google form was created for the study and was filled out only by volunteers. Participants who wished to do so had the option to leave the study as they wished. Each participant was included in the study after obtaining permission from their parents before participating.

### 2.2 Measures

#### 2.2.1 Mindfulness scale adolescent form

The scale was developed by Brown et al. [39] to determine the mindfulness levels of adolescents. It is a 6-point Likert-type scale consisting of 14 items. The scale items are scored in a range from 1 (almost always) to 6 (almost never). An example item is '3- I find it difficult to focus on what is happening right now.' The highest score that can be obtained from the scale is 84 and the lowest score is 14. High scores reflect mindfulness as a high level personality trait. It was adapted into Turkish by Turan [40]. Cronbach Alpha internal consistency reliability coefficient was calculated as  $\alpha = 0.78$ .

### 2.2.2 Problematic TikTok use scale

Development study was conducted by D'Souza et al. [41]. It is a 5-point Likert-type scale consisting of 16 items (1 = never and 5 = always). The scale has 3 sub-dimensions. They are called obsession, escape and lack of control. Turkish adaptation study was conducted by Günlü et al. [42]. The lowest score that can be obtained from the scale is 16 points and the highest score is 80 points. An example item is '9- I use TikTok to get away from reality.' A high score indicates a high level of TikTok use. The Cronbach's Alpha reliability of the scale was 0.90; the Cronbach's Alpha reliability of the sub-dimensions was found to be 0.84 for the obsession sub-dimension, 0.90 for the escape sub-dimension, and 0.85 for the lack of control sub-dimension.

### 2.2.3 UCLA loneliness scale

It was developed by Neto [43] to measure the level of loneliness. The scale is a 4-point Likert scale consisting of 6 items in total (1 = Not at all appropriate, 4 = Fully appropriate). It does not have any sub-dimensions. It was adapted into Turkish by Sariçam [44]. Confirmatory factor analysis showed that the fit index values of the 6-item unidimensional model were adequate. An example item is '3- I feel pushed out of the group.' The item factor loadings of the scale ranged between 0.35 and 0.70. Cronbach Alpha internal consistency reliability coefficient was calculated as  $\alpha = 0.77$ .

### 2.2.4 Brief psychological resilience scale

The scale developed by Smith et al. [45] was adapted into Turkish by Doğan [46]. The BPRS is a one-dimensional scale and has a 5-point Likert-Type response key (1 = totally disagree and 5 = totally agree). An example item is '3- It does not take me a long time to recover after stressful situations.' The scale consists of 6 items. In the Turkish adaptation of the scale, construct validity was examined using exploratory and confirmatory factor analysis methods and a single-factor structure explaining 54% of the total variance emerged. The factor loadings of the scale items ranged between 0.63 and 0.79. Cronbach's Alpha internal consistency coefficient was found to be 0.81. This information showed that the scale is a valid and reliable measurement tool.

### 2.2.5 Data analysis

SPSS 26 package program and AMOS program were used for the analysis phase of the study. Initially, normality analysis, reliability analysis and descriptive statistics of mindfulness, problematic TikTok use, loneliness and psychological resilience variables were examined. Then, correlation analysis was conducted for the relationships between variables. Significant results were obtained between the variables and structural equation modeling (SEM) was started. SEM is described as a very powerful quantitative analysis technique as it gives the chance to make decisions based on multiple parameters [47].

In this research, a two-stage SEM was used in line with the recommendations of Kline [47]. In the first stage, it was tested whether the measurement model, which deals with the relationships between the indicator variables forming the latent variables and these latent variables, was verified. Following the validation of the measurement model, the hypothetical structural model was examined. In order to evaluate the SEM results, the goodness of fit values expressed by Hu and Bentler [48] were taken into consideration. As critical values,  $\chi^2/\text{degree of freedom}$  ratio should be less than 5, CFI, NFI and TLI values should be greater than 0.90, SRMR and RMSEA values should be less than 0.08 [48, 49]. On the other hand, in order to qualify and select which of the multiple models in SEM is the best model, the chi-square difference test as well as the AIC and ECVI values were examined. The model with the smallest AIC and ECVI values is accepted as the best model [50, 51].

