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Understanding the moderating role of chronotypes for online mobile gaming in-app purchase intention

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ABSTRACT

In the highly dynamic and fast growing online mobile gaming industry, revenue streams are the most important for the game developers. One of the significant ways to generate revenues is to boost the in-app purchases by gamers. Using Stimulus-Organism-Response (SOR) framework, the present study modelled addiction, loyalty and in-app purchases with chronotypes (a biological disposition) as a moderator. The study posited that loyalty is one of the significant mediators to convert addiction into in-app purchases. For the present study, 345 university students completed a survey, and the data were analyzed via SmartPLS using multigroup analysis. The moderation of chronotypes (a biological disposition) and mediation of loyalty for in-app purchase intention were tested and supported by the results. The study suggested that evening type individuals had a higher tendency to be loyal towards online mobile gaming compared to morning type individuals. Moreover, evening type individuals had higher inclination toward in-app purchase intention compared to morning type individuals. Loyalty functioned as a mediator between addiction and in-app purchase intention. The present study is one of the first to investigate the role of chronotypes as moderator and loyalty as a mediator for online mobile gaming in-app purchase intention utilizing the SOR framework. From a practitioners' perspective, the present study highlighted a loyal segment of gamers who is more inclined to make in-app purchases. In addition, it highlights a dilemma for gaming operators to balance revenue generation with the well-being of its clientele.

1 Introduction

The increasing penetration of the internet and smartphones has led to changes in the gaming landscape. There are 4.88 billion smartphone users worldwide (Turner, 2024) which provides a potentially very large customer base for mobile game operators. In 2021, mobile consumers spent approximately \$116 billion on mobile games (Knezovic, 2022). The global mobile gaming industry comprises 2.68 billion gamers (Alda, 2023). Gamers downloaded 14.4 billion mobile

games in 2022 out of which, 12.1 billion were downloaded on *Google Play* (Statista, 2024). According to a report by New Zoo (2021), mobile gaming revenue accounts for as much as 52% of the total revenue of gaming industry, signifying the large boom in mobile gaming worldwide. These statistics demonstrate the increasing importance of the mobile gaming industry in people's everyday lives. Therefore, it is of great importance for the industry operators to understand gamers' behavior in terms of their spending on mobile games.

In terms of revenue generation, online mobile games comprise in-app purchases, paid apps downloads, and advertising (Haider, bin Azam Hashmi, Ali, & Malik, 2020; Mehrtens, Rosenboom, Chen, & Raeside, 2018). Studies have explored gamers' attitudes toward paid app downloads and advertising (Hsu & Lin, 2015; Lee, Zhang, & Mehta, 2020). For example, studies have addressed this domain with respect to consumer experiences, innovativeness, lifestyle, security, information, and pricing (Citrin, Sprott, Silverman, & Stem, 2000; Elliot & Fowell, 2000). However, in-app game purchases are considered to be different from other online purchases (Hsiao & Chen, 2016) and require a long-term engagement from the customers because they are backed by the gamers' engagement and stickiness to progress toward in-app purchases (Drell, 2013). A few studies, such as Balakrishnan and Griffiths (2018), have studied in-app purchase intention for mobile gamers via addiction and loyalty, creating a caveat in the exiting literature to understand the in-app purchase intentions of gamers. As aforementioned, engagement (loyalty) and stickiness (addiction) are essential to in-app purchases, and loyalty may be an intervening factor that mediates addiction to in-app purchases. Therefore, the present study examined loyalty as a mediator for addiction and in-app purchases, and attempted to further understand gamers' in-app purchase intentions.

