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Predictors of Smartphone's Gaming Addiction among Generation Z Consumers: An Empirical Investigation from Pakistan

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Abstract

Smartphone games are played on smartphones, such as smartphones or feature phones; personal digital assistants; tablets that can handle gaming consoles; and portable media players with internet connectivity. People are becoming addicted to smartphone games. Few researches have examined such addiction's causes, including perceived social and psychological factors. Practitioners, researchers, and academics alike are keenly interested in examining the causes of smartphone gaming addiction. Thus, this study examines the antecedents of smartphone phone gaming addiction. Self-determination theory was used to propose a theoretical model, which was validated using partial least square structural equation modeling on 421 smartphone game players of Generation-Z. Data were collected through structured questionnaires. The study reveals that materialism, enjoyment, and peer pressure positively affect Generation-Z's psychological engagement and smartphone gaming addiction. This study also reveals that psychological engagement can act as mediator between materialism, enjoyment, peer pressure, and smartphone gaming addiction. These players eventually develop a smartphone gaming addiction because of various elements encouraging them to play smartphone games regularly. Businesses can

benefit from understanding consumer behaviors related to smartphone use. This knowledge can be used for well-informed marketing strategies, product development, and customer engagement initiatives, recognizing the prevalence and potential consequences of smartphone addiction.

Keywords: Smartphone gaming addiction, materialism, perceived enjoyment, peer pressure, psychological engagement, generation-Z.

1. Introduction

Online gaming is a widely enjoyed activity that has been acknowledged as a significant means of obtaining information about entertainment in recent years (Hamari & Keronen, 2017). The proliferation of internet users has led to a plethora of online games across various platforms such as cellphones, laptops, tablets, and specialized consoles (Yilmaz & Tunca, 2024; Sun, Li, Lu, & Gao, 2023). These games have a broad appeal across all age groups, extending beyond only generation-Z. According to the Entertainment Software Association (ESA) in 2019, a significant proportion of adults in the United States, specifically 65%, engage in video games. The COVID-19 problem and the stringent quarantine measures implemented by several nations have led to a substantial surge in the demand for online gaming (Dahabiyeh, Najjar, & Agrawal, 2021). The digital gaming business is experiencing annual growth and is projected to earn $175.8 billion in revenue in 2021. Contrary to the declining trend in the PC game business, the mobile game market is experiencing growth (Wijman, 2021). A multitude of online games have the option to make in-game purchases, which can be used to obtain advantages, advance in the game, and improve the overall gaming experience.

The advent of digital technology, particularly smartphones, has significantly transformed the manner in which humans engage, communicate, and establish connections with their environment. Millennials, also referred to as the "iGen" generation, were born between 1981 and 1996 and have played a leading role in the digital revolution by embracing cellphones as an integral aspect of their daily lives (Tan, 2024).

The prevalence of smartphone usage has experienced a rapid and unpredictable increase in recent years, particularly among teens, who constitute one of the most rapidly expanding demographics of smartphone owners and users. The number of smartphone users in China has reached approximately 1.065 billion, with adolescents aged 10 to 19 years making up 14.3% of this population. While smartphones offer significant convenience, excessive use can increase the susceptibility of adolescents to smartphone addiction (Sun et al., 2023).

Such widespread digital penetration has grown to a greater extent in Asia (Haberlin & Atkin, 2022). Use of smartphone technology has greatly impacted communication channels (Subhani et al., 2023), information acquisition and entertainment industry due to its ease of use, mobility, and super speed (Routley, 2017). These smartphone devices are also major sources of gaming and sports. Smartphone gaming market is growing at wider speed

(Mahmood et al., 2014), it is expected to reach 200 billion dollars by 2023 with the steady annual growth of 9.3% ("Healthy forecasts," 2020). Use of smartphones has become an integral part of peoples' routines (de Reuver et al., 2016).

Uses of smart phones, tablets, smartphone devices, and gaming platforms have also increased in Pakistan. Reports suggest that 191.8 million people in Pakistan around 82% of the population own smartphone devices (O'Dea, 2021). Around 40.1 million people have smartphone subscriptions in Pakistan. In this modern world, information technology has advanced to such a level where access to smartphones and gadgets has become inevitable for many people. As of 2021, cellular subscription in Pakistan has reached to 189 million people. Reports suggest that 191.8 million people in Pakistan around 82% of the population own smartphone devices (O'Dea, 2021). Though most of the users use smartphone for cellular services (Ali et al., 2020), internet communication and social media, the use of next level sophisticated applications such as games is also increasing at greater pace in Pakistan especially after the COVID-19 pandemic (Nielsen, 2020). Roughly 16% of people in Pakistan play video games which are expected to rise to 21% by 2026 (Statista, 2023). 64% Pakistani adults use smartphone games. Smartphone games industry in Pakistan generates the revenue of around US$208.70 what is expected to become US$227.40 by 2026 (Statista, 2023).

Apart from the positive effects of smartphone, research has documented the harmful effects of extensive use of smartphone. Although literature has yet to identify the ultimate answer to the question regarding the definitive impact of smartphone use on individuals' wellbeing. Although most gaming players use smartphone without any known harmful effects, addictive users experience negative effects (e.g., Sun et al, 2023; Tan, 2024, Yilmaz & Tunca, 2024). Research on the effects of various uses of smartphone on different aspects of wellbeing is inconclusive (e.g., Hou, 2011). More specifically, there is limited understanding about the impacts of problematic use of smartphone gaming and how materialistic values have an impact on smartphone addiction. Moreover, the role of family and friends is also under research.

