

ORIGINAL ARTICLE

The Mediating Role of Alexithymia Level of High School Students' Smartphone Addiction in Predicting the Identity Function

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Main Points

- Smartphone addiction in high school students is negatively associated with the identity function.
- Smartphone addiction in high school students is positively associated with the alexithymia level.
- The alexithymia level of high school students is negatively associated with the identity function.
- The alexithymia level of high school students mediates smartphone addiction to predict identity functions.

Abstract

This study aims to examine the mediating role of the level of alexithymia in the relationship between smartphone addiction and identity functions. The study group included 460 participants who were students attending Anatolian High Schools in four districts of Istanbul, and they were identified by a simple random sampling method. In this study, the Smartphone Addiction Scale-Short Version, the Identity Function Scale, the Toronto Alexithymia Scale, and a personal information form were used. The structural equation model (SEM) and bootstrapping were utilized to test the mediation analysis of the research. In the results of the analysis, it was found that smartphone addiction in high school students negatively predicted identity function ($\beta = -0.37$; $p < .01$), but positively predicted the alexithymia level ($\beta = 0.43$; $p < .01$). In addition, it was found that the alexithymia level of high school students negatively predicted identity function ($\beta = -0.43$; $p < .01$). Finally, it was concluded that the alexithymia level in high school students mediates smartphone addiction to predict identity functions ($\beta = -0.19$; $p < .01$). The model fit values were also found to be within acceptable values ($\chi^2/df = 2.12$, $p < .01$, $RMSA = 0.05$, $SRMR = 0.05$, $GFI = 0.91$, $CFI = 0.94$, $TLI = 0.93$).

Keywords: Addiction, behavioral addiction, smartphone addiction, alexithymia, identity

Introduction

Since their introduction in 2007, there has been a severe increase in the use of smartphones worldwide. It is thought that 3.5 billion people worldwide currently use smartphones (Odea, 2020). With the availability of the internet on smartphones, many possibilities, such as downloading and installing applications related to various areas, accessing social media, reading books, and following the news have dramatically increased the use of smartphones (Körmendi, Brutóczki, Végh, & Székely, 2016). However, the increase in the use of smartphones has brought about many problems, of which

smartphone addiction is the most significant (Wu, Cheung, Ku, & Hung, 2013).

Smartphone addiction has been recognized as a special form of behavioral addiction (Tejlingen & Sathian, 2016), whose symptoms have been defined clearly. They include developing tolerance, loss of control, withdrawal, negative life outcomes, and constant thinking about and craving for smartphone use. Tolerance development refers to the increasing use of smartphones. Loss of control refers to the inability to adjust the duration and intensity of smartphone use. Withdrawal is indicated when a person shows symptoms of anger and depression

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when they do not have access to the smartphone. Negative life results occur as problems in work, family, relationships, and professional life. When the individual loses access to their smartphone, they constantly think about it and long for it (Foerster, Roser, Schoeni, & Röösl, 2015). In terms of susceptibility to smartphone addiction, adolescent high school students especially are among the at-risk groups (Kwon, Kim, Cho, & Yang, 2013). At the same time, the fact that adolescence is a period of identity acquisition, according to Erikson (1968), points out to the relationship between smartphone addiction and the identity function in modern times.

Identity is a social structure formed by the individual, by gathering goals, beliefs, values, personal skills, and characteristics (Erikson, 1968). Identity function, on the other hand, is accepted as the application of an individual's identity to social life, and the act of display of this identity in life spheres (Crocetti, Sica, Schwartz, Serafini, & Meeus, 2010). This identity function is comprised of the various elements of structure, harmony, goal, future, and control (Adams & Marshall, 1996). The structure element includes factors such as the individual's self-esteem, self-efficacy, self-acceptance, and the acceptance of bodily appearance, and it constitutes the basic construct of the individual's identity. The element of harmony includes the individual's state of cooperation and harmony with others in school, or in romantic or social relationships (Serafini & Adams, 2002) with people with whom the individual comes into contact. The goal element is that individuals set goals, fulfill the requirements, and put in effort within the framework of these goals (Hejazi, Lavasani, Amani, & Was, 2012). The control element includes the ability of the individual to regulate behaviors within the framework of his or her ideals, goals, and values, and to take responsibility for own behaviors (Buameister et al., 2007). Finally, the future element is the element that contributes to the individual's expectation and hope for the future, as well as to establish integrity between the individual's present and future (Günevra et al., 2016).