Since the variables of mindfulness, loneliness and psychological resilience are one-dimensional in SEM, the parceling method was used. The parceling method used in concepts related to personality traits reduces the number of observed variables, increases reliability and helps the scales to show normal distribution [52]. With parceling, 3 dimensions were created for mindfulness, 2 for loneliness and 2 for psychological resilience.

In order to strengthen and support the study, the bootstrapping process was used, which strengthened the significance of the mediation test [53]. The number of samples was increased to 5000 with the bootstrap process and the confidence interval was created with the bootstrap value. The absence of zero in this confidence interval indicates that the mediation is significant.

### 3 Results

This section includes descriptive statistics and correlation analysis. Then, the results of the measurement model and structural model are presented. Finally, the bootstrapping process results are stated.

According to Finney and DiStefano [54], the variables should be within the normality criteria of  $\pm 2$  for skewness and  $\pm 7$  for kurtosis. Since the skewness values are between  $-0.22$  and  $0.98$  and the kurtosis values are between  $-0.35$  and  $0.21$  in Table 1, it can be said that the data show a normal distribution.

When the relationships between the variables are examined, there are negatively significant results between mindfulness and problematic TikTok use ( $r = -0.33$ ,  $p < 0.001$ ), mindfulness and loneliness ( $r = -0.42$ ,  $p < 0.001$ ), psychological resilience and problematic TikTok use ( $r = -0.30$ ,  $p < 0.001$ ), loneliness and psychological resilience ( $r = -0.34$ ,  $p < 0.001$ ). There are positively significant relationships between psychological resilience and mindfulness ( $r = 0.37$ ,  $p < 0.001$ ), and problematic TikTok use and loneliness ( $r = 0.25$ ,  $p < 0.001$ ).

When looking at the measurement model, there are a total of 4 latent variables consisting of problematic TikTok use and loneliness variables and 10 observed variables between mindfulness and psychological resilience. As a result of the measurement model, it was understood that all path coefficients were significant and the factor loadings varied between  $0.46$  and  $0.94$ . According to the goodness of fit indices ( $\chi^2/df = 1.83$ ,  $p < 0.001$ ,  $RMSEA = 0.05$ ,  $SRMR = 0.03$ ,  $GFI = 0.97$ ,  $IFI = 0.99$ ,  $CFI = 0.99$ ,  $NFI = 0.97$ ,  $TLI = 0.98$ ,  $RFI = 0.96$ ), it is seen that the measurement model provides a good fit.

After the measurement model was validated, the structural model was tested. In the structural model after the measurement, firstly, the model in which problematic TikTok use and loneliness were full mediators between mindfulness and psychological resilience levels of high school students was tested. In the full mediation model, there is no direct path between the independent variable and the dependent variable. When the fit indices were examined, the fit values of the model were at an acceptable level ( $\chi^2/df = 2.01$ ,  $p < 0.001$ ,  $RMSEA = 0.05$ ,  $SRMR = 0.05$ ,  $GFI = 0.97$ ,  $IFI = 0.99$ ,  $CFI = 0.99$ ,  $NFI = 0.97$ ,  $TLI = 0.98$ ,  $RFI = 0.96$ ). In addition,  $AIC = 110.54$ ;  $ECVI = 0.31$  were found. In order to determine the best mediation model, the model in which problematic TikTok use and loneliness played a partial mediating role was examined. In the partial mediation model, a direct path is established between the independent variable and the dependent variable. When the fit indices are examined, it is seen that this model also has acceptable values ( $\chi^2/df = 1.83$ ,  $p < 0.001$ ,  $RMSEA = 0.05$ ,  $SRMR = 0.03$ ,  $GFI = 0.97$ ,  $IFI = 0.99$ ,  $CFI = 0.99$ ,  $NFI = 0.97$ ,  $TLI = 0.98$ ,  $RFI = 0.96$ ). In addition,  $AIC = 105.09$ ;  $ECVI = 0.30$ . It was seen that all path coefficients of both models were significant.

