Abstract

Purpose: This study examined the effects of smartphone addiction, parental attachment, and peer attachment on impulsivity among dropout adolescents, using 318 adolescents who participated in the fifth year of the Panel Survey of School Disengaged Adolescents.

Method: To investigate the impact of smartphone addiction on impulsivity among school dropouts, we conducted inter-variable correlation analysis, three-step mediated regression analysis, and Sobel test.

Results: First, the correlations between impulsivity, smartphone addiction, parental attachment, and peer attachment of dropout adolescents were analyzed, and the results showed that parental attachment and peer attachment were negatively related to impulsivity and smartphone addiction were positively related to impulsivity. Second, the mediating effects of parental attachment and peer attachment on the effects of smartphone addiction on impulsivity of dropout adolescents were analyzed, and the results showed that both parental attachment and peer attachment had mediating effects on reducing impulsivity of dropout adolescents.

Conclusion: This study is significant in that it confirms the influence of parental attachment and peer attachment on smartphone addiction and impulsivity among dropout adolescents. Therefore, based on the findings of this study, various educational interventions are needed to reduce the impulsivity of dropout adolescents through various pathways of adolescent impulsivity, and at the same time, programs that promote healthy parent-child relationships and peer relationships should be actively implemented as a preventive measure.

Keywords: Smartphone Addiction, Parental Attachment, Peer Attachment, Impulsivity, School-Disengaged Adolescents

1. Introduction

Adolescence is a transitional developmental stage between childhood and adulthood in which adolescents experience many frustrations and conflicts psychologically and rebel against the authority and interference of the older generation environmentally, so they face various problematic situations compared to other periods. Impulsivity, one of the typical behavioral traits of this period, refers to the tendency to act on impulse rather than rational thought[1] and to fail to control oneself, such as the inability to control anger[2]. High levels of impulsivity in adolescence are likely to lead to delinquency and deviant behavior in vulnerable environments[1], and the interaction between impulsivity and environmental vulnerability can be a powerful factor in maintaining antisocial behavior in adolescents[3]. In particular, it has been reported that dropouts are more environmentally vulnerable than their peers, leading to increased impulsivity[1][2]. Impulsivity has also been reported to be a factor in triggering cyberbullying and various delinquent behaviors[4][5].

According to the '2022 Basic Statistics on Education' survey released by the Ministry of Education, the total number of adolescents who dropped out of school in elementary, middle, and
high schools nationwide was 42,755, representing 0.8% of the total enrollment of 5,323,075 students[6]. Recently, the dropout rate of Korean youth by education level was 0.8% in 2019, 0.5% in 2020, and 0.5% in 2021 for middle school students, and 1.7% in 2019, 1.1% in 2020, and 1.5% in 2021 for high school students[7]. In other words, about 50,000 school-age children leave school every year, and the number of dropout youth is estimated to be about 370,000[8]. While the reasons for dropping out of school are varied, including personal reasons and school maladjustment, the rate of psychological dropouts has been increasing in recent years, indicating that many dropouts are experiencing psychological difficulties[9][10]. After dropping out of school, dropouts experience psychological challenges such as prejudice, disregard, discrimination, stigma, stereotyping, and conflict with parents[10][11][12]. They also experience increased stress such as frustration with their situation, anxiety about the future, and lack of freedom in their lives[9][11], which can lead to poor interpersonal relationships and increased problem behaviors[13][14][15].

In particular, negative interpersonal relationships, problematic behaviors, and psychological insecurities experienced by dropouts have been consistently reported as important factors that negatively affect self-esteem[16][17] and lead to psychological instability, resulting in a loss of control over one's situation and impulsivity to act hastily and impulsively[18][19]. In other words, the negative evaluations experienced by dropout adolescents reduce their ability to regulate and control their own behavior, leading to difficulties in controlling negative emotions such as anger and the tendency to improvise and act impulsively to escape reality. Furthermore, impulsivity leads to negative psychological traits in adolescence[20], and difficulties in controlling emotions lead to an inability to control impulses, leading to aggressive problem behavior[21]. Impulsivity is an important predictor of smartphone addiction in adolescents, and studies have consistently reported that impulsivity plays an important role in pushing adolescents toward smart addiction[22][23]; specifically, higher levels of impulsivity are associated with higher levels of smartphone preoccupation and compulsive use, and more severe smartphone addiction leading to impaired daily functioning[24][25].

