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Research Paper

An Exploratory Examination of the Relationship Between Internet Gaming Disorder, Smartphone Addiction, Social Appearance Anxiety and Aggression Among Undergraduate Students

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ABSTRACT

Studies show a relationship between social appearance anxiety, aggression, and behavioral addictions. However, the relationship between social appearance anxiety, aggression, smartphone addiction, and Internet Gaming Disorder (IGD) has not been investigated. The present study used a self-report survey to examine the structural relationships between social appearance anxiety, aggression, smartphone addiction, and IGD. The sample comprised 383 Turkish undergraduate students (50.9% male; 49.1% female), all of who played online videogames. The study comprised demographic information questions and the Social Appearance Anxiety Scale, Buss-Perry Aggression Scale, Smartphone Addiction Scale, and the Internet Gaming Disorder Scale-Short Form. The relationships between scales were examined utilizing structural equation modeling. The findings showed that social appearance anxiety (β=.583) and smartphone addiction (β=.319) had a direct effect on IGD. Additionally, smartphone addiction partially mediated the association between aggression and IGD (β=.125). These findings suggest longitudinal research is needed to examine the temporal patterns and directionality between social appearance anxiety, aggression, smartphone addiction, and IGD. The present study results demonstrate that IGD may be associated with social appearance anxiety, smartphone addiction, and aggression. Therefore, to help reduce the incidence of IGD, interventions are needed among gamers to inhibit social appearance anxiety, reduce smartphone addiction, and decrease aggression.

1. Introduction

It has been claimed that internet gaming disorder (IGD), which is more prevalent among adolescents and emerging adults, has become a public health problem for a minority of individuals (Balhara et al., 2021; Wu et al., 2018). IGD appears to be more prevalent in Asian countries, followed by Europe and North America (Stevens et al., 2021). It has been estimated that the prevalence of IGD is 4.8% to 5.9% in Asian countries, 1.16% to 2.5% in European countries, and 0.3% to 1% in North American countries (Sussman et al., 2018). The prevalence of IGD in Turkey (where the present study was carried out) is increasing among youth, leading the Turkish government to introduce measures to reduce its incidence (Republic of Turkey Ministry of Health, 2018).

The Republic of Turkey initiated the Presidential '11th Development Plan' incorporating action plans to reduce technology addiction among children and young people. This included bespoke training and relevant research projects to increase the awareness concerning technology addiction to families, professionals working in this field, teachers, and employees of public institutions and organizations. It is also planned that the action plan will (i) facilitate the access by affected individuals to health services in the field of combating addiction, (ii) increase the quality and quantity of these health centers (i.e., infrastructure, professional human resources, etc.), and (iii) develop social rehabilitation services where there is a need. The planned initiatives will be monitored and evaluated in the efforts to combat technology addiction through systematic scientific research.

IGD was introduced as a tentative disorder in the latest (fifth) edition of the American Psychiatric Association's (APA) Diagnostic and

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Statistical Manual of Mental Disorders (DSM-5; APA, 2013) and is considered a potential behavioral addiction like gambling disorder. However, the DSM-5 made it clear that further research was needed into the factors and variables associated with and underpinning IGD. IGD, vital, and other important variables are examined among Turkish university students in the present study. More specifically, the relationships between smartphone addiction, aggression, and social appearance anxiety, which are thought to be associated with IGD, were investigated.

When the literature is examined, no research has comprehensively investigated the structural relationships between social appearance anxiety, aggression, smartphone addiction, and IGD structures. In this study, by trying to discover the relationships between these structures, possible factors affecting IGD and the effects of these factors on each other are investigated. In this respect, the research has a new and original quality. IGD can be affected by the socio-cultural contexts in which individuals live. This research was carried out on undergraduate students from Turkey and aimed to contribute to the literature in terms of revealing results about IGD in the context of Turkish culture. The results obtained from the research will give researchers and experts ideas on preventing/controlling IGD.

2. Extant literature and hypotheses

2.1. Internet gaming disorder

In the DSM-5 (APA, 2013), gambling disorder was included as a behavioral addiction in the 'substance-related and addictive disorders' category. Non-substance-related addictive disorders were a new category in the DSM-5. Gambling disorder is the only behavioral addiction officially included in this group. This categorization brings a new diagnostic perspective to behavioral addictions. It means that other problematic behaviors (e.g., internet use, videogame playing, sex, shopping, exercise, work, etc.) could be officially recognized as behavioral addictions.