When the literature was reviewed, it was seen that similar studies examined the relationship between smartphone addiction and identity. When studies on smartphone addiction and the structure element were examined, a negative relationship was found between smartphone addiction and self-confidence (Lee et al., 2018), self-efficacy (Gökçearaslan et al., 2016), and the acceptance of bodily appearance (Liu, Sun, Li, & Zhou, 2020). In addition, a negative relationship was found between smartphone addiction and the goal, which is one of the elements of identity function, and also between smartphone addiction and self-regulation skills, as well as elements of future and harmony in relation to the control element (Bian & Leung, 2014; Kim, 2017; Lepp, Barkley, & Karpinski, 2014; Van Deursen, Bolle, Hegner, & Kommers, 2015).

In conclusion, when the literature was reviewed, it was noted that studies suggested the relationship between smartphone addiction and identity function. However, these studies were far from explaining this relationship. Therefore, it is one of the aims of this study to reveal the relationship between smartphone addiction and identity function, which is the application of identity to social life and is one of the tasks of high school students in their adolescence period.

The Mediating Role of Alexithymia

The concept of alexithymia is generally defined as the difficulty in recognizing and expressing emotions (Hozoori & Barahmand, 2013). It is generally accepted that it consists of six components. These are, difficulty in recognizing emotions, difficulty in expressing emotions, decreasing experiences involving emotions, being mostly oriented toward cognitive thinking, and a decrease in fantastic and symbolic thinking skills (Taylor & Baby, 2000). In the modern period, adolescents with an increasing tendency toward smartphone addiction are faced with problems in many areas. One of them is the difficulty they experience in recognizing and expressing their own and others' emotions (Kuss & Griffiths, 2015). At the same time, the difficulty of recognizing and expressing the emotions, that is, the level of alexithymia, for adolescents who are in the identity formation phase, negatively affects their identity development (Gül et al., 2020).

No study was found in the literature examining the relationship between smartphone addiction, alexithymia level, and identity function. However, previous studies have investigated the level of smartphone addiction and alexithymia, which demonstrate a positive relationship between them (Cengiz-Turan, 2020; Gao et al., 2017; Elkholy, Elhabiby, & Ibrahim, 2020; Mei, Xu, Gao, & Ren, 2018; Özen & Topcu, 2017). In addition, the relationship between alexithymia and identity functions has also been examined in previous studies. When previous studies were reviewed, it was seen that there were very few studies directly examining the relationship between alexithymia level and identity functions, and these studies demonstrated a negative relationship between them (Kapeleris & Paivio, 2014; Gül et al., 2020).

Thus, the relationship between smartphone addiction, alexithymia, and identity function can be seen in studies and theoretical explanations. It is seen that there is a positive relationship between smartphone addiction and alexithymia level, and a negative relationship between alexithymia and identity function. In light of this information, it is important to examine the mediating effect of alexithymia level on a meaningful explanation of the identity function of smartphone addiction. With this framework, this study aims to examine the relationship between smartphone addiction, alexithymia, and identity functions. In light of this goal, the following hypotheses will be examined:

H₁ = Smartphone addiction in high school students negatively predicts the identity function.

H₂ = Smartphone addiction in high school students positively predicts the alexithymia level.

H₃ = Alexithymia level in high school students negatively predicts the identity function.

H₄ = Alexithymia level in high school students mediates smartphone addiction to predict identity functions.

Methods

Participants

The study group included 460 participants who were students attending Anatolian High Schools in four districts of Istanbul, and they were identified by a simple random sampling method.

Among the participants, 251 (54.6%) were female and 209 (45.4%) were male. While the average age of students between the ages of 14 and 18 years was 15.87 years, the standard deviation (SD) was 1.28. Everyone in the study group used smartphones. The average daily smartphone usage was found to be 4.90 hours (SD = 1.11). At the beginning of the study, the necessary permissions were obtained from the Aksaray University Human Research Ethics Committee regarding the procedure (No. 2021/01-48). In addition, necessary legal permissions were obtained for the diagnostic scales to be applied to the participants. Only students who volunteered were included as participants of this study, and the necessary information about the goal and content of the study was provided to them by the researcher.