In addition, due to anxiety and stress, dropout adolescents spend more time on their smartphones than their peers[26] and are more immersed in their smartphones, making them vulnerable to addiction[10][27]. In particular, the correlation between time spent on smartphones and smartphone addiction is high, and smartphone addiction is highly correlated with delinquency and problem behavior[28][29][30][31], raising the seriousness of smartphone addiction and the need for intervention methods. In addition, disconnected youth are less educated, controlled, and supervised in their smartphone use, which increases their risk of addiction[32]. In particular, disconnected youth have a range of psychological maladjustments and emotional challenges, including depression, anxiety, and feelings of alienation and low self-esteem, in addition to common developmental challenges experienced by most of their peers[33][34][35]. These emotional difficulties can manifest as smartphone addiction and impulsivity[24][25]. Therefore, there is an urgent need for research on the psychological and emotional effects of smartphone addiction among school dropouts.

Parental and peer factors are generally considered to be the most important influences on the psychology and emotions of adolescents.

Parents are the closest environment that influences adolescent growth and development and are more influential and important than many other factors that affect adolescent development. Parents choose to model attitudes and behaviors that they believe are ideal for their children’s healthy social-emotional development[36] and convey meaningful values and norms to their children through positive interactions with them. Consequently, parental overprotective parenting[37][38], excessive control[25], and closed and dysfunctional parent-child communication[39] contribute to adolescent smartphone addiction. Conversely, affectionate and regular parenting contributes to secure parental attachment and positive emotional regulation in adolescents[40]. Furthermore, secure parental attachment and a good parent-child emotional re-
relationship make children emotionally stable[41] and positively affect their socioemotional development, such as emotional intelligence, such as empathy and emotional regulation, as well as their ability to express their emotions[42]. In other words, secure parental attachment is an important positive influence on adolescents' psychoemotional development[43]. Therefore, this study aims to examine the influence of parental attachment on psychoemotional factors such as smartphone addiction and impulsivity among school dropouts.

Adolescence is a time when social relationships expand compared to childhood, and it is highly influenced by peer attachment, which emphasizes the importance of support, understanding, recognition, and intimacy through peer relationships. Peers are people who are similar in age and developmental level and interact with them in daily life, and compared to adults, adolescents rate peers who spend a lot of time with them and share thoughts, feelings, experiences, and problems as important attachment partners[44]. The peer attachments they form influence their ability to adapt to the external environment and maintain a positive psychological state[45]. On the other hand, low peer attachment in adolescence, or difficulty in forming peer relationships, can lead to negative psychological states such as loneliness, which can lead to internet addiction[46]. This suggests that peer attachment performs various functions in the psychological and emotional aspects of adolescents through interpersonal relationships[47]. In addition, Internet addiction and smartphone use have been linked to impulsivity in many studies[48][49][50][51], so it is speculated that the psychological and emotional aspects of peer attachment may mediate the relationship between smartphone use and impulsivity. In particular, it is important to note that most of the most important peer relationships in adolescent interpersonal life typically take place in the context of school, and since dropouts are often excluded from these spaces, they may fail to form peer attachments that consist of intimacy and communication, which means that they may experience a decrease in life satisfaction due to loneliness and fear. Furthermore, as dropouts are more likely to be addicted to smartphones than their peers, which is highly correlated with loyalty, it is necessary to examine the attachment relationships between parents and peers in the dropout's immediate environment.