The diagnostic criteria for IGD in DSM-5 comprise (i) time-consuming preoccupation with online gaming, (ii) withdrawal symptoms if unable to engage in online gaming, (iii) needing to spend an increasing amount of time gaming online (i.e., tolerance), (iv) failure to control online gaming, (v) deceiving family members and therapists about the amount of time spent gaming online, (vi) losing interest in other hobbies and entertainment outside of online gaming, (vii) continuing to engage in online gaming despite psychosocial problems, (viii) alleviating negative moods or escaping situations by gaming online, and (ix) jeopardizing a relationship, job, education, and career opportunity because of online gaming. Individuals endorsing five or more of the criteria above over a 12-mont period causing clinically significant impairment and distress are deemed to have IGD (APA, 2013).

In the 11th Revision of the International Classification of Diseases (ICD-11; World Health Organization, 2021), gaming disorder (GD; predominantly online or offline) is included in the category of substance use or addictive behaviors. According to the ICD-11 definition, GD is characterized by persistent or recurrent gaming behaviors, online or offline. The symptoms of GD are: (i) loss of self-control associated with playing games (for example, frequency of playing videogames, duration of playing videogames, inability to stop playing videogames), (ii) prioritization of playing videogames over and above daily life interests and activities, and (iii) continuing or increasing videogame playing behavior despite negative consequences. According to ICD-11, the pattern of game behavior can be continuous or periodic, and repetitive. GD also causes significant distress or significant deterioration in personal, familial, social, educational, occupational, or other important areas of functioning of the individual.

2.2. Internet gaming disorder and social appearance anxiety

Body image is defined as an individual's feelings, thoughts, and perceptions about their own body (Gioia et al., 2020; Gumussoy et al., 2022). Positive body image results in individuals having satisfaction with their bodies. The negative thoughts and feelings of individuals about their body (or part of their body), finding themselves less attractive than other people, feeling uncomfortable about their body, and being ashamed of their body are all examples of negative body image (Boursier et al., 2020a). Individuals with a positive body image believe that their appearance is not the primary determinant of their personality, character, and values, and they do not spend too much time worrying about eating and weight gain (Cash and Fleming, 2002).

Body image is an essential factor affecting the self-esteem of the individual. Positive body image is associated with high self-esteem and negative body image with low self-esteem (Gumussoy et al., 2022). Body image can also determine eating behaviors, social phobia levels, sexual behaviors, social relationships, and emotional states (Ucar, Güney, Cesur, & Yurtsal, 2018; Yurdagul et al., 2021). Social appearance anxiety can also result as a consequence of negative body image and appearance by individuals (Boursier et al., 2020a). Social appearance anxiety refers to the emotional, cognitive, and behavioral anxieties experienced by the individual regarding their appearance (Duran and Öz, 2021). Body perceptions of those who are satisfied with their physical appearance are high, and those who are not happy with their physical appearance may be more introverted, inadequate in social situations, pessimistic, and insecure (Grogan, 2021; Hogans and Seock, 2022; Swami et al., 2021).

One of the diagnostic criteria for IGD in DSM-5 is gaming online to alleviate a negative mood or escape from the situation. Therefore, individuals with social appearance anxiety may turn to online gaming to exit such feelings and alleviate their emotional state. Consequently, social appearance anxiety may be a contributory factor to IGD. According to Király et al. (2015), among the psychological variables that appear to be related to the development and maintenance of IGD are social phobia and low self-esteem. Therefore, individuals with social appearance anxiety may have social phobia problems, their self-esteem may be low, and they may be more susceptible to IGD.

In the present study, it was hypothesized that social appearance anxiety and IGD might be related. Individuals who are not satisfied with their body image and concerned about social appearance may prefer their online persona in massively multiplayer online (MMO) videogames (e.g., their avatar character) and may play videogames often with their bespoke avatar. Players can even customize their online gaming avatars in their own unique way. Avatars designed by the players can attract the attention and appreciation of other players but can also make individuals feel better about themselves. For example, a player with obesity in real life may prefer to play games by designing a thinner and stronger avatar in MMO games. Individuals who experience social appearance anxiety in real life may express themselves better in the virtual environment than in the real world. Such reasoning suggests that IGD may be more prevalent among video gamers with social appearance anxiety. However, such an assumption that needs to be investigated. Based on this, the first hypothesis of the present study is that social appearance anxiety will be positively associated with IGD (H_1).