Previous studies have also highlighted that consumers' intentions and behaviors are based on their psychological states and personality traits (Cole & Griffiths, 2007; Wan & Chiou, 2006). Studies have explored the psychological state of online mobile gamers for impulsive and compulsive behavior, as well as their personality traits in terms of demographics (Huh & Bowman, 2008). Other factors that may influence such behaviors include chronotypes. Chark, Lam, and Fong (2020) suggested that individual chronotypes based on preferred sleep times (i.e., 'night owls' versus 'early birds'), affect individuals' behavior and engagement in various activities. Evening types have a propensity to sleep late at night and as a result, wake up late in the day, and are more energetic in the evening time. Morning types wake up early and like to complete their tasks early after sunrise. The use of the internet, smartphones, laptops, and videogames are more greatly associated with evening types (Bartel, Gradisar, & Williamson, 2015). Moreover, evening types keep their electronic devices' screens on for greater amounts of time (Kauderer & Randler, 2013) and they use more mobile channels for online purchases (Haider, Zhuang, Hashmi, & Ali, 2019).

All these characteristics are associated with individual differences, and chronotype itself is a form of individual difference which influences consumers' behavior. Horzum and Demirhan (2017) found that chronotype affects users' attitude and their aims in using *Facebook*. Past studies have noted the impact of chronotypes on consumer behavior. However, research examining the role of chronotypes on in-app purchase intention for online mobile games is lacking. Considering this gap in the literature, the present study examined chronotypes as a moderating variable for in-app purchase intentions.

Interestingly, most of the studies which have examined the gamer's behavior toward mobile gaming have been carried out in either the USA or France (Ravoniarison & Benito, 2019) or specific online mobile gaming in countries like China (Haider et al., 2020) and India (Balakrishnan & Griffiths, 2018). When looking at the global mobile gaming landscape, it is clear that Asia Pacific countries contributes the highest in terms of revenue generation (Kameke, 2022). Over the past few years, Pakistan (where the present study was carried out) has emerged as one of the countries where mobile gaming industry is booming. Mobile gaming revenue was expected to reach \$46.84 (US) million by the end of 2023 in Pakistan (Statista, 2021, 2022). Market research indicated that 69% of Pakistani adults play online mobile games, with 17.7% aged 16-24 years and 34.5% aged 25-34 years (AdColony, 2021). To date, there is a lack of research examining the behavior of millennials regarding their online mobile gaming in-app purchases in Pakistan. Therefore, the present study also focused on understanding the behaviors of millennials for in-app purchase intentions.

In summary, the present study has three objectives which contribute to the existing literature in the domain of consumer behavior and behavioral addiction. Firstly, to explore the mediating role of loyalty between addiction and online mobile gaming in-app purchase intention. Secondly, to examine the role of biological disposition (i.e., chronotypes) as a moderator for online mobile gaming in-app purchase intention. Thirdly, to enrich the existing literature by broadening the scope of research in countries like Pakistan where online mobile gaming is growing rapidly. Based on the gaps in existing literature, the present study used the Stimulus-Organism-Response (SOR) framework to underpin addiction, loyalty, and in-app purchase intention among online mobile gamers.

2 Literature review and hypotheses development

2.1 Underpinning theory - Stimulus Organism Response Framework

The present study is underpinned by the Stimulus Organism Response (SOR) framework (Mehrabian & Russell, 1974). According to this framework, a stimulus (S) is any external factor or state, while organism (O) refers to any factor (internal or external) that depends on the influence of a stimulus. As the organism is the outcome of stimulus, it plays the role of a mediator for generating a specific response (R). Past studies have extensively used the SOR framework in the domain of consumer behavior and behavioral addiction studies in different contexts such as online purchase intentions, social media site use intention (Hewei & Youngsook, 2022; Le, Wu, Liao, & Phung, 2022), mobile application use intention (Chopdar, Paul, Korfiatis, & Lytras, 2022; Tak & Gupta, 2021), and smartphone use intention (Fu, Chen, & Zheng, 2021; Yang & Gong, 2021). Drawing upon the SOR framework and past literature, the present study operationalized addiction as a stimulus that generates loyalty (organism). Loyalty acts as a mediator to generate a response (i.e., online mobile gaming in-app purchase intention). Moreover, the study includes users' chronotypes which is their biological disposition as a moderator which affects the relationship between addiction (S), loyalty (O), and in-app purchase intention (R), therefore extending the literature in consumer behavior studies which utilize the SOR framework.