Although smartphones have multiple benefits, but these have also caused many physical, physiological, social, and psychological problems for adolescents (Chen et al., 2020, Domoff et al., 2020), that has become issue of grave concern for the policy makers. People who use smartphone gaming extensively are motivated to gain enjoyment and entertainment out of games. They also want to decrease their loneliness and increase psychological engagement. Such enjoyment obtained from engagement in smartphone gaming is one way to avoid real-life problems and decrease stress (Rubin, 2009).

However, research on smartphone gaming behaviors and its determinants is at its infancy especially in developing countries like Pakistan. Therefore, this study intends to develop and test a comprehensive model to unearth the predictors of addictive use of smartphone gaming in Pakistani users (Wu, 2013). More specifically, we test how materialism values lead to the use of smartphone gaming and how people are motivated to use smartphone

gaming. What type of enjoyment people receive from smartphone gaming and how these enjoyments lead to psychological engagement and smartphone gaming addiction (Demetrovics et al., 2011). Literature has documented the various motivational aspects (i.e. competition, social, escape, skill development, coping, recreation, and fantasy) leading to gaming behaviors for decades (Demetrovics et al., 2011) as well as for the formation of social and demographic identities (Shaw, 2012).

However, research on the dynamics of smartphone games remains unexplored in Pakistan. Thus, this study investigates:

Research Question 1 - What motivates gamers to play smartphone games?

Many smartphone games are designed to chase consumers' cognitive attention by offering different rewards, coins and extra credits. Such extrinsic rewards have further motivational potential to stimulate consumers psychologically and physiologically. Research suggests that smartphone gaming, gambling and substance use all involve certain amount of reinforcement and conditioning therefore people once become accustomed to these are difficult to avoid it and become additive and are at risk of variety of different risks to their mental and physical health. Therefore, it is necessary to understand the psychological mechanisms behind this addiction.

The significance of the study is that it has investigated smartphone gaming addiction from three diverse perspectives such as personal, social, and psychological perspectives. For example, this study has incorporated materialism in smartphone gaming addiction literature which is unique to this study as previous literature has tested materialism in compulsive buying practices from Pakistan (Islam, Sheikh, Hameed, Khan, & Azam, 2018), but studies that might have tested it in addiction literature are rate. Next our study has tested peer pressure as predictor of smartphone gaming addiction, peer pressure was used as determinant to different other addictions such as drugs use but there was need to test it in gaming addiction as well (Ahmed, Wassan, Qadri, & Ahmed, 2022). Thirdly, this is the first study to incorporate psychological engagement in gaming addiction in Pakistan and its need was well recognized in the literature (Nahum-Shani, Shaw, Carpenter, Murphy, & Yoon, 2022). Studying all these diverse factors through the lens of Self-determination theory is again another contribution of this study (Sun & Zhang, 2021). This study has collected data from generation Z population which is again a significant addition to the knowledge because youth in Pakistan is growing and actively participating in decision making (Hafeez & Fasih, 2018).

The introduction provides an overview of the research topic and establishes the significance of the study. Next section is literature review that that provide an overview of existing literature. The methodology section outlines the research design, data collection methods, and analysis techniques employed. Results present the findings of the study, often using data visualizations for clarity. Discussion interprets the results, relates them to the

existing literature, and explores their broader implications. The conclusion summarizes the key findings and their implications, emphasizing the contribution of the study to the field.

2. Literature Review

2.1 Smartphone Gaming Addiction:

Addiction is defined as a psychological state in which a person is tied to an incontrollable habit of practicing a particular activity so tightly and enthusiastically that it is difficult for them to escape it. Recently the problems related to smartphone gaming are at the rise in young generation due to widespread penetration of digital media and smartphones. Addiction literature considers smartphone addiction equivalent to behavioral addiction with associated consequences similar to behavioral addiction. This study therefore uses "smartphone gaming addiction" to understand its predictors and associated mediating mechanisms. Studies have identified the harmful effects of smartphone gaming addiction in which people face difficulty in managing life events and succumb to greater psychological and health related issues (Griffiths & Meredith, 2009; Kuss & Griffiths, 2012). Very recent work has been done regarding the causes behind game addiction such as self-efficacy, curiosity, achievement goals, and flow experience on young people's gaming addiction (Yilmaz & Tunca, 2024). These issues become grave for younger gamers who fantasize gaming (Hussain, Jabarkhail, Cunningham, & Madsen, 2021; Pallavicini, Pepe, & Mantovani, 2022).

2.2 Psychological Engagement

'Engagement' refers to one's involvement and attachment to the target (Huang & Choi, 2019). Consumer engagement is defined on the basis of attitudinal perspective that displays consumer's psychological viewpoint in reaction to their involvement with, interaction to and experience of particular brand, product or a service (Brodie et al., 2011; Huang & Choi, 2019).

In smartphone gaming literature, psychological engagement is widely discussed. Multiple theories and models are tested in smartphone gaming literature concerning gamers psychological engagement. For example, the Self-Determination Theory (Ryan & Desi, 2020) proposes that gamers engage in smartphone gaming due to the fulfillment of psychological needs such as competence, relatedness, and autonomy. Research has found that game designs focusing on autonomy enhancement increase psychological engagement and motivation to engage in smartphone gaming. Gamers develop goals and strive to achieve them. Another theory which is important in smartphone gaming is flow theory (Chikszentmihalyi, 1990) which posits that psychological engagement is related to smartphone gaming experience and intention to play smartphone games frequently. Gamers who receive support from friends, peers and family show greater engagement and experience happiness in smartphone gaming. Together with this, these theories provide ample understating regarding the role of psychological engagement in smartphone gaming.