2.3. Social appearance anxiety and aggression

Aggression is a behavior that deliberately causes physical or psychological pain to others (Griffiths, 1999; Kjærvik and Bushman, 2021). Many factors can affect aggression, including family factors (such as parents' attitudes and behavior, domestic violence), mass media, culture, and individual factors (Throuvala et al., 2019). One such individual factor is an individual's body image. As aforementioned, individuals with a negative body image often have low self-esteem (Shang et al., 2021; Yahaya et al., 2021). A negative body image can cause social

appearance anxiety among individuals and result in negative behavioral problems such as social phobia, sexual behavior disorders, and difficulties in social relationships (Boursier et al., 2020a; Duyan et al., 2022).

Because individuals with negative body image perceptions and social appearance anxiety may experience envy towards individuals whose body image they perceive to be positive, they may have difficulties in establishing friendships, and they may have difficulties in expressing and accepting themselves, resulting in frustration and aggression towards others (psychological and physical aggression). It may also be easier to engage in aggressive behaviors associated with social appearance anxiety in virtual environments because it is much easier than face-to-face situations because of the perceived anonymity that online spaces afford. Balta et al. (2020) reported that psychopathological factors such as body image dissatisfaction were associated with cyberbullying behaviors. However, the relationship between social appearance anxiety and aggression among video gamers has yet to be investigated. Based on the extant literature, it is hypothesized that social appearance anxiety will be positively associated with aggression (H_2).

2.4. Internet gaming disorder and smartphone addiction

Due to the complexity of symptoms associated with smartphone use and the diversity of smartphone functions, there is no consensus on the definition of smartphone addiction (Chung et al., 2018) or whether it even exists (given that some scholars have claimed that individuals are no more addicted to their smartphones than alcoholics are addicted to bottles [Kuss and Griffiths, 2017]). In general, smartphone addiction has defined the inability to control smartphone use (Walsh et al., 2010). The components model of addiction (Griffiths, 2005) argues that all addictions comprise six core components (i.e., salience, mood modification, tolerance, withdrawal symptoms, conflict, and relapse). In this context, smartphone addiction is defined as a significant preoccupation of smartphone use by the individual, reliable mood changes due to smartphone use, increased daily time spent on using smartphones over a protracted period, negative mood states if unable to access a smartphone, the compromising of personal relationships and educational/occupational activities, and a return to problematic smartphone use after periods of abstinence (Csibi et al., 2021). Non-control of smartphone use, inability to stay away from the smartphone, and poor sleep quality are often observed consequences of problematic smartphone use (Busch and McCarthy, 2021). Increased time allocated to smartphone use and increased frequency of individuals constantly checking their smartphones are closely related to the severity of addiction (Busch and McCarthy, 2021; Yang et al., 2021).

The use of technology by young people and smartphones is increasing day by day. This increase is associated with the presence of areas of interest for young people, such as taking pictures and social media use, and playing games (Abbasi et al., 2021). According to Király et al. (2015), one psychological variable that seems to be related to the development and maintenance of IGD is the relationship between real-life problems and difficulties (in which gaming is used as an escape). Smartphones also provide applications (including gaming) in which individuals can escape from real-life problems and challenges, and also has the added advantage that most smartphone users carry their smartphone with them wherever they go. Therefore, some scholars have speculated that there may be a relationship between smartphone addiction and IGD (e.g., Lopez-Fernandez et al., 2018) even though many MMO videogames cannot be played on smartphones.

However, MMO players are interested in seeing the gameplay strategies of other players related to MMO games. Players often watch these game videos on media such as YouTube while actually playing the game (i.e., dual screening) (Brown-Devlin et al., 2021; Hwang and Lim, 2015). Many such videos concerning MMO gameplay are watched on smartphones while individuals are actually gaming. Therefore, players can watch these videos with their smartphones at any time of the day, either while playing or between gaming sessions. Paik et al. (2017) reported that some individuals play videogames on smartphones as well as on computers. They concluded that the IGD rate might vary depending on the type of device used for playing games. They suggested conducting studies to examine the relationship between smartphone addiction and IGD (Paik et al., 2017). To the best of the authors' knowledge, no previous research has examined the relationship between smartphone addiction and IGD (although one study did examine smartphone addiction among gamers and found no relationship but did not examine IGD; Lopez-Fernandez et al., 2018). Based on the limited data, it is hypothesized that smartphone addiction will be positively associated with IGD (H_3).