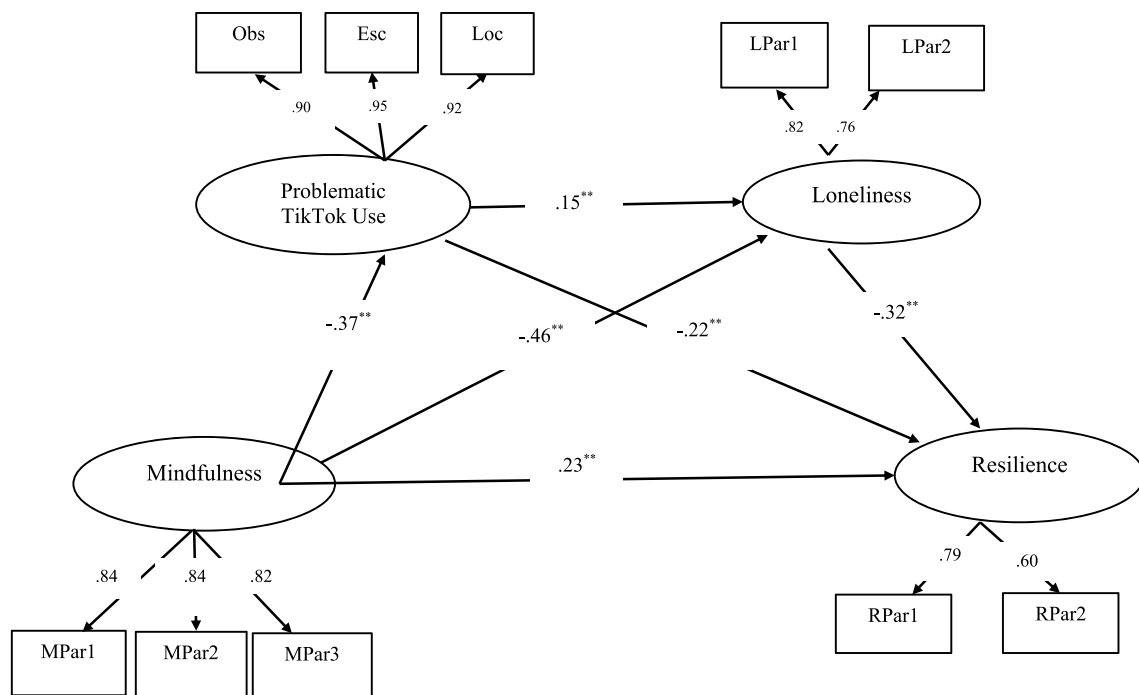
According to the results of the chi-square difference test performed to determine which model would be preferred, in which problematic TikTok use and loneliness are full or partial mediators, it is understood that the direct path added between mindfulness and psychological resilience makes a significant contribution to the model, ( $\Delta\chi^2 = 74.48$ ,  $Sd = 1$ ,  $p < 0.001$ ). In addition, it is seen that the  $AIC$  and  $ECVI$  values of the partial mediation model are smaller than the  $AIC$  and  $ECVI$  values of the full mediation model. In line with all these results, the model in which problematic TikTok use and loneliness have a partial mediation role between the mindfulness and psychological resilience of high school students was preferred. The path coefficients of this model are given in Fig. 1.

Mediating roles of problematic TikTok use and loneliness between mindfulness and psychological resilience were tested via the bootstrapping procedure. Table 2 shows the indirect effects were tested and their associated 95% CI, where the indirect effect of mindfulness on psychological resilience through problematic TikTok use and loneliness was significant ( $\beta = 0.24$ ,  $p < 0.001$ , 95% CI = [0.16, 0.35]). Considering all these results, it can be said that the problematic TikTok use and loneliness of adolescents play a partial mediating role between their mindfulness and psychological resilience.

**Table 1** Descriptive Statistics and Correlations

	N	Mean	SD	Skewness	Kurtosis	1	2	3
1- Mindfulness	354	54.75	13.69	0.32	-0.35	-		
2- Problematic TikTok Use	354	25.96	12.82	0.98	0.21	-0.33**	-	
3- Loneliness	354	11.80	4.41	0.73	-0.20	-0.42**	0.25**	-
4- Psychological Resilience	354	17.97	5.19	-0.22	0.13	0.37**	-0.30**	-0.34**