Data Collection Tools

Smartphone Addiction Scale-Short Version

The smartphone addiction scale was developed by Kwan et al. (2013). The adaptability of the scale to the Turkish population was validated by Noyan, Darcin, Nurmedov, Yilmaz, & Dilbaz (2015). It is a 6-point Likert type scale consisting of 10 items. The lowest score that can be obtained from the scale is 10 and the highest score is 60. Cronbach's alpha reliability coefficient of the scale was calculated as 0.87, and the test – retest reliability coefficient was calculated as 0.93.

Identity Function Scale

The identity function scale was developed by Serafini, Maitland, & Adams (2006). It was adapted to Turkish culture by Demir (2015). The scale was prepared in a 5-point Likert style consisting of 15 items. It has five sub-dimensions: structure, harmony, goal, future, and control. According to the confirmatory factor analysis, it was seen that the model-data fit was good ($\chi^2/df = 1.96$, goodness of fit GFI = 0.91, the comparative fit index (CFI) = 0.93, root mean square error of approximation (RMSEA) = 0.06, non-normed fit index (NNFI) = 0.90, standardized root mean square residual (SRMR) = 0.05). Cronbach's alpha reliability coefficient for the sub-dimensions of the scale was calculated to be between 0.70 and 0.80 and the test – retest reliability coefficient was calculated to be between 0.60 and 0.80.

Toronto Alexithymia Scale

The scale was developed by Bagby, Parker, & Taylor (1994), and adapted to Turkish form by Güleş et al. (2009). This is a 5-point Likert style scale consisting of 20 items. It has three sub-dimensions: difficulty identifying feelings, difficulty expressing feelings, and expressive thinking. Cronbach's alpha reliability coefficient of the scale was found to be 0.78 for the total. Cronbach's alpha reliability coefficient was calculated between 0.57 and 0.80 for the sub-dimensions, and the test – retest reliability coefficient was calculated between 0.60 and 0.80. In this context, the expressive thinking sub-dimension with a low Cronbach's alpha reliability coefficient was not used in this study.

Personal information form

The form was created by the researcher and it included questions related to age, gender, and daily smartphone usage.

Data Analysis

Since this study aims to reveal the relationship between variables, correlation analysis and descriptive statistical analysis were first

performed. The SEM (structural equation model) was used to test the mediation prediction of the alexithymia level between smartphone addiction and identity function. Measurement model analysis was performed for decomposition validity, which is a prerequisite for this analysis. While determining this measurement model, the model-data fit was examined by comparing alternative measurement models. With this comparison, the goodness of fit values of the proposed measurement model according to Gürbüz (2019) were compared with alternative measurement models. Following these, other analyses were made within the framework of the four conditions determined by Baron and Kenney (1986), for the mediation analysis. These conditions should first significantly predict the predictive variable (smartphone addiction) and the outcome variable (identity function). Second, the predictive variable (smartphone addiction) should significantly predict the mediator variable (alexithymia level). Third, it should significantly predict the outcome variable (identity function) of the mediator variable (alexithymia level). Finally, when the mediator variable (alexithymia level) is included in the analysis with the predictive variable (smartphone addiction), the predictive variable's predictability on the outcome variable decreases, and significantly predicts the outcome variable in the mediator variable. Furthermore in this study, the bootstrapping analysis proposed by Preacher and Hayes (2008) was used for mediator variable analysis within the framework of SEM analysis. With this analysis, the bootstrapping confidence interval and value are created with 5000 resamplings. If the confidence interval created in this way does not contain zero value, the mediation analysis is considered to be significant.

For SEM analysis, the model fit values suggested by Hu and Bentler (2003) were used. Accordingly, if the χ^2/df (chi square/degree of freedom) value is less than three, it is considered a good fit. In addition, if the RMSA and SRMR values are less than 0.08, it is considered as an acceptable fit, but if they are less than 0.05, it is considered a good fit. Along with this, if the GFI, CFI, and TLI are greater than 0.95, it is a good fit, and if they are greater than 0.90, it is an acceptable fit. SPSS 25 and AMOS 23 package programs were utilized in the analysis of the data. The margin of error in the study was determined as 0.01.

Results

Preliminary Analyses

First, the Mahalanobis distance was calculated in order to determine the extreme values. The Mahalanobis distance is used to determine how far a variable is from the averages and centers of other variables. In this way, extreme values can be determined (Esen & Timor, 2019). In this framework, six data that were found to be extreme values were excluded from the study. In addition, Herman's single-factor analysis was performed for common method bias. As a result of this analysis, 25% of it was explained with a single-factor structure. Podscoff et al. (2003) seems to provide the value required to avoid the common method bias problem. It was decided to conduct the SEM analysis within the framework of all these results.