2.5. Social appearance anxiety and smartphone addiction

As aforementioned, individuals with social appearance anxiety may not be able to express themselves in face-to-face situations and may spend more time in virtual environments such as social media and game platforms, which may lead to smartphone addiction. According to Király et al. (2015), individuals with psychiatric distress may turn to smartphone use as a coping strategy to improve their mood and provide emotional stability. Therefore, individuals with social appearance anxiety may use smartphones as a strategy to escape from real-life situations. The relationship between problematic internet use, social appearance anxiety, social media use, and nomophobia ('no mobile phone phobia') were examined in the study conducted by Ayar et al. (2018) among nursing students in Turkey. They found a moderate relationship between social appearance anxiety and nomophobia, social appearance anxiety, and problematic internet use. The researchers called for similar studies in the context among different samples and cultures for reasons of generalizability. Moreover, the relationship between smartphone addiction and social appearance anxiety appears to be a research gap that needs further investigation. Based on the literature above, it was hypothesized that social appearance anxiety would be positively associated with smartphone addiction (H_4).

2.6. Aggression and smartphone addiction

Increases in smartphone use have led to involuntary fears such as not being able to access or communicate via mobile devices. These fears, which have been termed nomophobia, may cause the individual to be more aggressive (León-Mejía et al., 2021; Humood et al., 2021). When individuals are deprived of their smartphones, they may experience fear of missing out (FOMO), especially about not being able to access social media. Such behavioral changes due to smartphone deprivation may cause individuals to experience behaviors such as panic, anger, aggression, and anxiety. A study by Nuri et al. (2021) among university students in Cyprus reported a significant relationship between (i) smartphone addiction and physical aggression and (ii) smartphone addiction and verbal aggression.

Research has also shown that nomophobia plays a mediating role in the relationship between smartphone addiction and aggression. Other researchers have noted that it would be useful to specifically investigate the relationship between aggression and smartphone addiction in different contexts (Nuri et al., 2021). Considering the relationship between aggression and smartphone addiction among individuals who play videogames, some scholars have claimed that the smartphone is preferred today in terms of playing videogames and watching the videogame playing strategies of other players (Karaoglan Yilmaz et al., 2018; Paik et al., 2017). Therefore, smartphones may contribute to the incidence and intensity of IGD (Paik et al., 2017). In the absence of smartphones, it is thought that aggressive behaviors may develop among videogame players when they are not able to play videogames and when they miss topics being discussed in discussion platforms such as gaming forums (Duman and Ozkara, 2021; Li et al., 2020).

There are a few studies conducted in different cultures reporting an association between smartphone addiction and aggression (e.g., Kim

et al., 2015). However, it is not known if this relationship will be present among Turkish university students and videogame players. It was hypothesized that aggression would be positively related to smartphone addiction (H_5).

3. Method

This study aimed to explore the structural relationships between internet gaming disorder, smartphone addiction, social appearance anxiety, and aggression variables. The research was carried out in this direction according to the correlational research method. Correlational studies are studies carried out to reveal the relationships between two or more variables (Creswell, 2012).

3.1. Participants

The sample comprised university undergraduates who regularly played online videogames studying at a state university in Turkey (N=383). Students were asked if they regularly played online videogames, and if they said they did, they were given the opportunity to participate in the study. Of those who said they played regularly, 26.3% played videogames daily, 33.2% played videogames a few days a week, 25.1% played videogames weekly, and 15.4% played videogames monthly. The participants ranged in age from 19 to 27 years (M=21.07 years; SD=2.16), with an approximately equal number of males and females. The descriptive statistics of the sample are displayed in Table 1.

3.2. Measures

Internet gaming disorder: The nine-item Internet Gaming Disorder Scale-Short Form (IGDS9-SF; Pontes and Griffiths, 2015; Turkish version: Arıcak et al., 2018) was used to assess IGD. The items (e.g., *"Do you feel more irritability, anxiety, or even sadness when you try to either reduce or stop your gaming activity?"*) are rated on a scale from 1 (*never*) to 5 (*very often*) with total scores ranging from 9 to 45. Higher scores indicate a higher risk of IGD. The scale's reliability in the present study was very good (Cronbach's alpha=.82).

Aggression: The 29-item Buss-Perry Aggression Questionnaire (BPAQ; Buss and Perry, 1992; Turkish version: Demirtas Madran, 2013) was used to assess aggression. The scale contains 4 sub-factors. The items (e.g., *"When frustrated, I let my irritation show"*) are rated on a scale from 1 (*extremely uncharacteristic of me*) to 5 (*extremely characteristic of me*) with total scores ranging from 29 to 145. The higher the score is, the higher aggression. The scale's reliability in the present study was very good (Cronbach's alpha=.85).