Therefore, this study aims to examine impulsivity, one of the psychoemotional characteristics of dropout adolescents, by focusing on the factors of smartphone addiction, parental attachment, and peer attachment. In addition, we will examine the influence of parental and peer attachment in the relationship between smartphone addiction and impulsivity.

According to the purpose of this study, the following research questions were set, and the research model is shown in <Figure 1>.

**First**, do smartphone addiction, parental attachment, and peer attachment affect impulsivity in dropout adolescents?

**Second**, do parental attachment and peer attachment mediate the relationship between smartphone addiction and impulsivity among dropout adolescents?

*Figure 1. Continuous multiple regression model.*
2. Subjects and Methods

2.1. Subjects

The data of the panel survey on dropout youth utilized in this study were collected by the National Youth Policy Institute (NYPI) to collect detailed information on the developmental and environmental characteristics of dropout youth and followed up for five years from 2013[52]. To obtain the sample of dropout youth, the NYPI obtained a list of dropout youth from schools and related institutions (e.g., GED schools, alternative education institutions, youth counseling and welfare centers, vocational training institutions, etc.) across the country in 2013, and then adjusted the list to avoid over-sampling from certain institutions, resulting in an initial sample of 776 youth[52]. The survey was conducted in a face-to-face interview by a professional researcher who asked the targeted youth questions and recorded their responses in a questionnaire. This study analyzed the data from the fifth year of the survey, excluding missing data and outliers, and finally analyzed 318 participants[53]. The variables analyzed in this study are shown in <Table 1>.

Table 1. General characteristics of the research subjects.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Classification</th>
<th>N(%)</th>
<th>Variable</th>
<th>Classification</th>
<th>N(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Male</td>
<td>167(52.5)</td>
<td>① Very ugly</td>
<td>10(3.1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>151(47.4)</td>
<td>②</td>
<td>41(12.8)</td>
<td></td>
</tr>
<tr>
<td>Withdrawal and reinstatement status</td>
<td>Out of regular secondary school (including non-high school/unaccredited alternative school, GED passers, and non-completers)</td>
<td>145(45.5)</td>
<td>③</td>
<td>71(22.3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Attending a full-time secondary school (including breaks/vacations)</td>
<td>9(2.8)</td>
<td>④ Moderate</td>
<td>134(42.1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Graduated from regular high school (excluding GED)</td>
<td>19(5.9)</td>
<td>⑤</td>
<td>45(14.1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Attended college (including breaks/vacations)</td>
<td>118(37.1)</td>
<td>⑥</td>
<td>17(5.3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Graduated from college</td>
<td>16(5)</td>
<td>Health</td>
<td>Not healthy at all</td>
<td>13(4)</td>
</tr>
<tr>
<td></td>
<td>Dropped out of college</td>
<td>11(3.4)</td>
<td>Unhealthy</td>
<td>66(20.7)</td>
<td></td>
</tr>
<tr>
<td>Current housing type</td>
<td>Living with your parents</td>
<td>226(71)</td>
<td>Healthy</td>
<td>195(61.3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Renting</td>
<td>55(17.2)</td>
<td>Very healthy</td>
<td>44(13.8)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Subletting</td>
<td>9(2.8)</td>
<td>No response</td>
<td>4(1.2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>School dormitory</td>
<td>6(1.8)</td>
<td>Living with parents</td>
<td>223(70.1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Company dormitory</td>
<td>2(0.6)</td>
<td>Living independently of parents</td>
<td>47(14.7)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Home of a relative or other acquaintance (senior, friend)</td>
<td>14(4.4)</td>
<td>Temporarily living apart from parents</td>
<td>44(13.8)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>6(1.8)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: N=318.