\*\* $p < 0.001$



**Fig. 1** Standardized factor loading for the partial mediated structural model. \*\* $p < 0.001$ ; *MPar* Parcels of Mindfulness; Obs: Obsession; Esc: Escape; Loc: Lack of Control; *LPar* Parcels of Loneliness; *RPar* Parcels of Resilience

**Table 2** Parameters and 95%CIs for the paths of the model

Path	Coefficient*	%95 CI	
		LL	UL
<b>Direct link</b>			
Mindfulness → Problematic TikTok Use	-0.37	-0.46	-0.27
Mindfulness → Loneliness	-0.46	-0.57	-0.35
Problematic TikTok Use → Loneliness	0.15	0.02	0.26
Loneliness → Psychological Resilience	-0.32	-0.46	-0.18
<b>Indirect Link</b>			
Mindfulness → Loneliness → Psychological Resilience	0.18	0.10	0.28
Mindfulness → Problematic TikTok Use → Loneliness → Psychological Resilience	0.24	0.16	0.35

Completely standardized effect; *CI* confidence interval; *LL* lower limit, *UL* upper limit

### 4 Discussion

The results of this study showed that problematic TikTok use and loneliness have a partial mediating role in the relationship between mindfulness and psychological resilience in adolescents. In the serial mediation model, it was concluded that individuals with high mindfulness have low levels of loneliness and problematic TikTok use and high psychological resilience. It can be said that if individuals with low mindfulness levels increase their mindfulness levels, their psychological resilience will increase, and loneliness and problematic TikTok use will decrease.

When the first hypothesis is examined, according to the analysis results, the hypothesis regarding the relationship between mindfulness and psychological resilience is confirmed. Indeed, in the longitudinal study conducted by Yuan [8], it was concluded that mindfulness training increases psychological resilience. In addition, a positive significant relationship was found between mindfulness and psychological resilience in a correlational study [7]. Mindfulness refers to a mechanism in which experiences occur within the focus of attention from moment to moment [4]. Based

on this finding, individuals having a high level of mindfulness and staying in the moment may mean that they can be more prepared and accepting of external dangers psychologically. Therefore, the individual may be more resilient psychologically.

In the second hypothesis, the mediation effect of problematic TikTok use between mindfulness and psychological resilience was tested and the hypothesis was confirmed. The research findings revealed that problematic TikTok use mediates between mindfulness and psychological resilience, and this finding was supported by the literature. The diversity of social media tools attracts individuals from all walks of life, as well as adolescents, which can lead to unconscious use [55]. Individuals with high levels of mindfulness are less addicted to social media than individuals with low levels of mindfulness [56]. In addition, a nine-year longitudinal study on the effect of social media on psychological resilience revealed that social media use negatively affects psychological resilience [57]. This finding may mean that if adolescents have high mindfulness, they will use social media consciously and thus reduce the negative situations that may arise from outside and maintain their psychological resilience. In other words, they can provide protection for the psychological resilience of adolescents who can control their TikTok use.

In the third hypothesis, the mediating effect of loneliness between mindfulness and psychological resilience was tested and the hypothesis was confirmed. The research findings revealed that loneliness mediates between mindfulness and psychological resilience, and this finding was supported by the literature. According to research, individuals with high psychological resilience are more successful than their peers in coping with various negative factors and loneliness [15, 16]. Another study examined the mediating role of rejection sensitivity in the relationship between mindfulness and loneliness. According to the results of the research, mindfulness predicts loneliness negatively [58]. According to the results of two different longitudinal studies, it was concluded that the psychological resilience of individuals whose loneliness levels increase over time decreases; and the loneliness of individuals whose psychological resilience levels increase over time decreases [59, 60]. According to these findings, it can be said that as mindfulness increases, the level of individuals feeling lonely will decrease, and as the level of loneliness decreases, the level of psychological resilience will increase.