Social appearance anxiety: The 16-item Social Appearance Anxiety Scale (SAAS; Hart et al., 2008; Turkish version: Dogan, 2010) was used to assess social appearance anxiety. The items (e.g., *"I am concerned that people think I am not good-looking"*) are rated on a scale from 1 (*not at all*) to 5 (*extremely*), with total scores ranging from 16 to 80. Higher scores indicate higher social appearance anxiety. The scale's reliability in the present study was excellent (Cronbach's alpha=.91).

Smartphone addiction: The 33-item Smartphone Addiction Scale (SAS; Kwon et al., 2013; Turkish version: Demirci et al., 2014) was used to assess smartphone addiction. The items (e.g., *"Using my smartphone longer than I had intended"*) are rated on a scale from 1 (*definitely not*) to 6 (*absolutely yes*), with total scores ranging from 33 to 198. Higher scores indicate a higher risk of smartphone addiction. The scale's reliability in the present study was excellent (Cronbach's alpha=.95).

Table 1
Descriptive statistics of the total sample (N=383).

		N	%
Mean age (SD)		21.07 years (± 2.16)	
Gender	Male	195	50.9
	Female	188	49.1
Faculty	Sports Science	231	60.3
	Education	95	24.8
	Literature	57	14.9

3.3. Data analysis

Descriptive statistics and Pearson correlations were calculated among the study variables. MLE (maximum likelihood estimation) was conducted to analyze each scale's suit utilizing structural equation modeling. Chi-square, comparative fit index (CFI), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Incremental Fit Index (IFI), Tucker Lewis Index (TLI), Standardized root mean square residual (SRMR), and Root-mean-square error of approximation (RMSEA) was conducted to test the adequacy of model fit. Bootstrapping with a 95% confidence interval with 5000 bootstrapped samples was performed to test mediation.

Confirmatory factor analyses assumptions, determining multicollinearity, and examining univariate as well as multivariate normality, were conducted (Ullman, 2001). The multicollinearity assumption was tested utilizing VIF and tolerance (T) indices. The results (VIF <10, T value was different than zero) indicated no multicollinearity (Hair et al., 2014). For the univariate normality assumption, skewness and kurtosis values were examined. According to Schumacker and Lomax (2004), univariate normality values should be between ± 2. This indicates that the distribution is normal. Furthermore, the maximum likelihood estimation method requires multivariate normally distributed data (Byrne, 2010; Brown and Moore, 2012; Byrne, 2010). Data showed multivariate normal distribution.

4. Results

All variables were positively and significantly correlated with each other. More specifically, IGD was strongly correlated with smartphone addiction (r=.763, p<0.01), social appearance anxiety (r=.826, p<0.01), and aggression (r=.826, p<0.01). Additionally, smartphone addiction was strongly correlated with social appearance anxiety (r=.764, p<.01) and aggression (r=.710, p<.01), and social appearance anxiety were strongly correlated with aggression (r=.606, p<.01). The model tested in the study using the path analysis method is shown in Fig. 1.

Fit indices values were calculated for the model presented in Fig. 1. According to the researchers, model fit indices should be in the range of acceptable fit or excellent fit (Hooper et al., 2008; Hu and Bentler, 1999; Kline, 2005; Tabachnick and Fidell, 2001). Model fit results calculated for a reliability value of 0.5 are given in Table 2. When the model fit values in Table 2 are examined, it can be said that the model fits well. Direct effects in the model are shown in Table 3.

Analyses showed that smartphone addiction directly affected IGD and was a predictor of IGD (β=.319, S.E=0.010, p<.001) (Fig. 1). Social appearance anxiety had a significant direct effect on IGD and was a predictor of IGD (β=.583, S.E=.024, p<.001. Social appearance anxiety was a predictor of aggression (β=.606, S.E=.058, p<.001) and smartphone addiction (β=.319, S.E=.010, p<.001). Aggression was a predictor of smartphone addiction (β=.527, S.E=.087, p<.001).