2.2. Research instruments

2.2.1. Smartphone addiction
To measure smartphone addiction, we used the 15-item Youth Smartphone Addiction Test of the Korea Information Society Agency[54], which was shortened to 8 items suitable for dropout youth by the researchers of the Panel Survey on Dropout Youth. The scale consists of items such as "I enjoy using my smartphone more than being with my family and friends," "I would find it hard to cope if I couldn't use my smartphone," and "I have tried to reduce the amount of time I spend on my smartphone, but I have been unsuccessful." Each item is scored from 8 to 32 on a 4-point Likert scale ranging from 1, "Not at all," to 4, "Very much so. In this study, higher scores indicate higher smartphone addiction. In this study, the reliability of the instrument, Cronbach's $\alpha$, was .76.

2.2.2. Impulsivity

To measure impulsivity, we utilized a questionnaire from the Dropout Youth Panel Survey. This instrument is an adaptation of Arneklev et al.'s[55] self-control scale. There are five items, including "I put the cart before the horse," "I quickly give up when things get difficult and complicated," and "I enjoy risky and exhilarating activities," with response categories ranging from 1, "Not at all," to 4, "Very much so," on a 4-point Likert scale ranging from 5 to 20, with higher scores indicating higher levels of impulsivity. In this study, the instrument had a Cronbach's $\alpha$ reliability of .79.

2.2.3. Parental attachment

To measure parental attachment, we utilized items from the Panel Survey of Dropout Youth. This instrument is part of the scale used by Choi et al.'s[56] in their study on support measures to promote mental health of children and adolescents, and consists of 8 questions, including 5 questions on parental emotional support and 3 questions on economic support. In this study, the 5-item parental emotional support scale, excluding economic support, was used to measure the level of emotional parental attachment among dropout adolescents. The response items include "My parents know and understand me," "They treat me warmly," and "They listen to my problems," and the response categories range from 5 to 20 on a 4-point Likert scale ranging from 1, "Not at all true," to 4, "Very true." Parental attachment is associated with higher scores. Higher scores on parental attachment indicate higher levels of parental emotional attachment. The reliability of the instrument in this study, Cronbach's $\alpha$, was .92.

2.2.4. Peer attachment

To measure peer attachment, we utilized a scale adapted from Lee et al.'s scale[57], which was selected and adapted by the researchers of the Panel Study of Dropout Youth. The scale consists of three items, "My friends understand me well," "I can talk to my friends when I want to confide in them," and "I trust my friends," and each item is scored from 3 to 12 on a 4-point Likert scale ranging from 1, not at all true, to 4, very true. In this study, higher scores indicate higher peer attachment. The Cronbach's $\alpha$ reliability of the instrument in this study was .85.

2.3. Analysis method

This study used SPSS/Win 24.0 program, and frequency and percentage were calculated after frequency analysis to find out the general characteristics of the research subjects; mean, standard deviation, and Pearson's correlation coefficient were used to find out the relationship between smartphone addiction, parental attachment, peer attachment, and impulsivity; and parallel multiple mediator model analysis was conducted to find out the relative influence of the variables. To examine the effect of smartphone addiction on the impulsivity of school-disengaged adolescents through the mediation of parental attachment and peer attachment, we conducted a three-step mediated regression analysis and Sobel test as proposed by Baron and Kenny[58].
3. Results

3.1. Descriptive statistics of research variables

The mean and standard deviation were calculated to determine the level of impulsivity, smartphone addiction, parental attachment, and peer attachment perceived by dropout adolescents, and the results are shown in the following Table 2. The mean of smartphone addiction was 13.43 (SD=3.78), the mean of parental attachment was 8.89 (SD=2.70), the mean of peer attachment was 14.78 (SD=2.97), and the mean of impulsivity was 9.32 (SD=1.69).