The descriptive statistics (mean, SD, kurtosis, and skewness values) and the correlation information of the variables in this study are given in Table 1. Within this framework, the variables had values between skewness (−0.53 and 0.37) and kurtosis

Table 1.
Correlation Between Variables

Variable	1	2	3
1. Smartphone addiction	–	–	–
2. Alexithymia level	0.40*	–	–
3. Identity function	– 0.34*	– 0.40*	–
Mean	27.74	29.46	56.80
SD	11.14	9.02	8.38
Skewness	0.37	– 0.53	– 0.36
Kurtosis	0.32	– 0.29	0.20
Cronbach's α	0.90	0.88	0.87
McDonald's ω	0.90	0.88	0.87

* $p < .01$.

SD, standard deviation.

(–0.29 and 0.32). These values met the criteria of Tabachnick and Fidell (2013), that the skewness and kurtosis value should be between +1.5 and –1.5 for normal distribution. Besides, Cronbach's alpha was found between the values $\alpha = 0.87$ and 0.90. Along with this, McDonald's omega was used, since in recent years it has been found to be more reliable than Cronbach's alpha for SEM analysis (Hayes & Coutts, 2020). In this study, McDonald's omega was found between ($\omega = 0.87$ and 0.90).

The results of the analysis (as seen in Table 1), revealed that smartphone addiction was positively correlated with alexithymia level ($r = 0.40$, $p < .01$) and was negatively ($r = -0.34$, $p < .01$) significantly correlated with the identity function. In addition, alexithymia was found to be significantly negatively associated with the identity function ($r = -0.40$, $p < .01$).

SEM

Measurement model

In this study, the measurement model was analyzed with the alternative model strategy in order to examine the compatibility of the predicted structures with the data. The results of the analysis revealed that (as seen in Table 2) the predicted model fit values were within acceptable values ($\chi^2/df = 2.12$, $p < .01$, $RMSA = 0.05$, $SRMR = 0.05$, $GFI = 0.91$, $CFI = 0.94$, $TLI = 0.93$). In the light of these findings, it can be said that the data fit of the predicted model is good, and the observed variables represent the implicit variables harmoniously.

Table 2.
Goodness of Fit Values for Models

							Model comparison			
Models	χ^2	df	χ^2/df	CFI	SRMR	RMSEA		$\Delta\chi^2$	Δdf	$p(\Delta\chi^2)$
1. Three-factor model ^a	62.3*	29	2.12	0.94	0.05	0.05				
2. Four-factor model	11.96*	3	3.39	0.87	0.06	0.07	2 vs.1	50.34	26	.00
3. Seven-factor model	16.37*	6	2.64	0.86	0.05	0.06	3 vs.1	45.93	314	.00
4. Single-factor model	41.30	6	6.51	0.50	0.11	0.11	4 vs.1	35.01	336	.31

* $p < .01$ ^a, suggested model.Table 3.
Structural Model Analysis Results

Prediction Variables	Result Variable			
	Alexithymia Level		Identity Function	
	β	SE	β	SE
Smartphone Addiction (Total effect)			–0.37*	0.02
R ²			0.14	
Smartphone Addiction	0.43	0.04		
R ²	0.19			
Smartphone Addiction (Direct effect)			–0.18*	0.00
Alexithymia Level (0.04)			–0.43*	
R ²			0.29	
Indirect Effect			–0.19*, CI (–0.25 – .013)	

* $p < .01$

CI, confidence interval is the lower and upper value in parentheses.

Bootstrap resampling = 5000.

SE, standard error.

Structural model

In this study, after the measurement model was verified, the hypotheses were tested within the framework of the implicit variable structural model. Firstly, it was examined whether smartphone addiction could significantly predict identity function. As seen in Table 3, it was found that smartphone addiction predicted identity function negatively and significantly ($\beta = -0.37$; $p < .01$). Additionally, model fit values were found to be within acceptable values ($\chi^2/df = 2.78$, $p < .01$, $RMSA = 0.06$, $SRMR = 0.05$, $GFI = 0.94$, $CFI = 0.96$, $TLI = 0.95$).

