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Effect of smartphone addiction on compulsive app downloading tendency: Protective factors for Generation Z consumers

Abstract

Purpose- This study focuses on how smartphone addiction impacts young consumer behavior related to mobile technology (i.e., the compulsive app downloading tendency). After a thorough literature review and following the risk and protective factors framework, this study explored factors that could mitigate its effects (resilience, family harmony, perceived social support, and social capital).

Design/methodology/approach- The study used the covariance-based structural equation modeling (CB-SEM) approach to analyze data collected from 275 Generation Z (Gen Z) smartphone users in Spain.

Findings- Results suggest that resilience is a critical factor in preventing smartphone addiction, and smartphone addiction boosts the compulsive app downloading tendency, a relevant downside for younger Gen Z consumers.

Originality- Through the lens of the risk and protective factors framework, this study focuses on protective factors to prevent smartphone addiction and its negative side effects on app consumption. It also offers evidence of younger consumers' vulnerability to smartphone addiction, not because of the device itself, but because of app-consumption-related behaviors.

Keywords: Smartphone addiction, compulsive app downloading, protective factors, Gen Z.

1. Introduction

In the current digital age, mobile technology has potential side effects that cannot be ignored (Turel *et al.*, 2021). Studies reveal that the average person spends over five hours per day on their smartphone (Kemp, 2023), with 66% of smartphone users admitting to being addicted to

their device, and that young individuals use their smartphones twice as much as estimated (Darina, 2023; Ditrendia, 2021). Alarming trends have emerged as younger generations present a greater risk of developing behavioral problems owing to the use of technology, specifically smartphones, as they have the highest screen-time rates (Khan and Khan, 2022). Scholars agree that Generation Z (Gen Z) consumers, including those born between 1999 (25 years old) and 2007 (17 years old) (Chetioui and El Bouzidi, 2023; Kiss *et al.*, 2020; Mason *et al.*, 2022), show advanced digital abilities and a particular relationship with technology, brands, and online purchase behavior that must be understood, as this generation will become the dominant consumer base (Chetioui and El Bouzidi, 2023; Muhammad *et al.*, 2023). Additionally, the literature warns that Gen Z consumers face greater levels of smartphone addiction and compulsive buying than older generations (Mason *et al.*, 2022). Olson *et al.* (2022) state that adolescents and young adults show high smartphone screen time. Drawing on previous research, Kiss *et al.* (2020) argued that Gen Z is one of the most vulnerable age groups to develop smartphone addiction and smartphone-related behavioral problems.

Thus, it is not strange that smartphone addiction has attracted the interest of researchers, who have analyzed its determinants and outputs in different disciplines (Busch and McCarthy, 2021). However, the potential negative role of smartphone addiction has not received much attention in consumer behavior studies. From a consumer behavior perspective, a nascent stream of research reveals the importance of this topic. For example, after finding a negative effect of smartphones on consumers' ability to accurately manage their shopping trips, Sciandra *et al*. (2019) revealed the harmful repercussions of smartphones on consumers' lives. Other scholars have found that smartphone addiction impact compulsive behaviors such as compulsive online buying, impulsive consumption, and materialism (Bozaci, 2020; Martinotti *et al.*, 2011; Mason *et al.*, 2022; Rodríguez-Brito *et al.*, 2022; Tan, 2024). In the case of using apps[1], Chopdar *et al.* (2022a) affirmed empirical examinations of the relationship between

excessive smartphone use, initial adoption of mobile shopping apps, and multiple app usage were difficult to identify. Richard *et al.* (2020) emphasize that the research must focus on addictive activities and applications rather than on the device *per se*. Notably, it is important to know when downloading multiple apps stops reflecting consumers' variety seeking and becomes problematic (i.e., compulsive app downloading tendency). During the last year, 255 billion mobile apps have been downloaded worldwide, representing an average of 40 apps per smartphone (Statista, 2023); app downloading is a phenomenon that continues to rise annually. Consistent with these findings, industry reports have revealed high churn rates for apps (more than 80 apps are installed on an average smartphone, 25% of the apps are used only once, and only 1.12% of the downloaded apps are used daily) (Blair, 2023). In fact, consumers often download apps but do not use them. These figures reveal a consumer's tendency to download apps without reflecting. Earlier studies have highlighted the importance of comprehending smartphone addiction's impact on app consumption, focusing on young consumers (Handa and Ahuja, 2020).

Marketing research lacks studies on the negative impact of smartphone addiction on consumption-related variables (Turel *et al.*, 2021). Moreover, academic interest in smartphone addiction has resulted in a vast number of studies discussing this problem. Khan and Khan (2022) presented a bibliometric analysis of smartphone addiction, concluding that prior studies have addressed the antecedents and consequences of smartphone addiction, psychological factors, smartphone usage patterns and types, smartphone addiction relationships, and scale development for measuring smartphone addiction. In addition, the authors emphasize the need for further investigation of smartphone addiction in the business context, specifically in the consumer behavior field.

Marketing research scholars have called for attention to the adverse effects of digital technology (Dwivedi *et al.*, 2021), including the impact of smartphone addiction on consumer behavior

(Altintas *et al.*, 2010; Chopdar *et al.* 2022a; Chopdar *et al.*, 2022b; Tan, 2024; Zolfagharian and Yazdanparast, 2017). Prior studies have recognized the effects of smartphone dependency on consumer behavior. For instance, Chatterjee *et al.* (2022) affirm that mobile technology shapes consumers' lives at the individual and collective levels, irreversibly linking technological use to consumer behavior. Scholars have also observed initial signs that mobile dependence leads to digitally distracted consumption (Chen *et al.*, 2020; Robayo-Pinzon *et al.*, 2021). Furthermore, they infer that addicted consumers acquire products driven chiefly by an emotional reaction instead of a rational evaluation and buy more products than planned (Chen *et al.*, 2020; Mason *et al.*, 2022). Moreover, when consumers are addicted to their smartphones, they indulge in shopping on mobile apps and online compulsive buying (Chopdar *et al.* 2022b; Mason *et al.*, 2022).

Considering the previous reasoning, this study investigates how smartphone addiction impacts consumer consumption of apps and identifies factors that may help prevent this addictive behavior (resilience, family harmony, social support, and social capital) in young consumers. Marketers should pay attention to the effects of smartphone addiction on young consumers' behavior, and academic research must propose ways to mitigate this problem (Turel *et al.*, 2021).

The current study has both theoretical and practical implications for analyzing smartphone addiction. Theoretically, our study opens the possibility of integrating smartphone addiction into the consumer literature, advancing the understanding of the dark side of mobile-app consumption and smartphone addiction as technology-related drivers of young consumers' behavior. Moreover, this study adds to extant knowledge by providing a clearer understanding of how to mitigate smartphone addiction by applying the risk and protective framework. In addition, this study augments knowledge about younger consumers, showing that people under the age of 21 have the highest chance of engaging in problematic smartphone consumption

behavior. Practically, our findings contribute to future studies on smartphone addiction prevention and interventions and provide marketers with insights into their social responsibility.