Previous research has found psychological engagement increases the gamer's frequency of the use of smartphone gaming as well as their satisfaction (Van Doorn et al., 2010; Huang et al., 2017). Extensive psychological engagement by gamers makes them compulsive users of smartphone games. They skip social events and become isolated from other social contacts and remain highly involved in in-game achievements and accomplishments. They consume their full time, energy, attention, money and resources in games (Jeong, Kim, & Lee, 2017). Recent research has reported more problematic outcomes of extensive psychological engagement in games such as game addiction (Fernandez, 2022), these findings indicate that smartphone gaming has harmful effects on youth which need to be curtailed. On the other side, it also enhances multiple positive attitudes and behaviors (Fang et al., 2017; Hanifah, 2021). Research also suggests that game designs that enhance autonomy and competence foster gamers' psychological engagement thus increase level of enjoyment, and satisfaction (Kumpulainen et al., 2023).

Another stream of research has documented positive effects of psychological engagement with students' performance (Tang et al., 2022; Abbasi et al., 2022), creativity and problem-solving skills. There is still a gap to identify the role of psychological engagement in the context of individual's personal perspective (materialism), affective perspective (enjoyment) and social perspective (peer influence).

Despite multiple positive and negative effects of smartphone gaming, problematic outcomes of smartphone gaming such as smartphone gaming addiction are considered significant threat to people's wellbeing, health and happiness. Because gaming addicts lose self-control over public and social issues and face multiple social and psychological problems (Griffiths & Meredith, 2009. Greater risk is for young consumers who lose their focus on education, recreation, career and health (Griffiths, Davies, & Chappell, 2004). More specifically, since a gamer spends a great deal of time, energy and money in game and achieve certain level of accomplishment they consider it as an investment and don't want to lose control over their investment. Indeed, they achieve a certain status in the gamers' community therefore leaving the games means losing investment, losing friends, losing identity as a gamer and losing self-proclaimed status. Therefore, a series of obvious reasons is developed that keep them tied with smartphone gaming.

- *H1: Psychological engagement positively impacts smartphone gaming addiction.*

2.3 Materialism

Materialism refers to the personal values supporting achievement of material goods for the satisfaction of personal material goals (Richins, 2011; Richins & Dawson, 1992). They elaborate materialistic values based on three facets. First refers to acquisition centrality. This facet is related to one's inclination towards possessing material goods for personal goals achievement. Peoples drive happiness from owning, possessing, and acquitting something material and concrete in their life. This material acquisition is a crucial tenet of

their wellbeing (Segev et al., 2015). The third tenet expresses possession as a matter of success. People consider having material goods as a signal to display their success and use such possessions as a yard stick to compare themselves with others (Noguti & Bokeyar, 2014).

Research regarding antecedents of materialism considers variety of factors as a precursor to materialistic values. For example, advertising is considered as an antecedent to materialism (Ahmad & Mahfooz, 2018). Another precursor to materialism recently identified is the consumption of social media (e.g., Lou & Kim, 2019; Seo & Hyun, 2018). Different digital platforms such as social media have developed an environment where users turn to be influencers due to extensive fan following, content sharing and digital achievements. This situation has developed integration between materialistic values and celebrity models (Chan & Prendergast, 2008).

Apart from negative consequences of materialism, materialistic values are indeed associated with certain positive outcomes. Additionally, material possessions define one's extended self which is the source of happiness, delight and safety (Richins, 2017). Marketing research has identified that consumers' positive attitude towards products is linked with materialistic values. Such acts of having something in hand define their self-concept and are the outcome of psychological engagement (Goldsmith, Flynn, & Clark, 2011). The relationship between psychological predictors and materialism is yet to be defined however similar research has outlined the link between traditional media such as TV and materialistic values (Sirgy et al., 2012). Furthermore, newer versions of media such as smartphone addiction is also linked adolescents' materialistic values (Wang et al., 2018). Additionally, social network sites have also fostered materialistic values as everything on social media is counted. From likes and comments to reactions and sharing, people are sensitive to SNS atmosphere and become addictive to it (Marengo, Montag, Sindermann, Elhai, & Settanni, 2021).

Research suggests that people categorize themselves to belong to higher cadre based on possessions of smartphones (Bakari & Bakari, 2019). A very recent study has been analysed the mediating role of addictive use between millennials' habitual use and materialism (Tan, 2024). This risk of being materialistic is alarmingly higher for younger generations (Schaefer et al., 2004). Given that the research on materialism and gaming addiction is overwhelmed in western countries and there is a significant gap in the literature regarding evidence from emerging economies, therefore it is vital to investigates link between materialism and gaming addiction (Ostinelli et al., 2021). Unfortunately, research to understand detrimental effects of gaming addiction in Pakistani generation is at infancy (Richins, 2017). Due to inclusive evidence, multiple calls for research assert the need to focus on investigating the relationship between materialism and wellbeing with regard to related psychological mechanisms effects (Ekinci et al., 2021; Easterbrook, Wright, Dittmar, & Banerjee, 2014). This study thus aims to investigate the impact of materialism on psychological engagement in gaming behavior.