In this study, a separate model was established in which the level of alexithymia was the mediator variable to test other hypotheses. As seen in Table 3, smartphone addiction positively and significantly predicted the level of alexithymia ($\beta = 0.43$; $p < .01$). In addition, it was found that the level of alexithymia predicted identity function negatively and significantly ($\beta = -0.43$; $p < .01$). Along with this, including the level of alexithymia, the mediator variable, and the model, it was found that the path from smartphone addiction to identity function was significant ($\beta = -0.18$; $p < .01$). The level of alexithymia explained 29% of the

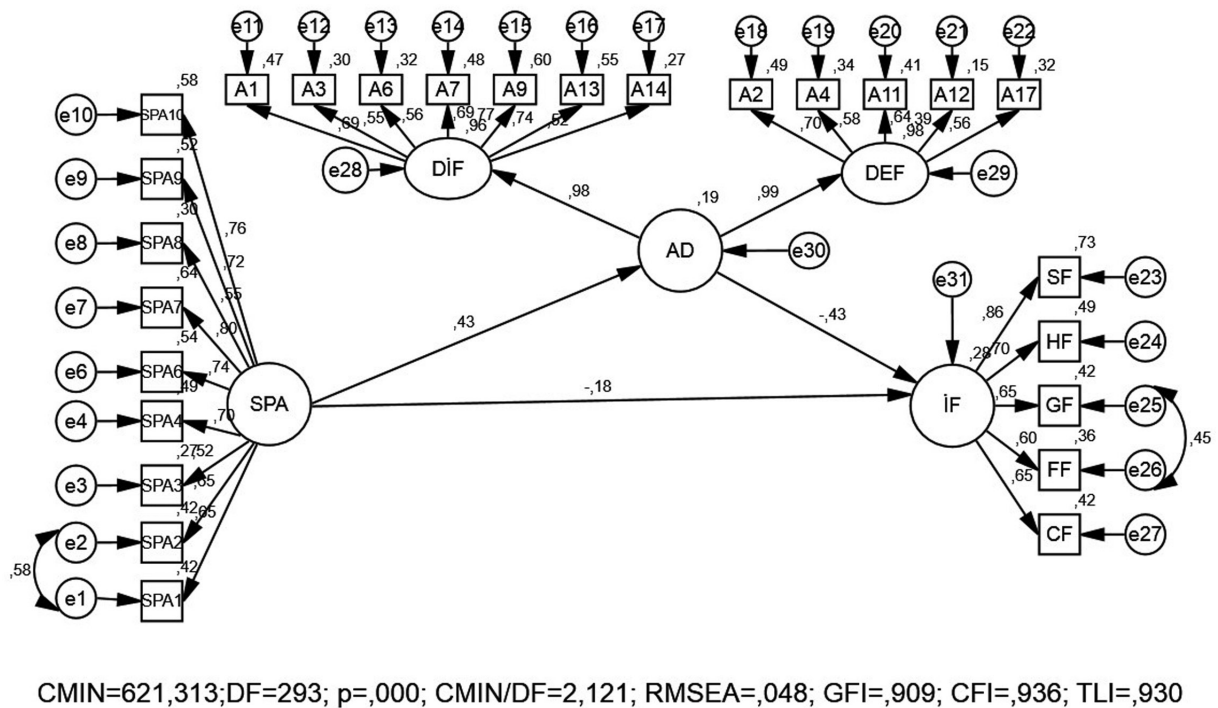


Figure 1. Standardized factor loadings for the final structural model.

SPA; Smartphone Addiction, AD; Alexithymia Level, DIF; Difficulty Identifying Feelings, DEF; Difficulty Expressing Feelings, IF; Identity Function, SF; Structure Function, HF; Harmony Function, GF; Goal Function, FF; Future Function, CF; Control Function

variance in identity function, together with smartphone addiction. Finally, according to the result of the bootstrap analysis, it was found that the level of alexithymia of smartphone addiction significantly predicted identity function with its mediating effect ($\beta = -0.19$, 95%, CI [-0.25 - .013]). Also, the model fit values were found to be within acceptable values ($\chi^2/df = 2.12$, $p < .01$, $RMSA = 0.05$, $SRMR = 0.05$, $GFI = 0.91$, $CFI = 0.94$, $TLI = 0.93$). The final result of the analysis is given in Figure 1.