2. Literature review

There is no consensus on the most appropriate framework to analyze the phenomenon in studies seeking to understand compulsive downloading and smartphone addiction. We chose the risk and protective factors framework, derived from the field of behavioral health prevention, as most appropriate framework (Jessor, 1992) to analyze the link between protective factors and consequences of smartphone addiction and identify ways to prevent mobile technology use from becoming problematic for consumers. This theoretical background sheds light on the recognized global smartphone-dependence epidemic (Kuss *et al.*, 2021; Meng *et al.*, 2022) and allows scholars from different fields to study problematic smartphone use.

2.1. The risk and protective factors framework

The risk and protective factors framework, originating from medical and psychiatric research (O'Connell *et al.*, 2009), employs a socio-psychological and epidemiological perspective to identify personal, social, and other environmental factors that can prevent behavioral disorders (Jessor, 1992). Later, Bronfenbrenner (2002) and Hong and Garbarino (2012) proposed a socio-ecological approach to this framework, suggesting four contextual domains that determine predictors of behavioral problems and addictions: personal (individual), microsystem (family and peers), exosystem (community), and macrosystem levels (societal). The personal level refers to individual characteristics (e.g., biological and/or psychological characteristics). The microsystem level refers to an individual's direct environment (e.g., schools and competitors). The exosystem level involves the interaction between two or more settings, but the individual is not involved in one (e.g., community environment). The macrosystem level is considered a societal outline for a specific context (e.g., societal institutions) (Hong and Garbarino, 2012).

We focus exclusively on protective factors because they offer a constructive way to mitigate the dark side of technology and are less studied compared with risk factors (Choi *et al.,* 2015; Wolniewicz *et al.,* 2020). A protective factor is understood as an individual attribute or characteristic, situational condition, and environmental context that reduces the possibility of addiction, behavioral problems, or disorders (Kiss *et al.*, 2020). Therefore, this study focused on four protective factors (one at each level) that show a high consensus among prior researchers regarding reducing smartphone addiction: resilience, family harmony, social support, and social capital (Bian and Leung, 2015; Choi *et al.,* 2015; Eksi *et al.,* 2020; Jeong *et al.,* 2020; Kiss *et al.,* 2020).

The following epigraph focuses first on the tendency toward compulsive app-downloading and smartphone addiction, and later, the protective factors are presented.

2.2. *Compulsive app downloading tendency and smartphone addiction*

2.2.1. Compulsive app downloading tendency

Compulsive buying is a continuing and repetitive purchase that turns into a principal reaction to adverse situations and unpleasant emotional states (Altintas *et al.*, 2010). Despite the focus on compulsive buying in existing studies, there is a lack of research on its link with smartphone addiction. Richard *et al.* (2020) appeal for research on smartphone addiction as these devices allow users to download and become dependent on multiple applications and engage the user in a vicious circle.

Compulsive app downloading tendency could be understood as an individual's reduced control over [downloading] mobile apps (Okazaki *et al.*, 2021). This concept is novel as, to the best of our knowledge, compulsive buying literature has not addressed compulsive "buying" [downloading] of apps. Compulsiveness implies the consumer's propensity to download apps impetuously, non-reflectively, immediately, and kinetically (Altintas *et al.*, 2010). Clements

and Boyle (2018) used a theoretical framework of automatic behaviors to study behavioral persistence in the context of mobile applications. They stated that the characteristics of technology contribute to the pehonomenon of compulsive technology use. Industry reports highlight this tendency: just one in four app users employs apps the day after being downloaded, and more than 70% of app users churn within three months of the download (Blair, 2023; Statista, 2022). In addition, scholars suggest that the mobile industry is facing the problem of consumers abandoning downloaded apps shortly afterwards (Stocchi *et al.*, 2022). However, is this tendency toward non-reflective app consumption derived from a more general misuse of smartphones?

2.2.2. Smartphone addiction

Academic literature defines smartphone addiction as the "excessive use of smartphones in a way that is difficult to control, and its influence extends to other areas of life in a negative way" (Gökçearslan *et al.,* 2016, p.640) leading to adverse outcomes, including health, social, and personal development, and limited preparation for adulthood (Khan and Khan, 2022). Richard *et al.* (2020) showed the lack of focus on a theory or model to understand a multidisciplinary issue such as smartphone addiction. Theoretical frameworks for studying smartphone addiction can be derived from different disciplines. The disease theory focuses on the development of physical dependence (Tabakoff and Rothstein, 1983), and smartphone addiction studies debate physical dependence based on neuroadaptations caused by repeated use and compulsive behaviors (Schmitgen *et al.*, 2020). The social cognitive theory (Bandura, 1989) claims that smartphone addiction can be explained by a combination of interactive environmental, behavioral, and personal elements (Buctot *et al.*, 2020; Mahapatra, 2019). Davis (2001) offered a cognitive-behavioral model of pathological or problematic Internet use to study Internet addiction. In this model, the central variable is maladaptive cognition as an antecedent of Internet addiction. Moretta *et al.* (2022) reviewed theories and suggested integrating

problematic behaviors irrespective of the device. Prior studies have employed the cognitive-behavioral model to investigate the connection between psychological elements and smartphone addiction (Chen, 2020; Liu *et al.*, 2020). The uses and gratifications theory (UGT) states that individuals seek specific media to fulfil specific needs (Kuss and Griffiths, 2012) in that individuals' needs are the internal driving forces of their smartphone-related behavior. The compensatory Internet use theory (Kardefelt-Winther, 2014) is an extension of UGT and aims to comprehend the stressful occurrences and life events that drive people to abuse technology as a means of numbing their unpleasant feelings related to these stressors. Thus, problematic smartphone use is a compensatory activity used to control negative emotions driven by stressors (Elhai *et al.*, 2017; Wolniewicz *et al.*, 2020). The general strain theory and the strength model of self-control have been used to understand how young individuals' stress and low self-control can result in smartphone addiction (Zhang *et al.*, 2022). Recently, Moqbel *et al.* (2023) used the conservation of resources theory (Hobfoll, 1989) to investigate smartphone addiction as a resource drainer that can lead to stress (depletion of a person's energy resources) and ultimately a decrease in well-being.

Regarding the young consumers' behavior, recent findings support the idea that smartphone addiction contributes to developing frequent and compulsive consumption (Tan, 2024).