- *H2: Materialism positively impact the smartphone gaming addiction.*
- *H3: Materialism positively impact the psychological engagement.*
- *H4: Psychological engagement mediates the relationship between materialism and smartphone gaming addiction.*

2.4 Perceived Enjoyment

The smartphone games are a major part of the growth of smartphone media and have become an indefensible part of social life. However, with the advent and popularity of smartphone games, people's focus towards its negative outcome is very recent. These smartphone and online games are a source of escape from real world issues and create their own fantasy world (Charlton & Danforth, 2010). Recent research ranked different predictors of smartphone gaming with regard to their importance. They found perceived enjoyment as an important source of motivation to engage in video gaming (Wang & Goh, 2017) and it provides them sensation and impacts their feelings (Wu & Zhang, 2023). Further research has also found hedonic motivations i.e., fantasy, escapism and enjoyment, as important precursor to smartphone gaming (Merhi, 2016; Moon et al., 2017).

- *H5: Perceived Enjoyment positively impacts smartphone gaming addiction.*
- *H6: Perceived Enjoyment positively impact the psychological engagement.*
- *H7: Psychological engagement mediates the relationship between perceived enjoyment and smartphone gaming addiction.*

2.5 Peer Pressure

Peer pressure refers to a direct or an indirect force exerted by people of same age to persuade and encourage other person to involve in certain behaviors (Ngee Sim & Fen Koh, 2003). Although peer pressure and peer influence work simultaneously, peer pressure is more dominant and binding than peer influence. Research suggests that people aged 13 to 24 years are higher at risk taking, have greater need for social interaction, peer support, and are sensitive to peer pressure. This sensitivity to peer pressure is due to multiple reasons: for example, peers are primary source for adolescents to comprehend social norms. Secondly alignment with peers is seen socially rewarding by adolescents because it maintains their membership in social identity groups.

Social support from both the sources i.e., parents and peers have greater impact on level of development especially behavioral adjustment and mental health of adolescents (McMahon et al., 2020, Wang et al., 2018). Relationship between parents and adolescent refer to type of emotional and social bond between parents and adolescents however peer relationships are defined as level of interaction of the adolescents with those who share same age, education, and development (Zhou et al., 2015). Previous research has realized the fact that interpersonal relationship has significant impact on adolescents' smartphone gaming addiction especially relationship with peers because in contrast to parents' adolescents share more communities with peers (Liu et al., 2020).

Many smartphone addiction studies have focused on curative variables however there is gap in the research regarding focusing on the aspects from social relationships and their impact on adolescents' behavior especially the one like peer pressure. There is great scarcity of research to explore the impact that peer pressure can have on adolescents' undesirable behaviors. This study thus incorporates peer pressure as a precursor to smartphone addiction in Pakistani context. Research in this area is in infancy, however literature has recorded the negative outcome of peer victimization as a risk factor in academic performance (e.g., Li et al., 2019). Other researchers also have found peer pressure responsible for depressive symptoms and smartphone addiction (Elhai, Tiamiyu, & Weeks, 2018). Past research has also considered peer pressure responsible for internet gaming addiction (Hao et al., 2020) as well as peer phubbing. Despite the intermittent evidence for the role of peer and family relationships on the smartphone addiction, there is not any research which have tested comprehensive model considering personal, social and psychological aspects behind smartphone addiction (Sun et al., 2020),

- *H8: Peer pressure positively impacts smartphone gaming addiction.*
- *H9: Peer pressure positively impacts psychological engagement.*
- *H10: Psychological engagement mediates the relationship among peer pressure and smartphone gaming addiction.*

2.6 Theoretical Framework with the lens of "Self Determination Theory (SDT)"

Finally, this study thus has simultaneously examined the role of psychological engagement between enjoyment, materialism, peer influence and smartphone gaming addiction regarding adolescent/generation-Z in one model. After conducting extensive literature review, the current theoretical framework is based on Self-determination theory (Ryan & Deci, 2017). The SDT proposes that need satisfaction is basic tenet for sense of accomplishment. People turn to virtual world, if they find that they cannot fulfill their needs in real life environment. Smartphone gaming provides them such attractive environment for their need's satisfaction. They meet new people there, their accomplishment function as a reinforcement and increase their self-confidence and sense of autonomy. Moreover, there thrust for relatedness, made susceptible to peer pressure. Thus, by conforming to group norms, they satisfy their needs for relatedness.