In the fourth and main hypothesis, the serial mediation effect of problematic TikTok use and loneliness between mindfulness and psychological resilience was tested and the hypothesis was confirmed. According to the research findings, it was revealed that problematic TikTok use and loneliness have a serial mediation effect between mindfulness and psychological resilience, and this finding is supported by the literature. Mindfulness in adolescents reduces problematic TikTok use and loneliness, and decreasing problematic TikTok use and loneliness contribute to the increase in psychological resilience. This result might be better understood when the relationship between serial mediators is examined. According to a very recent study [61], a positive significant relationship was found between problematic TikTok use and loneliness. It is frequently reported that loneliness levels are high in adolescents who use various social media applications such as TikTok, Facebook, Instagram, and Twitter [62]. In a study conducted with adolescents, the concepts of loneliness, psychological resilience, and problematic social media use were investigated. It has been concluded that increasing loneliness increases problematic social media use, while increasing psychological resilience reduces problematic social media use and loneliness [63]. In another study conducted with adolescents, it was concluded that loneliness decreases as a result of increasing psychological resilience [64]. In another study, results were obtained indicating that mindfulness training reduces problematic social media use and loneliness [63]. When all these results are evaluated in general, when adolescents increase their level of mindfulness, they can cope with the problems in their TikTok use and overcome their feelings of loneliness, thus remaining psychologically resilient. In this study, mindfulness and psychological resilience, which are important concepts for mental health, are discussed in the context of some negative emotions and behaviors. Having difficulty regulating the level of loneliness and problematic TikTok use can lead to psychopathology. Considering the inverse relationship between psychological resilience, mindfulness and psychopathology, the results of this study become more important.

## 5 Limitations and future research

There are some limitations that should be taken into consideration when evaluating the results of this study. First, since this study is a cross-sectional study, causal relationships cannot be inferred. In order to overcome this limitation of the study and reveal causal relationships, future studies can be conducted using longitudinal or experimental research models. Second, the measurements in this study are based on self-reporting. Self-reporting based measurements may reduce internal validity. Third, since the sample consisted only of Turkish adolescents, the generalizability of the sample is limited. These limitations should be taken into consideration when generalizing the results of the study to the entire

population. Fourth, different variables such as internal and external dynamics, interpersonal relationships, and social support that may affect the mediating role in the relationship between mindfulness and psychological resilience in this study can be investigated separately or together in future studies. The research is limited to the survey results given only by the participating adolescents. Since there are no additional questions on demographic variables, readers should take this into consideration.

## 6 Conclusion

When the results are considered, it is revealed that problematic TikTok use and loneliness have a partial mediating role in the relationship between mindfulness and psychological resilience. The relationships between these variables have been investigated together for the first time. It is a quantitative model explaining the relationship between mindfulness, problematic TikTok use, loneliness and psychological resilience among Turkish high school students. Considering all adolescents in the world, considering that problematic social media use has increased in recent years, the number of individuals who have difficulty coping with loneliness has increased and the value of combating these situations, this study can make a significant contribution to the literature.

**Acknowledgements** Not applicable

**Authors contributions** All the authors equally contributed to the conception and design of the research. T.O. collected the data and Y.A. performed the quantitative analysis. Y.A. interpreted the data and wrote the results. Two authors co-wrote the introduction discussions and conclusions. All of them reviewed the final version of article.

**Funding** The authors received no financial support for the research, authorship, and/or publication of this article.

**Availability of data and materials** The data supporting this study's findings are available from the corresponding author, [T.O], upon reasonable request.

## Declarations

**Ethics approval and consent to participate** The study protocol has been approved by the Yildiz Technical University Scientific Research and Ethical Review Board (December/05/2023). In this study, some of the participants were over 16 years of age and some were under 16 years of age. For the group over 16 years of age, informed consent was obtained from them. For the children under 16 years of age, informed consent was obtained from their parents or legal guardians.

**Research involving human participants and/or animals** 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.

**Competing interests** The authors declare no competing interests.

**Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

## References

1. Kabat-Zinn J. *Wherever you go, there you are: mindfulness meditation in everyday life*. 10th ed. New York: Hyperion; 2009.
2. Lykins ELB, Bear RA. Psychological functioning in a sample of long-term practitioners of mindfulness meditation. *J Cogn Psychother*. 2009;23(3):226–41. <https://doi.org/10.1891/0889-8391.23.3.226>.
3. Germer CK, Siegel RD, Fulton PR. *Mindfulness and psychotherapy*. New York: Guilford Press; 2005.
4. Neff KD. The Development and validation of a scale to measure self-compassion. *Self and Identity*. 2003;2:223–50.
5. Deniz ME, Şahin S, Sümer AS. The validity and reliability of the Turkish version of the self-compassion scale. *Soc Behav Pers*. 2008;36(9):1151–60.