2.2.3. The link between compulsive app downloading tendency and smartphone addiction

Excessive downloading can be considered as a compulsion in response to an uncontainable craving. This could be triggered by symptoms of smartphone addiction and maintained by an individual's inability to control their desires (Altintas *et al.*, 2010; Tan, 2024). Chopdar *et al.* (2022b) found that consumers addicted to smartphones are more prone to shop frequently using mobile applications. Lopez-Fernandez *et al*. (2017) stated that intensive smartphone users download new apps most often. Experimental evidence shows that smartphone dependence

increases impulsive behavior when consumers make economic comparisons and choices (Robayo-Pinzon *et al.*, 2021).

Similarly, compulsive buying is a consequence of compulsive social media use (Okazaki *et al.*, 2021) and social media addiction (Maccarrone-Eaglen and Schofield, 2023). In the case of young people, Mason et al. (2022) observed that overspending and online shopping could be critical consequences of smartphone addiction. Duke and Montag (2017) suggest that users who are addicted to smartphones may have automatized behaviors that are largely unconscious and hard to discontinue. However, none of these studies have discussed app consumption. From an analogous perspective, the compulsive app downloading tendency can reflect compulsion and a ritualistic response to uncontrolled thoughts about obtaining technological products [apps] (Okazaki *et al.*, 2021) stemming from smartphone addiction. Zhang *et al.* (2018) studied the app download process and provided empirical evidence that consumers who behave impulsively and less cautiously when downloading apps also exhibit less rational decision-making behaviors. Consumer behavioral theorists advise that dysfunctional consumer behavior, such as smartphone addiction, causes irrational purchasing decisions and triggers other compulsions in the context of smartphone use (Chen *et al.*, 2016; Grewal *et al.*, 2018; Zolfagharian and Yazdanparast, 2017), such as the compulsive app downloading tendency. Thus, consumers addicted to their smartphones may also consume products driven by reaction instead of reflective response and, consequently, find themselves consuming more products (including apps) than desired, resulting from the difficulty of controlling smartphone use (Hsiao, 2017; Mason *et al.*, 2022). In this sense, we propose the following hypothesis:

H1: Smartphone addiction is positively related to the compulsive app downloading tendency.

2.3. Protective factors

In addition to understanding the adverse effects of smartphone addiction, recent studies call for exploring factors that can mitigate its harmful effects (Turel *et al.*, 2021). Thus, this study focuses on one protective factor at each level: resilience at the personal level (Choi *et al.,* 2015; Kiss *et al.,* 2020), family harmony at the microsystem level (Eksi *et al.*, 2020), perceived social support at the exosystem level (Jeong *et al.*, 2020), and social capital at the macrosystem level (Bian and Leung, 2015).

2.3.1. Resilience

Resilience refers to "a person's ability to maintain psychological well-being and adapt successfully to acute stress, trauma, or more chronic forms of adversity" (Choi *et al.,* 2015, p. 309). In other words, resilience reflects the characteristic of constructive adaptation, regardless of adversity (Nie *et al.*, 2020). This personal-level protective factor suggests that young people with high resilience can better adjust to and successfully manage extremely stressful circumstances (Kiss *et al.*, 2020). Prior studies have also discovered that resilient people are less affected by stress, adversity, or risks and, consequently, are less susceptible to behavioral problems (Wang *et al.,* 2020).

Resilience is a psychological variable proposed as a protective factor against smartphone addiction and is closely related to problematic mobile use due to neuronal development during maturity, resulting in less problem-solving skills (Choi *et al.,* 2015; Kiss *et al.,* 2020). Scholars affirm that resilience is an adaptive resource for young people's development and is negatively correlated with technology-related addictive behaviors (Li *et al.*, 2010; Nie *et al.*, 2020). According to Kiss (2020), resilience allows individuals to be more creative and develop adaptive coping strategies that prevent the development of behavioral disorders and problematic smartphone use. Shen (2020) demonstrated the protective effect of psychological resilience on excessive smartphone use. In this sense, we propose the following hypothesis:

H2: Resilience is negatively related to smartphone addiction.

2.3.2. Family harmony

At the microsystem level, family harmony is "a value that expresses the closeness, cooperation, and relationships among family members and contributes to the well-being of the individual" (Eksi *et al.,* 2020, p.3). Previous literature supports the idea that family environment drives several problems, including problematic smartphone use (Aktürk *et al.*, 2018; Altintas *et al.*, 2010; Busch and McCarthy, 2021; O'Connell *et al.*, 2009). Scholars have found that the lack of open, mutual communication or close support within the family negatively affects young people (Kavikondala *et al.*, 2016) and exacerbates problematic technology use (Aktürk *et al.*, 2018; Eksi *et al.*, 2020). Hawi and Samaha (2017) categorically show the negative relationship between support from parents and family and addiction to the Internet. Floros and Siomos (2013) found a negative correlation between optimal parenting, motives for social network participation, and Internet addiction. Regarding smartphones, Hawi and Samaha (2017) found an indirect relationship between smartphone addiction and family relationships. Guo et al. (2019) found that problematic smartphone use is related to lower levels of family harmony. Therefore, we propose the following hypothesis:

H3: Family harmony is negatively related to smartphone addiction.

2.3.3. Perceived social support

Maslow's hierarchy of needs states that social needs are important in human behavior, and smartphones have a prevalent social component. A vital element of the exosystem is perceived social support because it appears to have a shielding effect (O'Connell *et al.*, 2009). Social support is "the perception that one is cared for, protected, respected, and valued by others and treated as a part of social network with assistance and commitment" (Eskandari *et al.*, 2020, p.130). It reflects perceived access to quality support when needed and can come from three sources (i.e., family, friends, and significant others) (Porter *et al.*, 2019). This definition

indicates that perceived social support is a contextual factor external to the self that is directly connected to well-being of young individuals (Herrero *et al.*, 2019; Moqbel *et al.*, 2023).

Research on diverse young populations has found that perceived social support can reduce the impact of adverse life events and is linked to improved health status (Aktürk *et al.*, 2018). Indeed, a negative correlation has been found between social support and addiction (Busch & McCarthy, 2021). For instance, in the case of social networks, Eskandari *et al.* (2020) found a significant negative correlation between social support and addiction to virtual social networks. Similarly, Taş and Öztosun (2018) observed a negative relationship between social support and addiction to the Internet in adults. Recently, researchers have focused on their relationship with smartphone addiction (Herrero *et al.*, 2019). Aktürk *et al.* (2018) affirmed that a lack of social support makes young people more vulnerable and leads to problematic smartphone use. More recently, Al-Kandari and Al-Sejari (2021) found that high levels of social support imply a lower incidence of symptoms produced by smartphone misuse. Following Chang *et al.* (2022), social use of smartphones is related to smartphone addiction in the sense that social support can help people overcome addiction. Thus, we propose the following hypothesis:

H4: Perceived social support is negatively related to smartphone addiction.