Table 2. Descriptive statistics of key variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Min</th>
<th>Max</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smartphone addiction</td>
<td>8</td>
<td>26</td>
<td>13.43</td>
<td>3.78</td>
</tr>
<tr>
<td>Parental attachment</td>
<td>5</td>
<td>18</td>
<td>8.89</td>
<td>2.70</td>
</tr>
<tr>
<td>Peer attachment</td>
<td>5</td>
<td>20</td>
<td>14.78</td>
<td>2.97</td>
</tr>
<tr>
<td>Impulsivity</td>
<td>3</td>
<td>12</td>
<td>9.32</td>
<td>1.69</td>
</tr>
</tbody>
</table>

Note: N=318.

3.2. Correlation of research variables

Before analyzing the correlation between impulsivity, smartphone addiction, parental attachment, and peer attachment of dropout adolescents, skewness and kurtosis were calculated to verify the normality of each variable. As a result, the absolute value of skewness of all variables ranged from .05 to .65, which is less than 3, and the absolute value of kurtosis ranged from .07 to 1.91, which is less than 10, fulfilling the assumption of normality[59].

The correlation results between impulsivity, smartphone addiction, parental attachment, and peer attachment among dropout adolescents are shown in Table 3. Based on the dependent variable, impulsivity, parental attachment (r=-.27, p<.01) and peer attachment (r=-.32, p<.01) were negatively correlated. In contrast, smartphone addiction (r=.23, p<.01) was positively correlated. Additionally, smartphone addiction was negatively correlated with parental attachment (r=-.21, p<.01) and peer attachment (r=-.14, p<.05), and positively correlated with parental and peer attachment (r=.37, p<.01).

Table 3. Correlations between impulsivity, smartphone addiction, parental attachment, and peer attachment.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Smartphone addiction</th>
<th>Impulsivity</th>
<th>Parental attachment</th>
<th>Peer attachment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smartphone addiction</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impulsivity</td>
<td>.23**</td>
<td>-.27**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Parental attachment</td>
<td>-.21**</td>
<td>-.32**</td>
<td>.37**</td>
<td>1</td>
</tr>
<tr>
<td>Peer attachment</td>
<td>-.14*</td>
<td>-.55</td>
<td>-.56</td>
<td>1</td>
</tr>
<tr>
<td>Skewness</td>
<td>.65</td>
<td>.05</td>
<td>-.55</td>
<td>-.56</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>.07</td>
<td>-.57</td>
<td>1.37</td>
<td>1.91</td>
</tr>
</tbody>
</table>

Note: *p<.05, **p<.01, ***p<.001.

3.3. Mediating effects of parental attachment and peer attachment on the relationship between impulsivity and smartphone addiction

To examine the relative influence of the variables on the impulsivity of dropout adolescents, a parallel multiple mediator model regression analysis was conducted with smartphone addic-
tion, parental attachment, and peer attachment as independent variables and grit as the dependent variable. Before conducting the regression analysis, the Durbin-Watson value (1.87–2.05) was checked to confirm the independence of the residuals, and the VIF value (1.05–1.19) was checked to confirm multicollinearity, and it was found that there was no abnormality[59].

The relative explanatory power of the variables affecting the impulsivity of dropout adolescents is shown in <Table 4>. First, smartphone addiction, parental attachment, and peer attachment were found to have an explanatory power of 15.4% for impulsivity (F=18.99, p<.001). These results suggest that excessive smartphone dependence and parental and peer attachment can be explained as variables affecting impulsivity among school dropouts.

To determine the mediating effects of parental attachment and peer attachment on the effects of smartphone addiction on impulsivity, a three-stage mediated regression analysis was conducted. In the first stage, the independent variable, smartphone addiction, had a significant negative effect on the mediating variables, parental attachment (B=-.17, p<.001) and peer attachment (B=-.06, p<.001). In step 2, the independent variable, smartphone addiction, had a significant positive effect on the dependent variable, impulsivity (B=.16, p<.001). Finally, in the third step, both independent variables and mediators were entered to determine their effects on impulsivity, and the mediators, parental attachment (B=-.14, p<.01) and peer attachment (B=-.38, p<.001), were found to have a significant negative effect. In addition, the independent variable, smartphone addiction, had a significant positive effect on impulsivity (B=.12, p<.01), suggesting that smartphone addiction partially mediates parental attachment and peer attachment to influence impulsivity in dropout adolescents.