6. Ögel K. Farkındalık (Ayrımsama) ve kabullenme temelli terapiler. Ankara: HYB Publishing; 2012.
7. Anasori E, Bayighomog SW, Tanova C. Workplace bullying, psychological distress, resilience, mindfulness, and emotional exhaustion. *Serv Ind J*. 2020;40(1–2):65–89. <https://doi.org/10.1080/02642069.2019.1589456>.
8. Yuan Y. Mindfulness training on the resilience of adolescents under the COVID-19 epidemic: a latent growth curve analysis. *Personality Individ Differ*. 2021;172: 110560.
9. Mandleco BL, Peery JC. An Organizational framework for conceptualizing resilience in children. *J Child Adolesc Psychiatr Nurs*. 2000;13(3):99–111.
10. Masten AS, Coastworth JD. The development of competence in favorable and unfavorable environments: Lessons from research on successful children. *Am Psychol*. 1998;53(2):205–20.
11. Goodman JH. Coping with trauma and hardship among unaccompanied refugee youths from Sudan. *Qual Health Res*. 2004;14(9):1177–96.
12. Li M, Xu J, He Y, Wu Z. The analysis of the resilience of adults one year after the 2008 Wenchuan earthquake. *J Community Psychol*. 2012;40(7):860–70.
13. McCubbin M, Balling K, Possin P, Friedrich S, Bryne B. Family resiliency in childhood cancer. *Fam Relat*. 2002;51:103–11.
14. Samuelson K, Barthel S, Colding J, Macassa G, Giusti M. Urban nature as a source of resilience during social distancing amidst the coronavirus pandemic. 2020. <https://doi.org/10.31219/osf.io/3wx5a>
15. Agabi CE, Wilson JP. Trauma, PTSD, and resilience. *Trauma Violence Abuse*. 2005;6(3):195–216.
16. Jakobsen IS, Madsen LMR, Mau M, Hjemdal O, Friberg O. The relationship between resilience and loneliness elucidated by a Danish version of the resilience scale for adults. *BMC Psychology*. 2020;8:1–10. <https://doi.org/10.1186/s40359-020-00493-3>.
17. Bruce LDH, Wu JS, Lustig SL, Russell DW, Nemecek DA. Loneliness in the United States: a 2018 national panel survey of demographic, structural, cognitive, and behavioral characteristics. *Am J Health Promot*. 2019;33(8):1123–33. <https://doi.org/10.1177/0890117119856551>.
18. Mosher CE, Lepore SJ, Wu L. Social correlates of distress following hematopoietic stem cell transplantation: Exploring the role of loneliness and cognitive processing. *J Health Psychol*. 2012;17(7):1022–32.
19. Caplan SE. Relations among loneliness, social anxiety, and problematic Internet use. *Cyberpsychol Behav*. 2007;10(2):234–42. <https://doi.org/10.1089/cpb.2006.9963>.
20. Nowland R, Necka EA, Cacioppo JT. Loneliness and social internet use: pathways to reconnection in a digital world? *Perspect Psychol Sci*. 2018;13(1):70–87. <https://doi.org/10.1177/1745691617713052>.
21. Chou HTG, Edge N. “They are happier and having better lives than I am”: the impact of using Facebook on perceptions of others’ lives. *Cyberpsychol Behav Soc Netw*. 2012;15(2):117–21. <https://doi.org/10.1089/cyber.2011.0324>.
22. Casale S, Fioravanti G. Psychosocial correlates of Internet use among Italian students. *Int J Psychol*. 2011;46(4):288–98.
23. Doğan U, Karakaş Y. Lise öğrencilerinin sosyal ağ siteleri kullanımının yordayıcısı olarak yalnızlık. *Sakarya Univ J Educ*. 2016;6(1):57–71.
24. Sinkkonen HM, Puhakka H, Meriläinen M. Internet use and addiction among Finnish adolescents. *J Adolesc*. 2014;37:123–31.
25. Brown KW, Ryan RM, Creswell JD. Mindfulness: theoretical foundations and evidence for its salutary effects. *Psychol Inq*. 2007;18(4):211–37. <https://doi.org/10.1080/10478400701598298>.