2.3.4. Social capital

At the macro-system level, social capital has been applied to numerous contexts in various disciplines, including marketing, to consider the resources embedded in social networks that individuals can use, access, and mobilize for economic and non-economic benefits (Chan, 2015). Social capital is a complex variable that refers to individual's embeddedness in the web of social relations and behaviors guided by social structures (Unlu, 2009). Relationships are the foundations that preserve community life and resources (Chen and Li, 2017). This implies that people living in communities with more social capital are more socially connected and obtain more potential resources for their and others' benefits. Accordingly, as social capital is

developed through regular social interaction, previous studies have shown that smartphone use for communication, which enable everlasting connectivity with close ties, can be appropriately adapted to maintain social capital (Park and Lee, 2012).

Previous studies highlight the crucial role of social capital in the use of technology. For instance, Mahmud *et al.* (2020) examined the relationship between social capital and smartphone addiction and found a link between social bonds with family, relatives, and friends and this technological dysfunction (addiction). They found that the creation of close ties, which affects intimacy, responsibility, and benefits, is inversely related to addiction to smartphones. Younger people, who have few close intimate relationships, unusual face-to-face interactions, and weak mutual responsibility, also lose their adaptive functions owing to smartphone addiction (Mahmud *et al.*, 2020). Similarly, Bian and Leung (2015) suggest that people who live in communities with lower social capital have conducive environments that increase the negative consequences of smartphone addiction. Recent evidence (Chen *et al.*, 2022) suggests that smartphone addiction can be prevented partly by improving younger people's psychological and social capital because constructive social interactions allow youngsters to cope better with behavioral problems such as smartphone addiction. Consequently, rich social capital may protect against smartphone addiction (Matsunaga *et al.*, 2023). Thus, we propose the following hypothesis:

H5: Social capital is negatively related to smartphone addiction.

2.4. The moderating role of age in the relationship between smartphone addiction and the compulsive app downloading tendency among Gen Z users

Among Gen Z individuals, younger consumers are more vulnerable to developing addictive behaviors regarding smartphone use (Kiss *et al.*, 2020; Mason *et al.*, 2022). Younger people face a higher risk of developing smartphone addiction because, as digital natives, smartphones are essential for them, are totally integrated into their lives, and are socially accepted (Akbulut

Zencirci *et al.*, 2018; Muhammad *et al.*, 2023). Prior studies have found a correlation between age and smartphone-use problems, particularly in younger people (Elhai *et al.*, 2020). For instance, San-Martín and Jiménez (2021) profiled smartphone users and found that age differed significantly across groups of young people, with the most addicted group being composed of the youngest (below 21 years old). Similarly, Akbulut Zencirci *et al*. (2018) evaluated the level of addiction across two groups of young people, one aged 18–20 years and the other aged 21–24 years; the former presented higher levels of smartphone addiction than the latter. In addition, Rodríguez-Brito *et al.* (2022) provided empirical evidence of the turning point regarding consumers' age; specifically, they found significant differences in technology consumption and smartphone usage time between 20 and 21 years. Furthermore, Kiss *et al.* (2020) posited that individuals with a mean age of 20.95 (≤ 21 years old) showed the strongest smartphone use problems. Prior literature offers evidence that late adolescence and early adulthood are vulnerable stages of life for developing behavioral problems, including those related to mobile technology (Kiss *et al.,* 2020; Rodríguez-Brito *et al.,* 2022).

Moreover, age played a significant role as a moderator. The consequences of smartphone addiction are more severe among young people. For instance, Mason *et al.* (2022) indicated that the incorrect use of smartphones for mood regulation was found more among younger people. Recent research supports the idea that age plays an important role in compulsive behavior. Japutra *et al*. (2022) observed that age negatively moderates the relationship between brand-related variables and compulsive buying. Additionally, Mason *et al*. (2022) suggest that the effect of smartphone addiction on compulsive buying is more prominent in the case of the youngest Gen Z individuals and call for research to explore these relationships. Thus, we propose the following hypothesis:

H6: Age negatively moderates the relationship between smartphone addiction and the compulsive app downloading tendency.

The proposed research model is illustrated in Figure 1.

-Figure 1 here-

3. Method

To test the proposed model, we gathered data via an online survey on the Prolific platform, offering 2£ compensation for participation. According to Peer *et al.* (2017), Prolific platform offers high data quality. It provides a range of demographic details about its participant pool on its website, which is used to define the specific target for this study a priori (i.e., young adults belonging to Gen Z, residents in Spain, gender balanced).

Regarding the survey design, we employed established scales taken from the literature (Table I) based on a five-point Likert scale (see Online Supplemental Material for details). After designing the questionnaire, we sought feedback from four young students as a procedural remedy to increase survey readiness because problems in the comprehension stage of the response are one of the easiest avoidable sources of common method bias (Podsakoff *et al.*, 2003). Accordingly, several amendments were made. Thus, we followed the recommendations of Podsakoff *et al.* (2003) to minimize the impacts of common method variance (CMV). Remedies were handled by anonymizing the data, diminishing evaluation apprehension, refining items, and segregating the measurements of endogenous and exogenous variables.

After data collection, 275 valid questionnaires were obtained, with a response rate of 91.6% and an error rate of 5.9%. The sample comprised 58.1% male, 41.5% female, and .4% non-binary, with an average age of 21.4 (S.D.: 2.16); 45% of the participants spent between 2 and 5 hours using a smartphone daily, with a mean of 25 (S.D: 27) downloaded apps on their smartphones. The sample and national profiles were similar according to the secondary data available regarding smartphone use and addiction in Spanish youth. In fact, Spanish youth (18 to 25 years old) dedicated more time to their smartphones than to any other device (4.8 h) and

the number of downloaded apps (5%) and in-app purchases (29%) increased (Ditrendia, 2022). Before estimating the measurement model, it is widely recommended that the non-response rate be below 30% (Armstrong and Overton, 1977). The non-response rate in this study was 14%, suggesting that the recommendation was followed. Following Armstrong and Overton (1977), we included a test to compare two "known" values (i.e., age and gender) of the population in the Prolific platform and the sample. The Pearson χ-square test of the values revealed non-significant differences in either age (p = .46) or gender (p = .78), dissipating the initial suspicions about non-response bias.

4. Results

4.1. Measurement model

We employed the covariance-based structural equation modeling (CB-SEM) approach to measure and estimate the model. AMOS (v28.0) was used for the statistical analysis. Specifically, smartphone addiction is a reflective–formative second-order construct shaped by four dimensions (daily-life disturbance, withdrawal, cyberspace-oriented relationship, and tolerance) (Lopez-Fernandez, 2017). Following the suggestions of Diamantopoulos and Winklhofer (2001), we used a multiple indicator multiple causes (MIMIC) model to assess the validity of this formative construct. For proper specification of the model, Diamantopoulos and Winklhofer (2001) and Jarvis *et al.* (2003) proposed including at least two reflective indicators to measure the formative construct. Following this recommendation, we added two reflective items to the four dimensions of smartphone addiction. These items reflect smartphone addiction based on the number of hours for which participants used their smartphones.