2.2 Chronotype

Human life operates around three clocks – solar, social, and biological (Roenneberg, Wirz-Justice, & Mellow, 2003). The biological clock is what regulates individuals' circadian rhythm. Simply put, this refers to the idea of sleeping at night and staying active during the day. Biologically, this

temporal organization anchors to the hormonal faculties that facilitate sleep induction. Studies show that the preference for optimal time for cognitive and physical activities, referred to as chronotype, varies across individuals (Chark et al., 2020). Such diurnal inclination, for efficient management of time, work, and sleep, is regarded as a personality-like trait that spreads across a continuum, ranging from extreme morningness to extreme eveningness. Subsequently, chronotypes demarcate individuals into three distinct categories: morning-types (or larks), neither, and evening-types (or owls). Larks, as the term suggests, go by the maxim ‘early to bed, early to rise’, performing best during the daytime. Owls go by the maxim ‘late to bed, late to rise’, dedicating their energy and efforts to the late hours of night for tasks or amusement (Horne & Östberg, 1976). Past literature has explored chronotypes differently, such as eveningness correlating with detrimental dispositions like videogame addiction (Vollmer, Randler, Horzum, & Ayas, 2014), internet addiction (Randler, Horzum, & Vollmer, 2014), and smartphone addiction (Randler et al., 2016).

2.3 Addiction and loyalty

Griffiths (2005) defines addiction as a problematic excessive behavior, arising from a contextual biopsychosocial process, comprising six core components (i.e., salience, tolerance, mood modification, relapse, withdrawal, and conflict). Addiction has been studied in multiple disciplines whereby addiction leads to specific types of outcomes. For example, Przepiorka and Blachnio (2016) showed that age and time spent on internet contribute to internet addiction. Sussman and Moran (2013) studied television addiction, its negative consequences and preventions. Clark and Calleja (2008) explored shopping addiction as a behavioral addiction and its impact on mood elevation. Another study by Carter, Van Wijk, and Rowsell (2019) found that food addiction leads

to binge eating. These diverse studies suggest that addiction can be a strong determinant of specific types of behaviors. In addition, addiction has also been extensively researched in relation to online gaming. Studies by Griffiths (2010) and Kuss and Griffiths (2012) demonstrate that addiction is a prevalent phenomenon in gaming. Lu and Wang (2008) specifically highlighted that online games can be addictive, and that such addiction leads to loyalty towards specific online games. Another study by Balakrishnan and Griffiths (2018) supported these findings and that addiction was associated with loyalty for online mobile gaming.

While examining loyalty, commercial operators look for ways to keep customers engaged in purchases of their products and services. This is what business models hinge upon, enabling revenue generation, brand dependence, sustainable long-term brand performance, as well as loyalty (Basu & Sondhi, 2020; Bhargava & Velasquez, 2020; Calvo-Porrall & Lévy-Mangin, 2017; Rashid, Nika, & Thomas, 2021). In the consumer-brand domain, loyalty is defined as the customer's intention to give exclusive patronage to a particular product or service over a sustained period of time (Senić & Marinković, 2014). The construct holds salience owing to its association with significantly advantageous concepts such as brand love, favorable word of mouth, willingness to pay more money, and purchase intention (Royo-Vela & Sánchez, 2022; Shamsudin, Abu Bakar, & Hashim, 2023; Srinivasan, Anderson, & Ponnayolu, 2002). Moreover, studies have also addressed its antecedents, such as satisfaction, trust, flow experience, and addiction (Al-Adwan, Kokash, Adwan, Alhorani, & Yaseen, 2020; Fuciu, 2019; Gu, Oh, & Wang, 2016; D. Lee, Moon, Kim, & Mun, 2015; Su, Chiang, Lee, & Chang, 2016). Furthermore, past studies in the context of telecommunication services, internet use, and mobile gaming have suggested that addiction leads to loyalty (Balakrishnan & Griffiths, 2018; Lu & Wang, 2008; Roman, Saniuta, & Pop,

2013). The present study particularly takes account of addiction and loyalty to understand the online mobile gaming in-app purchase intent in Pakistan.