26. Elhai JD, Levine JC, Dvorak RD, Hall BJ. Problematic smartphone use and mental health problems: current state of research and future directions. *J Affect Disord*. 2017;207:251–9. <https://doi.org/10.1016/j.jad.2016.08.030>.
27. Raes F, Pommier E, Neff KD, Van Gucht D. Construction and factorial validation of a short form of the self-compassion scale. *Clin Psychol Psychother*. 2011;18(3):250–5. <https://doi.org/10.1002/cpp.702>.
28. Bian M, Leung L. Linking loneliness, shyness, smartphone addiction symptoms, and patterns of smartphone use to social capital. *Soc Sci Comput Rev*. 2015;33(1):61–79. <https://doi.org/10.1177/0894439314528779>.
29. Becan C. Sosyal medya bağımlılığının haber takibi motivasyonları üzerine etkisi. *Erciyes İletişim Dergisi*. 2018;5(3):238–56.
30. Datareportal. Digital Reports. 2023. <https://datareportal.com/reports/digital-2023-turkey>.
31. Wearesocial Digital. Another year of bumper growth. 2022. <https://wearesocial.com/uk/blog/2022/01/digital-2022-another-year-of-bumper-growth-2/>.
32. Turel O, Qahri-Saremi H. Problematic use of social networking sites: antecedents and consequence from a dual system theory perspective. *J Manag Inf Syst*. 2016;33(4):1087–116. <https://doi.org/10.1080/07421222.2016.1267529>.
33. Kahneman D. Thinking, fast and slow. Straus and Giroux: Farrar; 2011.
34. Griffiths M, Kuss D, Demetrovics Z. Social networking addiction: An overview of preliminary findings. In: Rosenberg KP, Feder LC, editors. *Behavioral addictions: criteria, evidence, and treatment*. Academic Press; 2014. p. 119–41.
35. Nelson L, Roots K, Dunn TJ, Rees A, Hull DD, Van Gordon W. Effects of a regional school-based mindfulness programme on students’ levels of wellbeing and resiliency. *Int J Spa Wellness*. 2022;5(1):1–15. <https://doi.org/10.1080/24721735.2021.1909865>.
36. Tasijawa FA, Siagian I. School-based interventions to improve adolescent resilience: a scoping review. *Open Access Maced J Med Sc*. 2022;10:33–40. <https://doi.org/10.3889/oamjms.2022.8063>.
37. Keng SL, Smoski MJ, Robins CJ. Effects of mindfulness on psychological health: a review of empirical studies. *Clin Psychol Rev*. 2011;31(6):1041–56. <https://doi.org/10.1016/j.cpr.2011.04.006>.
38. Twenge JM, Joiner TE, Rogers ML, Martin GN. Increases in depressive symptoms, suicide-related outcomes, and suicide rates among U.S. adolescents after 2010 and links to increased new media screen time. *Clin Psychol Sci*. 2018;6(1):3–17. <https://doi.org/10.1177/2167702617723376>.
39. Brown KW, West AM, Loverich TM, Biegel GM. Assessing adolescent mindfulness: validation of an adapted Mindful Attention Awareness Scale in adolescent normative and psychiatric populations. *Psychol Assess*. 2011;23(4):1023–33.
40. Turan ME. Bilinçli farkındalık ölçeği ergen formunun geçerlik ve güvenilirlik çalışması. *OPUS Uluslararası Toplum Araştırmaları Dergisi*. 2020;16:5608–25. <https://doi.org/10.26466/opus.683364>.
41. D’Souza L, Samyukta A, Bivera TJ. Development and validation of test for internet addiction (TIA). *Int J Indian Psychol*. 2018;6(3):4–14. <https://doi.org/10.25215/0603.81>.
42. Günlü A, Oral T, Yoo S, Chung S. Reliability and validity of the problematic TikTok use scale among the general population. *Front Psych*. 2023;14:1068431.
43. Neto F. Psychometric analysis of the short-form UCLA loneliness scale (ULS-6) in older adults. *Eur J Ageing*. 2014;11:313–9.