The goodness-of-fit indices in the confirmatory factor analysis (CFA) allow us to consider the acceptable measurement model ($\chi 2 = 186.717$; $p < .000$; RMSEA = .053, NFI = .90; CFI = .96; IFI = .96; GFI = .93). To check the psychometric properties of the measurement scales, we verified that Cronbach's α, the composite scale reliability (CR), and average variance extracted

(AVE) exceeded the cut-off values of .80, .70, and .50, respectively (Fornell and Larcker, 1981; Gefen *et al.*, 2011), except for social capital, daily-life disturbance, and tolerance[2] (Table I). Moreover, we calculated the variance inflation factor (VIF) to detect multicollinearity. The results allowed us to discard any multicollinearity problem since the VIF values are, in all the cases, close to or lower than 3 (see Table I) (Becker *et al.*, 2015).

We then verified that the square root of the AVE for reflective constructs surpassed their inter-correlations to ensure discriminant validity (Fornell and Larcker, 1981; Hair *et al.*, 2018) (Table II). Thus, the measurement model was considered satisfactory, with evidence of adequate reliability, convergent validity, and discriminant validity after deleting certain items because their loadings did not exceed the recommended threshold (Hair *et al.*, 2018). Tables I and II display the psychometric properties of the measurement model.

-Table I here-

-Table II here-

The evaluation of CMV in results of statistical analysis is highly recommended (Chin *et al.*, 2012; Podsakoff *et al.*, 2003). Thus, we ran the Harman's single-factor test, using both the traditional exploratory factor analysis (EFA) and the recent CFA approach. The EFA loaded with all items onto one factor shows that a unique unrotated factor explained 19.88% of the variance, which indicates a minimal risk of CMV, since the factor does not account for more than 50% of the variance (Podsakoff et al., 2003). Regarding the CFA method to evaluate CMV, we included all manifest variables as indicators of a single factor and the results show a poor model fit ($\chi 2 = 1114.174$; RMSEA = .175; NFI = .425; CFI = .447; IFI = .452; GFI = .668). In addition, we utilized the marker variable technique suggested by Lindell and Whitney (2001) to assess the influence of CMV. We consider the “number of sibling” as the marker variable since no theoretical reason was found to relate it to the rest of the variables (Lindell and Whitney, 2001). Following Lindell and Whitney (2001, p.116), we analyze the CMV adjusted

correlations among the research constructs using the smallest positive correlation (r = .008) as a proxy for CMV. The differences between the original and CMV-adjusted correlations were minor, while no significant correlation changed to non-significant. The results and procedures suggest that CMV is not a problem in this case.

4.2. Structural model

Next, we tested the proposed hypotheses by estimating the structural model. Table III presents the global estimation model. Regarding the consequence, H1 is confirmed since smartphone addiction has a positive direct effect on the compulsive app downloading tendency ($\beta = .573$, $p < .05$). Regarding the protective factors, H2 is supported, as resilience is a personal factor that negatively influences smartphone addiction ($\beta = -.149$, $p < .05$). However, we did not find evidence to support the hypothesis that family harmony and social support affect smartphone addiction, thus rejecting H3 and H4. Finally, social capital significantly affects smartphone addiction, thereby increasing it ($\beta = .350$, $p < .05$). Although this relationship was significant, it contradicted our hypothesis. Thus, we could not confirm H5.

-Table III here-

4.3. The moderating role of age

Regarding the moderating effect of age, we tested for an interaction effect. Based on recommendations by Rasoolimanesh *et al*. (2021) to test the moderation effect of a continuous variable (age) in one specific relationship of a structural model (i.e., Smartphone addiction → compulsive app downloading tendency), it is appropriate to implement the interaction effect approach. In this sense, the interaction of age with the relationship between smartphone addiction and the compulsive app downloading tendency was negative and significant ($\beta = -.015$, $p < .001$; see Table III). To better comprehend the moderating impact of age, Figure 2 illustrates the simple slope plots for the effect of smartphone addiction (x-axis) on the

compulsive app downloading tendency (y-axis) examined at ±1 SD above and below the age mean (21.4 years old). As shown in Figure 2, smartphone addiction has a higher effect on younger consumers' tendency to compulsively download apps. In contrast, as consumers get older, this relationship is mitigated, which confirms H6.

-Figure 2 here-

5. Discussion and implications

As mobile technology continues to grow in popularity among the younger generations, marketing academics and managers must understand the effects of smartphones addiction on Gen Z's mobile technology consumerism (via compulsive app downloading). This study proposes a model that analyzes the impact of smartphone addiction on technology-related behavior (i.e., the compulsive app downloading tendency) and explores the protective factors (i.e., resilience, family harmony, perceived social support, and social capital) mitigating smartphone addiction. Furthermore, this study explored the moderating role of user age in the impact of smartphone addiction on the compulsive app downloading tendency among Gen Z consumers.

Overall, this study contributes to existing literature in several ways. First, our results reveal the importance of raising concerns about the negative side effects of smartphone use from a consumer perspective. This study is one of the first to incorporate the consumer perspective into the study of problematic smartphone behavior and app consumption, addressing a gap in literature (Richard *et al.*, 2020). Second, the literature has focused more on explaining smartphone addiction (Busch and McCarthy, 2021), and less on analyzing mitigating factors as antecedents of addiction and adverse consumer outcomes (Turel *et al.*, 2021). As Richard *et al.* (2020) state, the literature offers several perspectives on smartphone addiction but fails to establish a causal theory model that accounts for this phenomenon. Third, our study confirms

that resilience (Choi *et al.,* 2015; Kiss *et al.,* 2020; Shen, 2020) directly protects young consumers from addictive disorders related to smartphone use. Fourth, as Richard *et al.* (2020) indicate, the macrosystem and exosystem levels have been less researched than the microsystem level; therefore, we analyzed the role of key variables of the exosystem level (social support) and macrosystem level (social capital) in the context of smartphone addiction.

Following the social learning theory, compulsive consumers learn part of their behavioral problems through socialization processes by imitating the roles played by family members and significant others while growing up. Surprisingly, family harmony and perceived social support did not play protective roles as hypothesized. Being part of a peaceful and harmonious family is not sufficient to reduce smartphone addiction, nor is the perception that one is a part of a social network. Following Guo *et al*. (2019), Stewart *et al.* (2022), and Islam *et al.* (2018), other factors related to the family, such as patterns of family communication, parental observation, comparison with parents, and smartphone use habits, could be included in future studies. Additional elements, such as young consumers' stress, might have an influence (Handa and Ahuja, 2020). Thus, parents and educators should create a less stressful external environment to promote adaptive functioning (Zhang *et al.*, 2022). Influencers could also play a key role as promoters of healthy smartphone use and responsible app consumptions since influencer marketing is a useful tool to encourage responsible consumption among Gen Z users (Djafarova and Foots, 2022).