Discussion

This study aimed to examine the relationship between smartphone addiction, alexithymia level, and identity functions. As the results of the analysis show, smartphone addiction negatively predicts the identity function. In the literature, there are many studies with findings similar to those of this research. It was found in the studies that smartphone addiction negatively predicted the structure element (Gökçearaslan et al., 2016; Lee et al., 2018; Liu et al., 2020), harmony element (Bian & Leung, 2014), goal element (Kim, 2017), future element (Lepp et al., 2014), and control element (van Deursen et al., 2015), which are among the identity function elements. In light of the literature, it is seen that the use of smartphones by adolescents at the level of addiction negatively affects their development of a suitable structure about their identity, affects their harmony with their environment, negatively affects their personal control skills, causes a decrease in setting expectations for the future and in the efforts toward their goals. Since all these factors are also a function of identity, it can be said that smartphone addiction in high school students negatively affects their identity function.

One of the findings obtained as a result of the analysis performed in this study is that the smartphone addiction positively predicts the level of alexithymia, and parallel results were found in the literature. Kuss & Griffiths (2015) found that smartphone addiction was associated with adolescents' difficulty in recognizing and expressing their emotions. In addition, it was found in the literature that adolescents' engagement with smartphones, which reaches the level of addiction, positively predicted the level of alexithymia (Gao et al., 2017; Elkholy et al., 2020; Mei et al., 2018; Özen & Topcu, 2017). Together with these, in the literature, the mediating role of alexithymia was examined in a study in which smartphone addiction addressed the altruistic behaviors of young people, and it was found that smartphone addiction positively and significantly predicted the level of alexithymia (Hao, Jin, Lyu, & Rabia Akram, 2020). Besides, Scimeca et al. (2016) also stated the same finding. In the framework of the literature, it can be thought that high school students' addictive relationship with a mechanical device such as a smartphone decreases their connection with their emotions, and therefore, positively predicts the level of alexithymia.

One of the findings of this study was that the level of alexithymia negatively predicts identity function, and parallel results were found in the literature (Kapeleris & Paivio, 2014; Gül et al., 2020). In addition, in a study examining the level of alexithymia of adolescents in a psychosocial framework, it was found that the alexithymia level significantly and negatively affected the identity function of adolescents (Powell, Coll, Trotter, Thobro, & Haas, 2011). In another study, it was found that the level of alexithymia in students negatively predicted their identity skills (Sangani & Jangi, 2019). Thus, emotions have an important place

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in the process of high school students' formation of their identity structure. The emotional contact is important in order to create a harmonious network in social relationships, and emotions are at the center of these factors while the adolescent establishes goals and future expectations. Emotional factors also find a place in personal control and self-regulation. All these factors may explain why high school students' alexithymia level predicts identity function negatively.

In conclusion, in this study, the partial mediation of the alexithymia level between smartphone addiction and identity functions was found to be significant. No similar study was found in the literature. When the literature was examined, it was found that smartphone addiction reduced the adolescents' connection with their emotions (Yavuz, Altan, Bayrak, Gündüz, & Bolat, 2019) and that smartphone addiction increased alexithymia by negatively reflecting on the individuals' social and emotional relationships (Hao et al., 2019). Smartphone addiction negatively affects the process of recognizing and expressing the emotions necessary for adolescents to develop their identity function harmoniously; in other words, it increases the level of alexithymia. Kapeleris & Paivio (2014) and Gül, Aktaş, Kaya, & Morsünbül (2020) also revealed in their studies that the level of alexithymia had a negative effect on identity functions. Thus, in the light of the literature, it can be said that high school students' development of addiction to smartphones has an effect on their difficulties in recognizing and expressing their emotions, and thus, negatively affects their identity function.

Limitations and Directions

This study had some limitations. The study group consisted of high school students, and was conducted using diagnostic scales. In addition, the possibility of a bidirectional relationship between smartphone addiction, alexithymia, and identity function is one of the limitations of the study. Therefore, in future studies, a larger study including university students can be conducted. Experimental work on subjects similar to this study can also be performed. For future studies, researchers can retest the model suggested in this study and add other variables. Finally, studies that address different variables that mediate the relationship between smartphone addiction and identity function can be suggested for future studies.

Although it had some limitations, this was a noteworthy study since it revealed the relationship of smartphone addiction with identity function and examined the mediating role of the alexithymia level. In the framework of the study, psychological counselors at the high school level can formulate psychosocial intervention plans addressing the negative impact of smartphone addiction on the difficulty in recognizing emotions and on identity functions, in addition to focusing on prevention of smartphone addiction.

Ethics Committee Approval: Ethical committee approval was received from the Aksaray University Human Research Ethics Committee regarding the procedure (No. 2021/01-48).

Informed Consent: Necessary legal permissions were obtained for the scales to be applied to the participants.

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