Mediation (indirect effects)

The 'social appearance anxiety → Buss-Perry aggression → smartphone addiction' pathway was significant in relation to the indirect effects. Aggression partially mediated the association between social appearance anxiety and smartphone addiction (β=.237, SE=.030, p<.001, 95% CI: .179-.296). The 'social appearance anxiety → smartphone addiction → IGD' pathway was significant, and smartphone addiction partially mediated the association between social appearance anxiety and IGD (β=.243, SE=.035, p<.001, 95% CI: .173-.314). The 'aggression → smartphone addiction → IGD' pathway was significant, and smartphone addiction partially mediated the association between

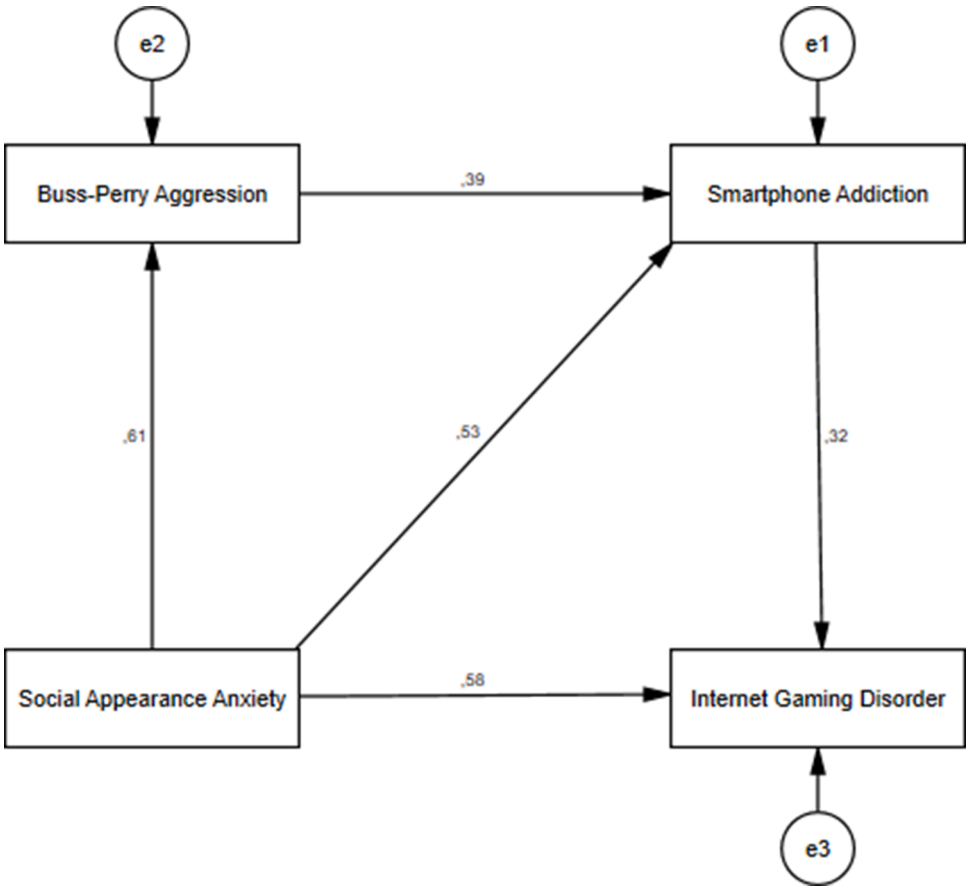

Fig. 1. The hypothetical model of structural relations between Internet Gaming Disorder, Smartphone Addiction, Social Appearance Anxiety, Aggression.

Table 2
Values of the goodness of fit index in structural equation model.

	Model value	Perfect fit	Acceptable fit
X^2 /*df*	1.847	$0 \leq \chi^2/df \leq 3$	$3 < \chi^2/df \leq 5$
CFI	.999	$.95 \leq CFI \leq 1$	$.90 \leq CFI < .95$
GFI	.998	$.95 \leq GFI \leq 1$	$.90 \leq GFI < .95$
AGFI	.976	$.90 \leq AGFI \leq 1.00$	$.85 \leq AGFI < .90$
IFI	.999	$.95 \leq IFI \leq 1$	$.90 \leq IFI < .95$
TLI	.995	$.95 \leq TLI \leq 1$	$.90 \leq TLI < .95$
RMSEA	.047	$.00 \leq RMSEA \leq .05$	$.05 < RMSEA \leq .08$
SRMR	.008	$.00 \leq SRMR \leq .05$	$.05 < SRMR \leq .10$
p	.174		

Table 3
Standardized direct effects of the study variables.