Table 4. Mediating effects of parental and peer attachment on the relationship between smartphone addiction and impulsivity.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE</td>
<td>B</td>
<td>SE</td>
</tr>
<tr>
<td>Constant</td>
<td>16.99</td>
<td>.60***</td>
<td>10.17</td>
<td>.35***</td>
</tr>
<tr>
<td>Smartphone addiction</td>
<td>-.17</td>
<td>.04***</td>
<td>-.06</td>
<td>.03*</td>
</tr>
<tr>
<td>Parental attachment</td>
<td></td>
<td>-.14</td>
<td>.05**</td>
<td></td>
</tr>
<tr>
<td>Peer attachment</td>
<td></td>
<td>-.38</td>
<td>.09***</td>
<td></td>
</tr>
<tr>
<td>R-sq</td>
<td>.044</td>
<td>.020</td>
<td>.052</td>
<td>.154</td>
</tr>
<tr>
<td>F-value</td>
<td>14.53***</td>
<td>6.52*</td>
<td>17.45***</td>
<td>18.99***</td>
</tr>
</tbody>
</table>

Note: *p<.05, **p<.01, ***p<.001.

The results of the Sobel test for the indirect effects in the paths of smartphone addiction → parental attachment → impulsivity and smartphone addiction → peer attachment → impulsivity are shown in Table 5. In the path of smartphone addiction → parental attachment → impulsivity, the indirect effect size was .62 and the Z value was 2.83(p<.01), indicating a mediating effect. In the path of smartphone addiction → peer attachment → impulsivity, the indirect effect size was .01 and the Z value was 1.85(p<.05), indicating a mediating effect.

Table 5. Results of the indirect effect analysis.

<table>
<thead>
<tr>
<th>Mediating effect path</th>
<th>Indirect effect</th>
<th>Z(t)-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smartphone addiction→parental attachment→impulsivity</td>
<td>0.62</td>
<td>2.83**</td>
</tr>
<tr>
<td>Smartphone addiction→peer attachment→impulsivity</td>
<td>0.01</td>
<td>1.85*</td>
</tr>
</tbody>
</table>

Note: *p<.05, **p<.01.
4. Discussion and Suggestions

This study focused on smartphone addiction among the variables that affect the impulsivity of dropout adolescents. For this purpose, parental emotional attachment as a family variable and peer attachment as a social variable were set as mediating variables, and the mediating effects of these variables were analyzed in the relationship between smartphone addiction and impulsivity. The main findings of this study are summarized and discussed as follows.

First, we analyzed the correlations between impulsivity, smartphone addiction, parental attachment, and peer attachment among dropout adolescents and found that parental attachment and peer attachment were negatively related to impulsivity, while smartphone addiction was positively related to impulsivity. In other words, the better the emotional attachment between parents and peers, the less impulsive the dropout adolescents were, while the stronger the smartphone addiction, the more impulsive they were. In addition, smartphone addiction was negatively related to parental attachment and peer attachment. Taken together, these results suggest that smartphones increase impulsivity in dropout adolescents, while positive parental and peer relationships reduce smartphone addiction and impulsivity. These findings are partially consistent with previous studies showing that Internet and smartphone addiction are positively related to impulsivity, that peer attachment is negatively related to smartphone addiction, and that parental attachment and peer attachment negatively affect negative psychological outcomes such as impulsivity.

These findings suggest that smartphone addiction, parental attachment, and peer attachment are important factors influencing psychosocial outcomes such as impulsivity among dropout adolescents. This means that the stronger the tendency to smartphone addiction, the more impulsivity, and the more social stigma and depression they may experience compared to their peers, which may lead to delinquency, problematic behavior, and impaired daily functioning. This suggests the importance of positive parental and peer relationships in reducing smartphone addiction and impulsivity among these disconnected youth.