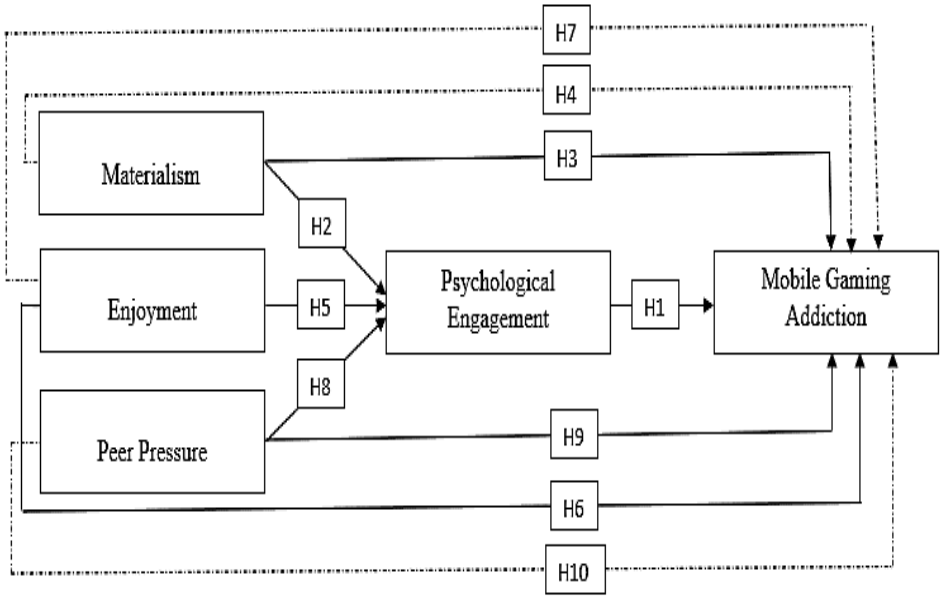

Figure 1: Theoretical Model

3. Data and Method

3.1. Data Collection

This study's data comes from a survey administered to a representative sample of Pakistani smartphone gamers in Generation Z. Individuals were mostly selected for inclusion in the sample based on their age. All of the respondents fell anywhere between 11 and 27 years old. This research made use of convenience sampling (Attiq et al., 2021), often known as non-probability sampling. Convenience sampling technique is adopted due to cost and time constraint (Cooper et al., 2018), further target population is geographically spread out (Saunders et al., 2019). Computer-assisted web interviewing (CAWI) was used to collect data from respondents from October to December 2022 using a standardized questionnaire. The online questionnaire was created in Google Forms and shared via email and Facebook.

Since this is a study of young gamers, researchers used a computer-assisted web interviewing (CAWI) approach, and previous research has shown that young people are more likely to volunteer for CAWI studies than older persons. Baker et al. (2010) found that anonymous online reporting was more reliable than verbal reporting given by an interviewer. Computerized self-completion has been the subject of several empirical investigations, including those by Link & Mokdad (2005a, 2005b).

Participants were invited to fill out a two-part online questionnaire. In the first section, researcher asked people to fill out some basic demographic information including their age, gender, and level of education. The second part of the survey evaluated the participants' habits related to internet gaming. During the online process, 421 usable surveys were generated.

3.2 Measurement Scale

This study employs a standardized questionnaire to collect information from our sample population. All of the study's constructs are based on previously validated scales. The demographics of the sample were collected in the first section of the questionnaire, while the constructs of interest were assessed in the second. The construct measurement items were developed using a variety of measuring scales, and responses were recorded on a five-point Likert scale ranging from 1 to 5. The validity of the created survey tools has been evaluated by a group of professionals (three research experts and one specialist) with experience in gaming research (Mumtaz et al., 2022).

The six-item Richins and Dawson (1992) tool used to measure materialism. Five items in the Phan, Keebler, and Chaparro (2016) instrument used to measure enjoyment. The four-item Lee and Schoenstedt (2011) tool is used to measure peer pressure. A three-item scale developed by Fang et al. (2017) examined psychological engagement. Lemmens, Valkenburg, and Peter's (2009) short form a 7-item scale is used to measure the addiction to smartphone games.

3.3. Method of Data Analysis

This study recommends PLS-SEM for analysis. This study used SmartPLS 3.2.8 to analyze data. Software SmartPLS uses Partial Least Squares (PLS). SmartPLS, developed after AMOS and Lisrel, is gaining prominence. SmartPLS analyses do not assume normality. Even with small samples, SmartPLS analyses are successful. Partial Least Squares Structural Equation Modeling (PLS-SEM) provides more exploratory and explanatory data than Covariance-Based SEM (CB-SEM), which operates on covariance (Yıldız, 2021). SmartPLS is better than AMOS because it is less affected by sample size (Hair et al., 2019). PLS-SEM is a complex statistical tool used in many fields. Unlike other statistical methods, PLS-SEM lets researchers work with data without distribution assumptions. No parameter identification issues arise with PLS-SEM. This method does not require independent observations. PLS-SEM is a statistical method that makes no data distribution assumptions. Keeping missing data to a manageable level makes it very resilient. This technique is tailored to practical applications with low theoretical background and high prediction accuracy (Wong, 2019). Zhang et al. (2016) said both strategies yield similar results. This study uses PLS-SEM to take use of its predictive power (Anderson & Gerbing, 1988). Like Vinzi et al., 2010, Attiq et al., 2022, Attiq and Moon, 2022, and Hussain and Attiq, 2017, several social science studies use PLS-SEM.

4. Data Analysis and Results

4.1 Descriptive Analysis

In this section, the sample's specifics are laid out. To that purpose, the study takes into account the 421 participants' gender, age, and level of education. Study counted 283 males and 138 females. 193 are in the age range of 18-22. 208 individuals fall between the ages of 23 and 27. There are 203 people who have at least a bachelor's degree.

4.2 Measurement Model

The method of structural equation modeling known as partial least squares was employed in this investigation. As a first step, the measurement model examines the outer loads. It is possible to increase the reliability of a measurement model by confirming the observed constructs and their corresponding items. The results of the outer loading were tabulated in Table I. Once the external loadings have been thoroughly analyzed, the constructs' reliability and validity will be put to the test. Reliability (or internal consistency) can be evaluated using Cronbach alpha values. Cronbach's alpha's final values were reliably between 0.72 and 0.89 above the cutoff point >0.70 (Fornell & Larcker, 1981). The second measure of internal consistency is composite reliability. Outer loadings on all variables were used to assess the composite reliability. High reliability, as defined as > 0.70, was shown for final composite reliability values in the range of 0.88 to 0.92 (Arnold & Reynolds, 2003). The outcomes were displayed in Table I.

All items in a given variable can be tested for their correlation with one another using convergent validity. For testing convergent validity of variables, the average extracted variance (AVE) is assessed. The rankings for convergent validity of the variables were between 0.59 and 0.71. Since all AVE values are more than the 0.50 criterion recommended by Fornell and Larcker (1981), it may be concluded that all constructs have good convergent validity. The convergent validity findings are shown in Table I.