2.4 Moderating role of chronotypes for addiction and loyalty

Having broadly defined the concept of chronotypes, this section examines how it moderates the relationship between addiction and loyalty. In the online gaming sector, Vollmer et al. (2014) proposed that evening-type individuals have add-on addiction (conceptualized as obsession) with gaming, relative to early risers. Consequently, there is a comparatively higher inclination and addiction within this chronotype towards playing videogames, alongside internet and smartphone addiction (Randler et al., 2014). These findings indicate that evening type individuals engage in greater screen time than those who prefer to work in the morning (Kauderer & Randler, 2013). Moreover, while some research considers loyalty as an autogenous behavioral outcome (Su et al., 2016), others consider it as a construct which can significantly affect consumer purchase intention, user-generated content, feedback, and other relevant behavioral outcomes (Oliver, 1999). As suggested by previous studies, the more the addiction to online games, the greater the loyalty of game users, which can affect their subsequent behavior (Khang, Kim, & Kim, 2013), with chronotype playing its respective role.

Drawing on the aforementioned literature, and in light of the theoretical underpinning, it can be concluded that evening type individuals are more likely to be addicted to gaming, as compared to the morning types. Also, loyalty toward gaming proceeds these chronological behaviors. Therefore, the present study examined and conceptualized whether the relationship between addiction and loyalty varied among consumers based on their chronotype. Therefore, it was hypothesized that evening type individuals with an addiction to online mobile gaming would have

a higher tendency to be more loyal to online mobile gaming compared to morning type individuals (H₁).

2.5 Moderating role of chronotypes for loyalty and purchase intention

Purchase intent is a type of decision-making that considers the reason that compels an individual towards buying a particular brand (Badar, Khattak, Danish, Tariq, & Nisar, 2020). Constructs like consideration, purchase, and anticipation to purchase a brand, supplement and refine the understanding of this concept (Shah et al., 2012). As purchase intent remains an outcome of interest, numerous studies have documented the precedents to it, including word of mouth, product attributes, involvement, and trust (Akkaya, 2021; Harrigan, Feddema, Wang, Harrigan, & Diot, 2021; W.-I. Lee, Cheng, & Shih, 2017; Nuseir, 2019). Loyalty is also viewed as an integral antecedent to purchasing intent (Amoroso & Roman, 2015; Calvo Porral & Lang, 2015). Researchers have investigated this relationship in different contexts because business activity (i.e., purchase intent) is conducted with loyalty in the minds of the consumers (Dick & Basu, 1994).

Acknowledging the existing relationship between loyalty and purchase intention, and utilizing the theoretical operationalization of SOR framework, the present study examined whether the relationship between these two constructs varied with consumers when differentiated based on their chronotype. More specifically, the study examined the proposition that loyalty and purchase intention would be stronger among evening type individuals relative to morning type individuals, leading evening types to buy more in-app purchases while online mobile gaming, in contrast to the morning types. Therefore, it was hypothesized that evening type individuals with loyalty for online

mobile gaming would have a higher tendency to make in-app purchases compared to morning type individuals (H₂).

2.6 Mediating role of loyalty for addiction and purchase intention

Several studies have attempted to define the relationship between addiction and purchase intention or activity behavior of individuals (Andreassen et al., 2015; Duroy, Gorse, & Lejoyeux, 2014; S. Lee, Park, & Bryan Lee, 2016; Wakefield, Germain, & Henriksen, 2008; Weisstein, Kukar-Kinney, & Monroe, 2016). However, scant evidence exists regarding the relationship between addiction and purchase intention, specific to the context of online gaming. Drawing on the extant literature and the SOR framework, the present study examined whether loyalty mediated individuals' purchase intentions and addiction among online mobile gamers. More specifically, it was hypothesized that loyalty would act as a mediator between addiction and in-app purchases for online mobile gaming (H₃).