There is no consensus regarding the protective role of social support in smartphone addiction. According to previous research, this variable may serve as a moderator rather than a predictor of smartphone addiction (Wang *et al.*, 2018), and its efficacy as a protective factor varies with the size of the support system and satisfaction with the perceived support system (Bruwer *et al.*, 2008). Using the smartphone for app downloading or shopping in the privacy of their own space can lead consumers to maladaptive consumption while removing the possibility of social

criticism about an undesirable behavior. According to Chang *et al.* (2022), there is a difference between online social support and realistic social support, which is more relevant to facing smartphone addiction. Therefore, future studies should delve into this topic.

Contrary to our hypothesis, social capital positively affects smartphone addiction. This result is understandable because social capital is a complex concept developed to explain the features of social life, key elements maintaining community life, and resources accumulated through personal relationships (Chen and Li, 2017). This implies that people with more social capital are more socially connected and have more potential resources to mobilize for the benefit of themselves and others. Accordingly, social capital requires time and investment in the network (Unlu, 2009), and considering that the smartphone enables perpetual connectivity with existing close ties (Park and Lee, 2012), this can result in its continuous or excessive use for communication and maintenance of relationships. In line with Bian and Leung (2015, p.64), our result might support that a positive correlation exists between social capital and smartphone addiction, "since social capital is about connections among people, people who are addicted to smartphones or use smartphones heavily may also generate more social capital," and social capital induces consumer smartphone addiction.

Fifth, we add to recent studies that call for an understanding of the disadvantages of smartphone addiction as a factor driving compulsive behaviors related to consumption (Mason *et al.*, 2022). We found evidence that smartphone addiction prompts compulsive consumer behavior and app downloading. In agreement with previous studies (Mason *et al.*, 2022; Robayo-Pinzon *et al.*, 2021), compulsive behavior represents the negative side of problematic smartphone use. Our results align with those of Darrat's *et al.* (2023) regarding the fact that the growing prevalence of digital immersion and hyperconnectivity via smartphone has increased compulsive and frequently erratic consumption patterns among young consumers.

This finding complicates the work of marketers interested in promoting the adoption of revenue-generating apps because smartphone addicts tend to download apps impetuously, non-reflectively, immediately, and kinetically. Further studies are needed to understand the effects of smartphone addiction on app monetization. In an era of social responsibility and responsible business practices (Ting *et al.*, 2022), marketers and app developers must consider the adverse outcomes of smartphone addiction and address the challenge of ensuring that their practices do not exacerbate the young consumer's problem by failing to consider final users' needs and healthy interests while designing their applications. In this sense, marketers can apply social responsibility, use permission marketing, and help consumers to properly use their smartphones and apps by modifying selling tactics employed in advertising and shopping channels. Indeed, any marketing communication requires a responsible approach (Ting *et al.*, 2022).

Sixth, our findings confirmed that the consequences of smartphone addiction are more severe among younger users. The effect of smartphone addiction on the compulsive app downloading tendency was more prominent when users were younger than 21 years. This result expands on previous research showing differences across young people in terms of levels of addiction (Akbulut Zencirci *et al.,* 2018). Moreover, this study complements prior literature (Mason *et al.*, 2022) that explores the role of smartphone addiction in compulsive online buying and confirmed the negative moderating role of age in the rise of compulsive app downloading owing to smartphone addiction among Gen Z consumers.

Regarding practical implications, behavioral disorders related to smartphone addiction may not contribute to consumers making conscious decisions about apps as they can indiscriminately increase their free app downloads. In this sense, resilience stands out and provides insights that responsible marketers and managers can use to tackle smartphone addiction and promote healthy content downloading. Other stakeholders from diverse playgrounds, such as policymakers, regulators, and schools, must be involved in finding solutions to the dark side of

using smartphones. In this sense, intervention and coping strategies, such as relaxation, self-control ability, self-regulation, establishing healthy boundaries, and resilience training, can contribute to promoting safer environments to resist the development of problematic behavior (Moqbel *et al.*, 2023; Mourelatos and Manganari, 2023; Shen, 2020; Zhang *et al.*, 2022).

To reduce the compulsive app downloading tendency, marketing strategies can concentrate on following a freemium plan by offering an elementary free app and a premium high-quality version for a price to prevent the saturation effect, especially in the case of younger users (i.e., when app users already access high levels of quality downloading a free app, it will not be rational or worthwhile paying for added quality increments). As Mondal and Chakrabarti (2021) highlight, more than 70% of downloaded apps are abandoned within 90 days, and this discontinued use of apps is a concern for marketing practitioners and academics.

6. Limitations and future research

The present study considered a specific demographic group (i.e., young people who used online survey platforms) and followed a cross-sectional design. While this sample population may limit the study's generalizability, it was appropriate given the participants' familiarity with technology and its relevance to their lives, as other authors justify (Clements and Boyle, 2018). Notwithstanding the previous reasoning, future studies should collect larger samples for pre-testing purposes and collect data at two points to discard other methodological concerns related to surveys, as recommended by Shiau *et al.* (2020). These methodological shortcomings restrict the generalizability of our results. It would be interesting to replicate this study using a larger cross-national or cross-cultural sample. Other variables should be considered in future studies. For example, additional protective factors (e.g., family communication) or other marketing variables directly related to the consumer research context must be considered in future studies, such as the consumer-branded app relationship and consumerism. The results of the proposed model are limited because some relationships have not been explored. For example, some

variables, such as social capital, can engender smartphone addiction and be reinforced by it, showing a bi-directional influence. Thus, longitudinal data can be used to test these bi-directional relationships (Herrero *et al.*, 2019). Another critical factor to be considered is the smartphone's purpose. As Moqbel *et al.* (2023) recognize, the dark side of smartphone addiction is related to the hedonic purpose of smartphones. Along the same line, Clements and Boyle (2018) suggest that, depending on the intended functionality, hedonic or utilitarian use, and whether mobile devices are being used for personal or professional purposes, specific functionalities on mobile technologies should be turned on or off to inhibit particular compulsive interactions.

In addition, our study only used quantitative methods. Thus, it would be interesting to use qualitative mixed methods and combine parents, peers, teachers, marketers and policymakers' opinions to complement our results. The COVID-19 pandemic may also have affected the results, and comparing results among pre-, during, and non-pandemic periods would be enriching since previous research (Gong *et al.*, 2022) has found that media dependency during pandemic circumstances exacerbates anxiety and reduces well-being. Finally, the appearance of artificial intelligence can worsen the negative consequences of technology-related addictive behavior due to immersion in a different reality, which should be addressed in future research dealing with consumers.