Table 1: Testing of Measurement Model

Constructs	Code	Outer Loadings	Cronbach's Alpha	Composite Reliability	AVE
Materialism	MTR1	0.73	0.89	0.90	0.66
	MTR2	0.81			
	MTR3	0.85			
	MTR4	0.75			
	MTR5	0.86			
	MTR6	0.86			
Enjoyment	EJY1	0.78	0.85	0.85	0.62
	EJY2	0.81			
	EJY3	0.80			
	EJY4	0.80			
	EJY5	0.75			
Peer Pressure	PPR1	0.82	0.75	0.83	0.58
	PPR2	0.85			
	PPR3	0.46			
	PPR4	0.86			
Psychological Engagement	PEN1	0.79	0.73	0.73	0.65
	PEN2	0.81			
	PEN3	0.82			
Smartphone Game Addiction	SmGA1	0.72	0.83	0.85	0.60
	SmGA2	0.75			
	SmGA3	0.77			
	SmGA4	0.78			
	SmGA5	0.79			
	SmGA6	0.82			
	SmGA7	0.81			

Finally, the discriminant validity of each research variable is evaluated. For this, the study employs the Heterotrait-Monotrait (HTMT) method of determining discriminant validity. For the HTMT procedure to be valid, the HTMT value must be under 0.85. The findings that showed discriminant validity are summarized in Table 2.

Table 2: Discriminant Validity HTMT Ratio

Constructs	Materialism	Enjoyment	Peer Pressure	Psychological Engagement	Smartphone Game Addiction
Materialism					
Enjoyment	0.45				
Peer Pressure	0.58	0.62			
Psychological Engagement	0.54	0.81	0.61		
Smartphone Game Addiction	0.55	0.75	0.64	0.72	-

4.3 Structural Model

The structural model was then analyzed for research hypotheses across all constructs, following the analysis of the measurement model. Five metrics were proposed by Hair et al. (2019) to evaluate a structural model: multi-collinearity assessment, hypothesis testing, R^2 evaluation, effect size f^2 evaluation, and Q^2 predictive significance evaluation.

As a preliminary step in establishing multi-collinearity, the variance inflation factor test was used to each construct. Since the VIF score was lower than 3.3, the research indicated that there was no multi-collinearity issue, which is the cutoff value suggested by Hair et al. (2019). Table 3 below summarizes the results.

Table 3: Collinearity Testing

Constructs	Psychological Engagement	Smartphone Game Addiction
Materialism	1.41	1.35
Enjoyment	1.88	1.42
Peer Pressure	1.59	1.56
Psychological Engagement	1.85	-

The second part involves testing the hypotheses. The findings confirmed H1 in that there is a strong relationship between psychological engagement and smartphone game addiction as $\beta = 0.17$, $p<0.00$).H2 was approved on the basis of the findings that materialism has a significant positive influence on psychological engagement as $\beta = 0.18$, $p<0.00$.H3 was approved on the basis of the findings that materialism has a significant positive influence on smartphone game addiction as $\beta = 0.17$, $p<0.00$.The results supported H5 in that enjoyment significantly affects psychological engagement as $\beta = 0.50$, $p<0.00$.The results supported H6 in that enjoyment significantly affects smartphone game addiction as $\beta =$

0.38, p<0.001. Peer pressure has been found to significantly increase one's level of psychological engagement as (β = 0.13, p<0.00, lending support to H8. Peer pressure has been found to significantly increase one's level of smartphone game addiction as (β = 0.20, p<0.00, lending support to H9. The Figure 2 is also graphically presenting the results of structural model that depict the casual relationships of study variables.

Table 4: Testing of Hypotheses

Structural Path	β	P-value	Results
H1: Psychological Engagement→Smartphone Game Addiction	0.17	0.00	Accepted
H2: Materialism → Psychological Engagement	0.18	0.00	Accepted
H3: Materialism → Smartphone Game Addiction	0.17	0.00	Accepted
H5: Enjoyment → Psychological Engagement	0.50	0.00	Accepted
H6: Enjoyment → Smartphone Game Addiction	0.38	0.00	Accepted
H8: Peer Pressure → Psychological Engagement	0.13	0.01	Accepted
H9: Peer Pressure → Smartphone Game Addiction	0.20	0.00	Accepted

The predictive power of a model is then evaluated using R^2 (the determination coefficient). Predictive relevance (i.e., Q^2) is measured using a blindfolded technique. Results showed that Q^2 values for psychological engagement and smartphone game addiction are all above the threshold, i.e., greater than zero (Hair et al., 2017). Additionally, the size of the effect is quantified by calculating the f-value. Table 5 shows the obtained outcomes.

Table 5: Testing of Structural Model

Constructs	R^2	Q^2	Effect Size (f^2)	
			Psychological Engagement	Smartphone Game Addiction
Materialism	-	-	0.04	0.05
Enjoyment	-	-	0.32	0.16
Peer Pressure	-	-	0.02	0.05
Psychological Engagement	0.45	0.25	-	0.04
Smartphone Game Addiction	0.53	0.33	-	-