			β	S.E.	C.R.
Social appearance anxiety	→	Aggression	.606*	.058	14.900
Aggression	→	Smartphone addiction	.391*	.062	10.729
Social appearance anxiety	→	Smartphone addiction	.527*	.087	14.461
Social appearance anxiety	→	Internet gaming disorder	.583*	.024	14.002
Smartphone addiction	→	Internet gaming disorder	.319*	.010	7.659

*$p<.001$

aggression and IGD (β=.125, SE=.021, p<.001, 95% CI:.083-.166). Consequently, all five research hypotheses were supported.

5. Discussion

The present study was carried out among Turkish university students who regularly played online games and examined the relationships between students' IGD, smartphone addiction, social appearance anxiety, and aggression. The results showed high and significant associations between all the variables. More specifically, IGD was directly related to social appearance anxiety and smartphone addiction. Based on these findings, increases in individuals' social appearance anxiety and smartphone addiction may play a contributory role in the development of IGD. Social appearance anxiety also had a mediating effect on IGD, and social appearance anxiety had an effect on IGD via smartphone addiction. This pathway suggests that social appearance anxiety contributes to smartphone addiction, which contributes to IGD.

Another variable that had an effect on IGD was aggression (i.e., the path from aggression to IGD was mediated via smartphone addiction). Here, the suggested path is that aggression contributed to smartphone addiction, which in turn contributed to IGD. According to Karaoglan Yilmaz et al. (2022), in their research on university students, revealed that aggressive behavior has a direct effect on smartphone addiction. Accordingly, as individuals' aggressive behavior increases, the probability of being addicted to smartphones may increase. Fekih-Romdhane et al. (2022) revealed a significant positive relationship between smartphone addiction and physical aggression and verbal aggression. Accordingly, as students' smartphone addiction increases, their tendency to aggression may also increase. In the study of Doo and Kim (2022), it was revealed that an increased tendency to aggression in adolescents also increases the probability of smartphone addiction.

Based on these results in the literature, it is seen that the results of our current research on the relationship between aggression and smartphone addiction are consistent with the literature.

Although (as far as the present authors are aware) there is no previous study investigating the relationship between IGD and social appearance anxiety, previous research has shown significant relationships between social appearance anxiety and technological addictions more generally. For instance, Boursier et al. (2020b) found that social appearance anxiety was important in the physical appearance of young people and was associated with problematic social media use. Similarly, Dogan and Colak (2016) also reported the predictive role of social appearance anxiety on problematic social media use. A study conducted by Boursier et al. (2020b) found that social appearance anxiety was positively associated with problematic social media use behaviors among young people. Therefore, an increase in social appearance anxiety among young people may lead to an increase in problematic social media use behaviors. These findings are consistent with the present study results showing a significant relationship between IGD and social appearance anxiety. Individuals with social appearance anxiety may seek out activities such as online gaming, which increases the likelihood of IGD.

The present study found a high positive association between IGD and smartphone addiction. It may be that an increase in smartphone addiction among individuals who play videogames may cause an increase in IGD. Lopez-Fernandez et al. (2018) examined whether there is a relationship between game addiction and smartphone addiction. A comparative study was conducted between Belgian and Finnish participants in the study. They found that mobile gaming was not related to problematic smartphone use in these two samples. However, Lopez-Fernandez et al. did not assess IGD, and any differences in findings between their study and the present study may simply be due to cultural differences. Liu et al. (2016) reported that the frequency of playing smartphone gaming on a smartphone is associated with smartphone addiction. In their study, Cha and Seo (2018) found that the frequency of playing smartphone gaming was one of the predictors of smartphone addiction. These findings in the literature are consistent with the results of the relationship between IGD and smartphone addiction in the present study.

The present study's findings demonstrated significant associations between smartphone addiction and social appearance anxiety and between smartphone addiction and aggression. These findings suggest that social appearance anxiety and aggression may contribute to smartphone addiction. Furthermore, aggression partially mediated the association between social appearance anxiety and smartphone addiction. Increases in social appearance anxiety may cause increase aggression which consequently leads to an increased risk of developing smartphone addiction. The findings of several previous studies are consistent with the present study's findings. For instance, Ayar et al. (2018) reported moderate relationships between social appearance anxiety, nomophobia, social appearance anxiety, and problematic internet use among nursing students. Studies by Lim and Kim (2018), Park and Kim (2016) also revealed that there is a relationship between aggression and smartphone addiction in primary school students. Although these studies were carried out on different samples in terms of culture and age, the key findings were consistent with the results obtained in the present study. A small number of research results in the literature examining the relationship between smartphone addiction and aggression reveal a positive and significant relationship between these two structures (Karaoglan Yilmaz et al., 2022; Fekih-Romdhane et al., 2022; Doo and Kim, 2022). These findings support the results of our study. Accordingly, as individuals' aggression tendencies increase, smartphone addiction tendencies also increase. Therefore, examining the aggression status of individuals with smartphone addiction and taking measures to prevent/reduce it, if any, may contribute to the reduction of smartphone addiction.