7. Conclusion

In an era where the emphasis on social responsibility empowers marketers to position themselves differently than others in the marketplace to gain a competitive advantage, smartphone addiction and compulsive app downloading should be prevented for the benefit of consumers and society. A crucial concern for marketing scholars and practitioners alike is whether the focus should be on improving retail strategies and conducting better analyses of consumer behavior to prevent detrimental effects on both young individuals and future society.

Through the lens of the risk and protective factors framework, this study yielded an increased understanding of mitigating mechanisms of smartphone addiction and compulsive app downloading. As organizations track objective measures such as time screens, it becomes increasingly essential to assess the subjective aspects to protect young consumers from developing or exacerbating their smartphone addiction, such as promoting resilience.

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[1] A mobile app is a "computer program designed to run on a mobile device such as a smartphone or tablet" (Hsiao, 2017, p. 273).

[2] As the composite reliability for these constructs was sufficient and all other coefficients in our study fulfilled the required criteria, we proceeded with the analysis, including the construct (see Cronbach & Shavelson, 2004).

Figure 1 Proposed model

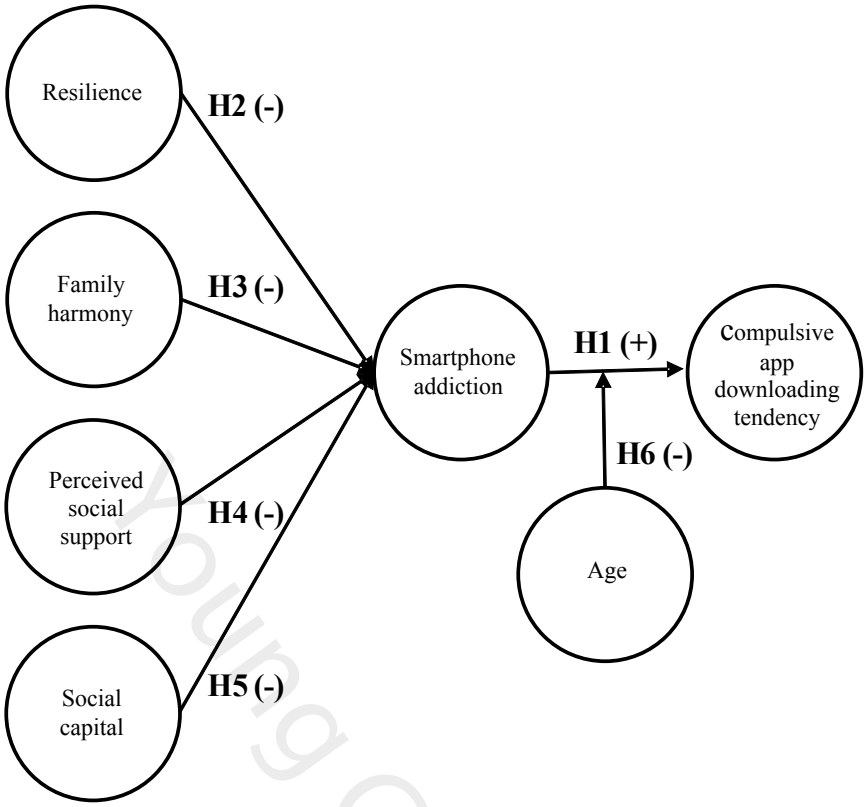


Table I. Measurement model estimation

Item (authors of reference)	**Mean/SD**	**Loading**	**VIF**	**α**	**CR**	**AVE**
Resilience (Rodriguez-Rey et al., 2016)						
RES1 (R)	2.71/1.12	.854	2.89	.88	.88	.59
RES2 (R)	2.41/1.11	.577	1.51			
RES3	3.07/1.16	.803	2.55			
RES4	3.26/1.12	-				
RES5 (R)	2.96/1.16	.815	2.61			
RES6	3.04/1.15	.774	2.45			
Family Harmony (Kavikondala et al., 2016)						
FH1	3.66/1.20	.811	2.19	.84	.84	.64
FH2	3.69/1.14	.768	1.99			
FH3	3.42/1.23	-				
FH4	3.90/1.14	.826	2.21			
FH5	3.49/1.23	-				
Perceived Social Support (Porter et al., 2019)						
PSS1	3.66/1.27	.991	3.26	.88	.85	.66
PSS2	3.68/1.34	.832	3.14			
PSS3	3.51/1.36	-				
PSS4	3.83/1.23	-				
PSS5	4.05/1.10	.542	1.41			
PSS6	3.98/1.13	-				
Social Capital (Chan, 2015)						
SC1	3.49/1.27	-		.56	.64	.50
SC2	4.15/.913	-				
SC3	3.71/1.14	-				
SC4	2.99/1.20	-				
SC5	3.61/1.04					
SC6	4.00/.963	.897	1.39			
SC7	3.46/1.14	.				
SC8	3.37/1.07	.437	1.28			
Compulsive app downloading tendency (Okazaki et al., 2021)						
TCAD1	3.25/1.48	-		.74	.75	.60
TCAD2	1.41/.771	-				
TCAD3	1.23/.624	-				
TCAD4	1.98/1.20	.676	1.55			
TCAD5	2.25/1.28	.750	1.57			
TCAD6	1.66/1.07	.683	1.55			
Daily-life disturbance						
DLD1	2.28/1.16	-		1.00	1.00	1.00
DLD2	3.73/1.15	1.000				
DLD3	2.65/1.38	-				
Withdrawal						
WIT1	2.99/1.18	.733		.77	.78	.55
WIT2	2.72/1.17	.846				
WIT3	2.03/1.07	.627				
WIT4	2.67/1.22	-				
Cyberspace-oriented relationship						
COR1	2.58/1.19	1.000		1.00	1.00	1.00

Tolerance					
TOL1	3.3/1.22	1.000	1.00	1.00	1.00
TOL2	1.90/1.07	-			
Smartphone addiction (Kwon et al.. 2013; Lopez-Fernandez. 2017)					
	Mean/SD	Weight	Tolerance		VIF
Daily-life disturbance	3.73/1.15	-.03	.816		1.22
Withdrawal	2.58/.94	.25	.721		1.38
Cyberspace-oriented relationship	2.58/1.19	.02	.588		1.70
Tolerance	3.30/1.22	.22	.603		1.65

Notation: (R): Reverse coded; -: Deleted item; CR = composite reliability; AVE = average variance extracted; VIF = Variance Inflation Factor; SD: Standard Deviation.