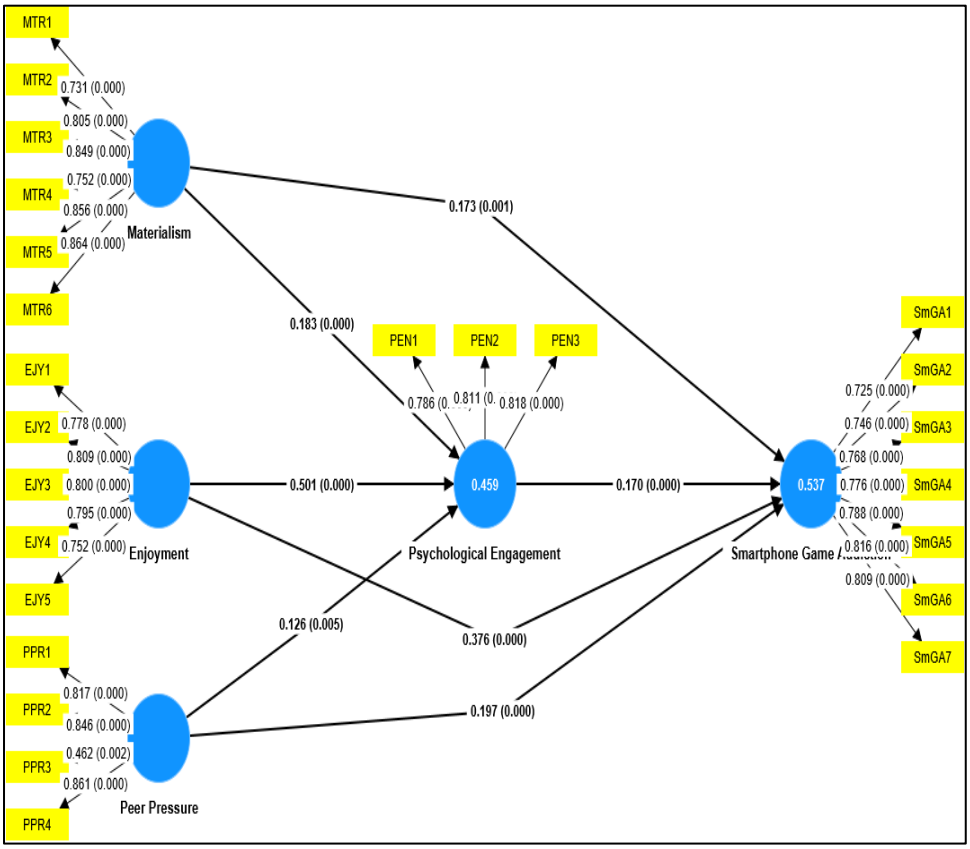

Figure 2: Structural Model

4.4 Mediation Analysis

In mediation analysis, H4 was approved on the basis of the findings that psychological engagement mediates the relationship among materialism and smartphone game addiction. as $\beta = 0.03$, $p<0.01$. H7 was approved on the basis of the findings that psychological engagement mediates the relationship between enjoyment and smartphone game addiction. as $\beta = 0.09$, $p<0.02$. At the end, H10 was approved on the basis of the findings that psychological engagement mediates the relationship among peer pressure and smartphone game addiction. as $\beta = 0.02$, $p<0.04$.

Table 6: Testing of Mediation Analysis

Structural Path	β	P-value	Results
H4: Materialism → Psychological Engagement → Smartphone Game Addiction	0.03	0.01	Accepted
H7: Enjoyment → Psychological Engagement → Smartphone Game Addiction	0.09	0.00	Accepted
H10: Peer Pressure→ Psychological Engagement → Smartphone Game Addiction	0.02	0.04	Accepted

5. Discussion

This study investigated the role of personal, psychological, and social factors on psychological engagement and smartphone gaming addiction. Data was collected from the generation Z smartphone users falling age bracket of 11 to 27 years. A total of 421 useable responses were analyzed through SmartPLS. Hypotheses are tested using PLS SEM techniques. Results have supported the hypothesis. Overall, using the lens of Self-determination theory, findings of the study suggest that young generation determined to have something valuable in their possession psychologically engage in gaming which ultimately lead them to smartphone gaming addiction. Another source of psychological engagement found in this study was the feeling enjoyment and fun obtained from involvement in games. Enjoyment was not only the predictor of psychological engagement in gaming, but it also increased smartphone gaming addiction (de Bérail, Guillon, & Bungener, 2019). Apart from personal and psychological factors, social factors were also important for the lifestyle of generation Z (Ameen, Cheah, & Kumar, 2022). For example, this study found that peer influence is positively related to psychological engagement and smartphone addiction. This study also found psychological engagement as a mediating mechanism between predictors of the model and outcome variable i.e., smartphone game addiction. Detailed discussion as per hypothesis is given below:

Research suggests that when adolescents are immensely engaged with a consumption of product, highly involved in it and fully loyal to it (Fullerton, 2005), then it is difficult for them to escape from that consumption (Bakari & Bakari, 2019). Therefore, as per SDT theory, adolescents once engaged in smartphone gaming, they are more likely to develop addiction to it (Ryan & Deci, 2000; Sun & Zhang, 2021).

Regarding materialism and its impact smartphone addiction and psychological engagement, scant literature suggests that materialistic values are directly related to social media addiction (Wang, Lei, Yu, & Li, 2020), internet addiction (Bhatia, 2019), brand addiction (Le, 2020) and smartphone addiction (Wang et al., 2020). Our study adds to the knowledge that materialism can add to smartphone gaming addiction.

Moreover, as per the premises of SDT, activities that enhance opportunities for autonomy and freedom motivate generation Z to engage in related behaviors such as psychological engagement (Ryan & Deci, 2000). Our study findings support the notion that materialistic values have autonomy enhancing potential thus will enhance psychological engagement.