Findings in the present study also showed a strong association between aggression and social appearance anxiety. The results suggest that social appearance anxiety contributes to the level of aggression. Farnam et al. (2017) reported a negative inverse relationship between body image and aggression. More specifically, as individuals' satisfaction with their body image increased, aggression decreased. Such findings are consistent with the results of the present study.

It should also be noted that the present study has some limitations. First, the research was conducted with self-selected Turkish university students playing online videogames using self-report methods. Self-report studies are subject to well-established methods biases (e.g., social desirability). The sample size was modest and larger cohorts with increased representativeness are needed to increase the generalizability of the results in future studies. Likewise, relationships between variables studied here were only from Turkish participants. Therefore the findings need replicating in different cultures. In future studies, in-depth qualitative research could examine the causes of variables affecting IGD. Future studies should also investigate the effect of individual differences such as different age categories on IGD and not just emerging adults.

6. Conclusions

In the present study, the relationships between IGD, smartphone addiction, social appearance anxiety, and aggression among university students were examined in the context of Turkish culture. The results showed that social appearance anxiety and smartphone addiction directly affected IGD. Consequently, results suggest that intervention measures are needed to reduce social appearance anxiety and smartphone addiction as a way of inhibiting the development of IGD. Early detection of social appearance anxiety, IGD, and smartphone addiction levels through regular screening is essential. Guidance and social support is needed for young people. This could include personal development training to increase self-esteem and psychological resilience and ensure that they are at peace with their own appearance and their own bodies. By investigating the factors underlying social appearance anxiety of young people (e.g., loneliness due to social appearance anxiety, feelings of social exclusion), interventions to combat such factors can be developed that adhere to experiences in the cultural context. In order to inhibit smartphone addiction among young people, interventions are needed to provide young people with self-control and resilience skills. Evaluation studies may also be helpful to determine the effectiveness of such interventions in reducing the incidence of IGD.

The findings also showed that social appearance anxiety and aggression had a direct effect on smartphone addiction and that aggression had an effect on IGD via smartphone addiction. Therefore, intervention measures to reduce individuals' social appearance anxiety and aggression levels are likely to be helpful in reducing both smartphone addiction and IGD. Social appearance anxiety and aggression levels among young people can be determined through screening. Guidance and counseling activities can be carried out among individuals and groups at risk. Virtual environments may make it easier for individuals to engage in aggressive behavior because it can be difficult to detect. Therefore, greater awareness of cyberbullying and its subsequent effects are needed to reduce aggressive behaviors among young people. Finally, an increase in social appearance anxiety appeared to be related to an increase in aggression. Therefore, interventions to reduce social appearance anxiety among individuals may also decrease individuals' aggression.

Smartphone addiction and Internet gaming disorder is a growing problem among young people today. This research is important in terms of revealing the relationships between social appearance anxiety, aggression, smartphone addiction, and Internet Gaming Disorder structures in Turkish university students playing online video games. In other words, it is unique in detecting structural relationships in the context of video game students and Turkish culture.

Research results show that social appearance anxiety and aggression have a direct effect on smartphone addiction. It has been determined

that social appearance anxiety and smartphone addiction have a direct effect on Internet Gaming Disorder. Aggression has an indirect effect on Internet Gaming Disorder.

The results of the research reveal clues about what may be the underlying factors of Internet Gaming Disorder in young people. The results of the research will provide tips to the experts about the interventions that can be made for the patients who apply to the psychiatry services due to Internet Gaming Disorder or for the students who apply to the school guidance service for this purpose.

Author contributions

RY, SS, MDG, FGKY designed the study and wrote the protocol. RY and FGKY conducted literature searches and provided summaries of previous research studies. SS and MDG conducted the statistical analysis. RY and FGKY wrote the first draft of the manuscript. All authors contributed to and have approved the final manuscript.

Informed Consent

Consent was obtained from all participants included in the study.

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Consent was obtained from all participants included in the study.

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Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declaration of Competing Interest

The authors have no conflicting or competing interests to declare.

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