44. Sarıçam H. COVID-19 sonrası yetişkinlerde yalnızlık: UCLA Yalnızlık Ölçeği Kısa Formunun (UYÖKF-6) psikometrik özellikleri. *Iğdır Üniversitesi Sosyal Bilimler Dergisi*. 2023;32:1–17. <https://doi.org/10.54600/igdirsosbilder.1066242>.
45. Smith BW, Dalen J, Wiggins K, Tooley E, Christopher P, Jennifer BJ. The brief resilience scale: assessing the ability to bounce back. *Int J Behav Med*. 2008;15:194–200.
46. Doğan T. Kısa psikolojik sağlamlık ölçeği'nin Türkçe uyarlaması: Geçerlik ve güvenilirlik çalışması. *The Journal of Happiness & Well-Being*. 2015;3(1):93–102.
47. Kline RB. Principles and practice of structural equation modeling. New York: Guilford Press; 2011.
48. Hu LT, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Struct Eqn Mode*. 1999;6(1):1–55. <https://doi.org/10.1080/10705519909540118>.
49. Tabachnick BG, Fidell LS. Using multivariate statistics. 6th ed. New York: Harper Collins College Publishers; 2012.
50. Akaike H. Factor analysis and AIC. *Psychometrika*. 1987;52(3):317–32.
51. Browne MW, Cudeck R. Alternative ways of assessing model fit. *Sociol Methods Res*. 1992;21(2):230–58.
52. Nasser-Abu Alhija F, Wisenbaker J. A Monte Carlo study investigating the impact of item parceling strategies on parameter estimates and their standard errors in CFA. *Struct Equ Model*. 2006;13(2):204–28.
53. Preacher KJ, Hayes AF. Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behav Res Methods*. 2008;40(3):879–91.
54. Finney SJ, DiStefano C. Nonnormal and categorical data in structural equation modeling. In G. R. Hancock & R. O. Mueller (Eds.), *A second course in structural equation modeling* (2nd ed.). Charlotte, NC: Information Age, pp. 439–492, 2013.
55. Deniz L, Gürültü E. Lise öğrencilerinin sosyal medya bağımlılıkları. *Kastamonu Eğitim Dergisi*. 2018;26(2):355–67.
56. Sun X. A review of mindfulness and social media excessive use. *Adv Soc Sci Educ Hum Res*. 2022;631:1286–94.
57. Schemer C, Masur PK, Geiß S, Müller P, Schäfer S. The impact of internet and social media use on well-being: a longitudinal analysis of adolescents across nine years. *J Comput-Mediat Commun*. 2021;26(1):1–21.
58. Xie Q, Manova V, Khoury B. How do dispositional mindfulness and self-compassion alleviate loneliness? The mediating role of rejection sensitivity. *Curr Psychol*. 2023;42(27):23712–21.
59. Kuo BC, Huang S, Li X, Lin D. Self-esteem, resilience, social support, and acculturative stress as predictors of loneliness in Chinese internal migrant children: a model-testing longitudinal study. *J Psychol*. 2021;155(4):387–405.
60. Windle G, Hoare Z, Woods B, Huisman M, Burholt V. A longitudinal exploration of mental health resilience, cognitive impairment and loneliness. *Int J Geriatr Psychiatry*. 2021;36(7):1020–8.
61. Williams M, Lewin KM, Meshi D. Problematic use of five different social networking sites is associated with depressive symptoms and loneliness. *Curr Psychol*. 2024;43:20891–8.
62. Sun L. Social media usage and students' social anxiety, loneliness and well-being: Does digital mindfulness-based intervention effectively work? *BMC Psychol*. 2023;11:1–12.
63. Lin S, Yuan Z, Niu G, Fan C, Hao X. Family matters more than friends on problematic social media use among adolescents: Mediating roles of resilience and loneliness. *Int J Mental Health Addict*. 2023. <https://doi.org/10.1007/s11469-023-01026->.
64. He N, Xiang Y. Child maltreatment and nonsuicidal self-injury among Chinese adolescents: the mediating effect of psychological resilience and loneliness. *Child Youth Serv Rev*. 2022;133: 106335. <https://doi.org/10.1016/j.childyouth.2021.106335>.

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.