Our positive findings of relationship between perceived enjoyment and smartphone gaming addiction are in line with Cao et al (2020) who found perceived enjoyment positively related to social media addiction in Chinese WeChat users. As basic temptation behind consumption of smartphone gaming is fun and enjoyment into it therefore studies also suggest that adolescents need for enjoyment is positively related to smartphone gaming addiction (Reinecke, Vorderer, & Knop, 2014).

Moreover, studies suggest that Generation Z invests ample resources including money, time, and energy in the consumption of products that supply enjoyable moments (Turel & Serenko, 2012). Research suggests that perceived enjoyment positively related to smartphone addiction (Sun et al., 2015) and social media addiction (Reinecke, Vorderer, & Knop, 2014). Thus, our study suggests that in-game characteristics such as amount of fun, and entertainment are positively related to psychological engagement in smartphone gaming.

Generation-Z behaviors are susceptible to peer pressure. Regarding peer influences and addiction literature, researchers suggest that peer pressure is important force behind variety of addiction including drug addiction, substance use, online gaming and smartphone gaming, social media addiction (Badenes-Ribera et al. 2019). Our findings regarding the direct impact of materialism, enjoyment and peer pressure on smartphone gaming addiction is also supported by extant literature.

Major motivation to succumb to peer pressure is generation-Z desire to relate to group to support self-identity. Because peers share many similarities and spend more active time than parents. It is not easy for generation-Z to escape peer pressure. As per SDT, adolescences are high on need for relatedness, they are more prone to peer pressure thus it may lead to engagement in gaming and gaming addiction (Ryan & Deci, 2000).

5.1 Implications

5.1.1 Theoretical Implications

This study offers multiple theoretical and practical implications for policy makers. Firstly, most of the gaming addiction literature has provided evidence from developed countries, however proliferation of smartphones in developing countries like Pakistan is also booming recently. Pakistani youth are frequently using digital platforms for different purposes. Previous literature suggests that Pakistani generation-Z are using social media problematically and it is creating issues related to mental health and poor academic performance. However, research on gaming addiction from Pakistan is scarce, this study thus has added to the literature of gaming addiction. Secondly, this study has incorporated

various factors including personal factors such as materialistic values, in-game factors such as enjoyment, and social factors such as peer pressure, psychological factors such psychological engagement in the gaming addiction research. This comprehensive model is unique to this study and contributes to the existing literature. Finally, this study has applied sophisticated analytical techniques using SmartPLS software and PLS-SEM techniques to test the data. Results have confirmed the reliability and validity of the model and have supported our hypothesis. Research suggests that empirical studies on smartphone gaming literature from Pakistani context are scarce, this study will surely add to the literature.

5.1.2 Practical Implications

Regarding practical implication, this study offers that policy makers, educational leaders and parents should note that generation-Z between the age of 11 to 27 years are at the risk of smartphone gaming addiction which may pose greater threat to their physical, psychological, and mental health as well as career prospects and academic performance. Policy makers are focusing more on gaming addiction in young gamers (Griffiths, Davies, & Chappell, 2004).

5.2 Limitations and Recommendations

This study has some limitations as well. The first limitation may be its cross-sectional design. Future research may be needed to investigate factors of this study in a longitudinal design because the mechanism through which addiction may take place takes time to materialize. The second limitation may be the same source data which may raise the problem of social desirability bias. Future research may collect data regarding gaming addiction of generation-Z from others such as family and friends to cater for social desirability. Although same source data is important to tackle the issues pertaining to one's values, psychological and social perceptions such as materialism, psychological engagement, enjoyment, and peer pressure in this study. Third, this study has measured smartphone gaming addiction through perceptual measures and self-reports, other objective ways of data collection may be applied to exactly measure the amount of time generation-Z consume playing smartphone games. Fourth, future studies may extend the findings of this study by including more distal outcomes of smartphone gaming addiction such as mental health, sleep problems, physical health problems, ergonomic issues (Yuan et al., 2013) etc. finally future studies may benefit from experimental designs by comparing gamers, non-gamers and gaming addicts to see how factors of this study differently contribute in the smartphone gaming addiction (Braun, Stopfer, Müller, Beutel, & Egloff, 2016).

5.3 Conclusion

This study tested the role of materialism, perceived enjoyment, peer pressure, psychological engagement, and smartphone gaming addiction. Results from the sample of generation-Z supported the hypothesis such that in generation-Z, materialistic values,

enjoyment and peer pressure create engagement with gaming and smartphone gaming addiction.

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Annexure - I: Questionnaire

Measurement Scales
Materialism (Richins and Dawson, 1992) • I admire people who own expensive homes, cars, and clothes • I like to own things that impress people. • Buying things gives me a lot of pleasure. • I like a lot of luxury in my life. • I would be happier if I could afford to buy more things.

• It sometimes bothers me quite a bit that I cannot afford to buy all the things I would like.
Enjoyment • I think the game is fun. • I enjoy playing the game. • I feel bored while playing the game. • I am likely to recommend this game to others. • If given the chance, I want to play this game again.
Peer Pressure • Knowing many others playing games on smartphones makes me play more. • I feel I need to play smartphone games because others play. • My friends force me to play games on smartphone. • My friends encourage me to play games on smartphone.
Psychological Engagement • I feel strong and vigorous when I am playing games on smartphone. • I am enthusiastic in playing games on smartphone. • Playing games on smartphone is absorbing and immersive.
Smartphone Game Addiction • Did you feel addicted to a smartphone game? • Did you spend more and more time on games? • Did you play video games on smartphone to escape reality? • Others have unsuccessfully tried to reduce your playing time? • Did you feel bad when unable to play? • Did you have hard arguments with others on your time spent on smartphone games? • Your playing time caused sleep deprivation?