Table II. Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)
Resilience (1)	**.768**					
Family Harmony (2)	.302	**.800**				
Social Support (3)	.228	.263	**.812**			
Social Capital (4)	.281	.114	.219	.**707**		
Addiction (5)	-.092	.050	.013	.179	-	
Compulsive app downloading tendency (6)	-.041	-.055	-.006	.046	.262	**.707**

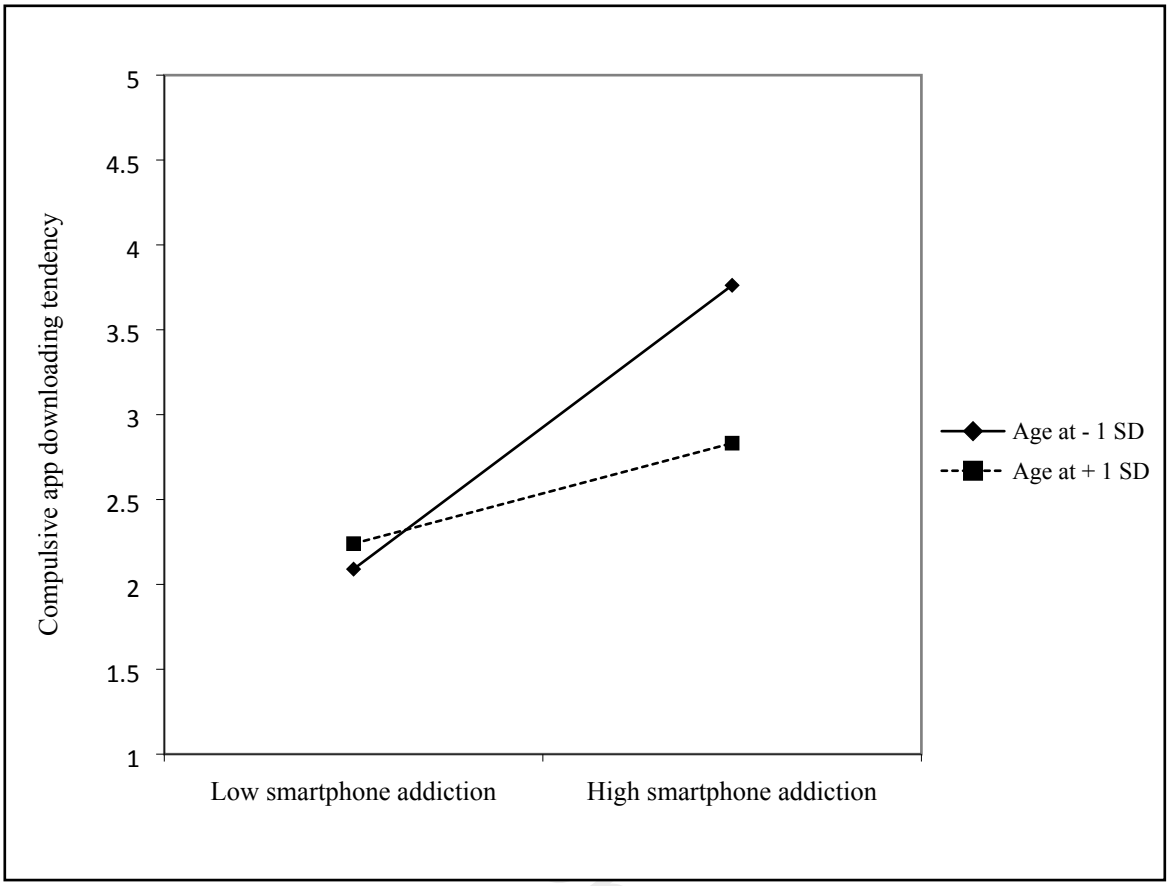
Notes: Values below the diagonal show correlations between constructs; values on the diagonal (in bold) show the square root of AVE.

Table III. Structural model estimation

Path	β
H1: Smartphone addiction → Compulsive app downloading tendency	**.573*** **
H2: Resilience → Smartphone addiction	**-.149** **
H3: Family Harmony → Smartphone addiction	.070 n.s.
H4: Social Support → Smartphone addiction	-.013 n.s.
H5: Social Capital → Smartphone addiction	**.350** **
H6: Smartphone addiction*Age → Compulsive app downloading tendency	**-.015*** **
R^2 smartphone addiction=.06; R^2 Compulsive app downloading tendency =.34 Goodness of fit $\chi 2$ = 187,581 (p < .000); RMSEA = .051; NFI = .90; CFI = .96; IFI = .96; GFI = .93	

Notation: ***p < .001; **p < .05; n.s.: non-significant; significant path in bold.

Figure 2 Age moderation effect



Notation: SD: Standard Deviation

SUPPLEMENTAL ONLINE MATERIAL

Scales used and authors of reference

Resilience (Rodriguez-Rey et al., 2016)

- It is hard for me to snap back when something bad happens. (R)
- I have a hard time making it through stressful events. (R)
- I tend to bounce back quickly after hard times.
- I usually come through difficult times with little trouble.
- I tend to take a long time to get over setbacks in my life. (R)
- It does not take me long to recover from a stressful event.

Family Harmony (Kavikondala et al., 2016)

- My family functions well for all members.
- My family's day-to-day interactions are peaceful.
- Family members accommodate each other.
- I am proud of my family.
- My family is harmonious.

Perceived Social Support (Porter et al., 2019)

- There is a special person who is around when I am in need.
- I have a special person who is a real source of comfort to me.
- I get the emotional help and support I need from my family.
- My family is willing to help me make decisions.
- I have friends with whom I can share my joys and sorrows.
- I can talk about my problems with my friends.

Social Capital (Chan, 2015)

- When I feel lonely, there are several people I can call to talk to.
- I am most comfortable with people and groups who share my values and beliefs.
- If I have severe financial difficulties, I know there is someone that can help me.
- I have the ability to organize my group of friends to fight injustice.
- Based on the people I interact with, it is easy for me to hear about the latest news and trends.
- Interacting with people makes me curious about things and places outside of my daily life.
- I am willing to spend time to support general community activities.
- I interact with people who are quite different from me.

Compulsive app downloading tendency (Okazaki et al., 2021)

- My smartphone has unopened/unused apps in it.
- Others might consider me a "downloading app-aholic."
- Much of my life centers on downloading apps.
- I download apps in my smartphone I don't need.
- I download apps in my smartphone I did not plan to download.
- I consider myself an impulse downloader of apps.

Smartphone Addition Scale (Kwon et al., 2013; Lopez-Fernandez, 2017)

<u>Daily-life disturbance</u>

- I miss planned work due to smartphone use.
- I am having a hard time concentrating in class while doing assignments or while working due to smartphone use.
- I have felt pain in the wrists or at the back of the neck while using a smartphone.

<u>Withdrawal</u>

- I am not able to stand not having a smartphone.
- I am feeling impatient and fretful when I am not holding.
- I am having my smartphone in my mind even when I am not using it.
- I will never give up using my smartphone even when my daily life is already greatly affected by it.

<u>Cyberspace-oriented relationship</u>

- I am constantly checking my smartphone so as not to miss conversations between other people on social networks.

<u>Tolerance</u>

- I use my smartphone longer than I had intended.
- The people around me tell me that I use my smartphone too much.