In other words, in order to understand negative psychological behaviors such as impulsivity, it is important to know what kind of emotional bonds they have with their parents and peers. During adolescence, the more stable and positive parental attachment, which includes parents’ emotional understanding of their children, counseling, and financial support, is associated with children’s positive emotional development. Positive peer attachment, which is the development of a sense of community through good communication and increased trust with peers, is also associated with emotional stability.

Parents act as a safe haven for adolescents, and parental attachment is a very important factor for psychological and emotional stability. Due to the characteristics of school dropouts, they are prone to smartphone addiction, depression, anxiety, and other negative emotions, and have difficulty establishing positive peer relationships, so it is important for parents to show interest in their children and form a positive attachment relationship. This suggests that parental support and a stable parent-child relationship can reduce negative emotions such as depression in adolescents, help them form a positive self-concept, and enable them to cope positively with negative problems and stressful situations. In addition, as smartphone addiction affects impulsivity and adolescents who drop out of school have weak coping skills against self-stigma to internalize negative evaluations of their surroundings, it is necessary to introduce social education programs that can help adolescents mitigate impulsivity through self-control and management support programs and reduce the level of smartphone addiction.

Second, we analyzed the mediating effects of parental attachment and peer attachment in the relationship between smartphone addiction and impulsivity among dropout adolescents,
and found that both parental attachment and peer attachment have a mediating effect on reducing impulsivity among dropout adolescents. In other words, the higher the smartphone addiction, the higher the impulsivity, but in this process, parental and peer attachment can reduce the impulsivity of adolescents.

Our findings are consistent with research showing that higher parental and peer attachment is associated with lower smartphone addiction[64] and studies reporting high correlations between impulsivity and smartphone addiction[24][48]. Our findings are similar to those of a study that examined the longitudinal interrelationships of parental and peer attachment, informal stigma, and delinquency with smartphone addiction and impulsivity in adolescents[27] and the mediating effects of social stigma and impulsivity on the relationship between parental abuse and smartphone addiction[28]. These findings suggest that dropout adolescents with deficits in parental attachment may experience greater perceived social stigma, which may increase their propensity for smartphone addiction and impulsivity, leading to a variety of problematic behaviors. In particular, social stigma can lead to increased anxiety, depression, and attachment anxiety. Attachment anxiety in adolescence leads to impulsivity, which makes them more prone to smartphone addiction and is a major factor in problematic behavior[70]. However, as Hirschci and Gottfredson[71] argue, healthy psychological and emotional attachments derived from relationships with parents and peers can reduce problem behavior and impulsivity, and are an important factor in curbing smartphone addiction and negative psychological problems in adolescents[72].

Despite the fact that adolescence is a developmental stage characterized by a broader range of interpersonal relationships and less time spent interacting with parents than before, parents still play an important role in the lives of adolescents[2]. This suggests that effective and quick approaches to impulsivity and smartphone addiction among school dropouts are largely dependent on fostering parent-child attachment. Being out of school during adolescence, when social relationships are formed through peers, can lead to a variety of problems in adolescent development. Neglected attention at home and a disrupted attachment relationship with parents increase the psychosocial difficulties experienced by dropouts[73]. Despite the current recognition of the importance of attachment through the parent-child relationship for the psychological and emotional health of dropout youth, parental involvement is not as high as it should be due to practical difficulties. However, the results of this study suggest that parental factors are effective against problematic behaviors such as smartphone addiction and impulsivity, and intervention measures through parental education should be prepared.

In addition, peer attachment has been shown to be a factor in reducing smartphone addiction and impulsivity among disconnected youth. In this study, peer attachment was found to be a factor influencing adolescents' inappropriate smartphone use and addiction. These findings are similar to previous studies[74][75] that found that smartphone addiction among school dropouts was related to peer attachment and alienation. These results suggest that during adolescence, when peer relationships are important, the need to constantly connect with peers to validate one's existence and the fear of alienation and exclusion from peer relationships may lead to excessive smartphone use and addiction. Adolescence is a time when the importance of peer attachment is emphasized, and adolescents feel more alienated than in other developmental periods, and this can be seen as a dysfunctional defense mechanism that tries to solve the alienation of peer relationships through excessive smartphone use and social media activities. Because they are more likely to be socially stigmatized, depressed, and alienated than their peers, they are at a higher risk for smartphone addiction, which means they are more likely to develop impulsivity, which can lead to problematic behaviors. Therefore, in-depth and systematic research on restoring healthy peer relationships among school dropouts is needed.

Parents are still a source of security and attachment to parents is still important for disen-
gaged adolescents[68], but with the rapid physical and physiological development of adolescence, the need for independence from parents increases and attachment behaviors and interactions with parents naturally decrease[76]. In addition, during this period, adolescents feel self-esteem and confidence when they receive recognition from their peers, so their attachment to peers increases[77]. This means that when adolescents are experiencing a lot of conflicts and confusion due to their physical and emotional development and decreasing interaction with their parents, the role of peers who spend a lot of time with them and have common interests and emotional connections plays an important role in their emotional and psychological stability. Therefore, it may be more effective to increase both parental and peer attachment in order to help adolescents overcome problematic behaviors such as smartphone addiction and impulsivity.

This study hypothesized that smartphone addiction would affect impulsivity among school dropouts, and tested the mediating effects of parental attachment and peer attachment. The results showed that smartphone addiction increased impulsivity, and parental attachment and peer attachment decreased impulsivity. Impulsivity is closely related to all problem behaviors related to adolescents, including smartphone addiction, gaming addiction, pornography addiction, drinking, smoking, and running away from home[78]. In addition, people with high impulsivity are rebellious, quick to anger, less friendly and responsible toward others, and lack self-control, which makes them unacceptable to others and unable to establish harmonious relationships[79]. These characteristics can be further manifested through the virtual world of smartphones, leading to self-aggrandizement, academic disruption, poor concentration, rebelliousness, short-temperedness, and aggression toward others. In addition, the portability and immediacy of smartphones make them more attractive to adolescents with high impulsivity and self-centeredness, which increases their desire to use smartphones, which in turn leads to smartphone addiction and various problematic behaviors, forming a vicious circle. Therefore, it is necessary to consider educational programs to restore relationships with parents and peers to reduce smartphone use among disconnected adolescents, as well as educational measures to curb the impulsivity of adolescents with high levels of impulsivity and inappropriate smartphone use.

The implications and limitations of this study include the following.

First, this study is significant in that it confirms the influence of parental attachment and peer attachment on smartphone addiction and impulsivity among dropout adolescents. Therefore, based on the results of this study, various educational interventions are needed to reduce the impulsivity of adolescents through various pathways of adolescent impulsivity, and at the same time, it is necessary to actively implement programs that promote healthy parent-child relationships and peer relationships as a preventive measure.

Second, prior to prevention and education on excessive smartphone use and addiction among out-of-school youth, national implications for appropriate smartphone use should be made. In other words, it is necessary to organize a group of experts through various social complementary facilities, such as out-of-school youth support centers, to present appropriate smartphone usage guidelines, and to try a multifaceted approach for various publicity.

Finally, a limitation of this study is that the psycho-emotional characteristics and predictors were identified only from the responses of adolescents who dropped out of school. In future studies, comparative studies with adolescents from various environments, such as adolescents from multicultural families or single-parent families, would provide a more sophisticated understanding of desirable psycho-emotional characteristics and parental and peer dynamics.
5. References

5.1. Journal articles


5.2. Thesis degree


5.3. Books


5.4. Additional references


6. Appendix

6.1. Author’s contribution

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<td>- Participants in Drafting and Revising Papers ✔</td>
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