Based on the aforementioned literature and three hypotheses, Figure 1 shows the present study's research framework.

Figure 1: Research framework

3 Methods

3.1 Participants

The sample comprised 345 students at major public sector universities of Pakistan. According to the literature, students are an appropriate target population to study online mobile gaming and related phenomena (Alam, Ahmed, Kokash, Mahmud, & Sharnali, 2024; Balakrishnan & Griffiths, 2018; Ha, Yoon, & Choi, 2007; Okazaki, 2008). Although mobile gaming is popular among all age groups, a majority of the players are millennials (Clement, 2021), making university students

a suitable choice for the present study. The students were approached by the researchers during their break times between university classes to participate in the research. In total 380 participants agreed to complete the questionnaire. However, some of the questionnaires were only partially completed, so after screening, 345 responses remained for data analysis. Chin (1998) suggests that a researcher use a rule of thumb of 10 cases per predictor, whereby the overall sample size is 10 times the largest of two possibilities: (i) the block with the largest number of indicators (i.e., the largest so-called measurement equation) or (ii) the dependent variable with the largest number of independent variables impacting it (i.e., the largest so-called structural equation). Since the present study did not have formative measurement items in the model, the largest number of predictors in the model was only one. Therefore, the sample size was sufficiently large based on the above calculation to go ahead with analysis.

3.2 Measures

The survey comprised two sections. Section A comprised items related to the variables under study and Section B comprised items related to demographics. The measure for online mobile gaming addiction was a 21-item scale developed by Balakrishnan and Griffiths (2018), consisting of seven sub-dimensions: salience (e.g., *“Have you felt addicted to an online mobile game?”*), tolerance (e.g., *“Do you spend increasing amounts of time playing online mobile games?”*), mood modification (e.g., *Do you play online mobile games to feel better?*), relapse (e.g., *“Do you fail when trying to reduce the amount of time playing online mobile games?”*), withdrawal (e.g., *“Do you become stressed when you are unable to play online mobile games?”*), conflict (e.g., *“Do you have fights with others (e.g., family, friends) over the time you spend playing online mobile games?”*); and problems (e.g., *“Do you neglect other important activities (e.g., school, work,*

sports) to play online mobile games?"). Each sub-dimension consists of three items each and are rated on a five-point scale, from 1 (never) to 5 (very often).

The items for loyalty were taken from Choi and Kim (2004) and comprised two items (e.g., *"I would re-use these online mobile games when I want to play online games later"*) rated on a five-point scale, from 1 (*strongly disagree*) to 5 (*strongly agree*). The scale for purchase intention was also adopted from Balakrishnan and Griffiths (2018), and comprised five items (e.g., *"I plan to spend more on purchasing in-app game features while playing online mobile games"*) rated on a five-point scale, from 1 (*strongly disagree*) to 5 (*strongly agree*). Finally, the scale to assess chronotypes was adapted from Haider et al. (2019) comprised 13 items (e.g., *"Considering only your own "feeling best" rhythm, at what time would you go to bed if you were entirely free to plan your evening?"*), whereby the chronotypes were categorized as morning and evening types rated on nominal scales (coded 1 and 2) and considered as single item classification construct. The complete list of the variables under study is shown in Table 2. The survey was pretested with the help of marketing academic scholars and modified accordingly for data collection. Formal ethical approval for the study was received from the first author's university's ethics committee. Informed consent was given by all participants who took part in the study.

4 Results

4.1 Demographic profile of participants

Among the participants, 60% were males and 40% were females. Four-fifths were aged 21-25 years (80%), 12% were aged 18-20 years, 5% were aged 26-30 years, and 2% were aged over 30 years. Moreover, 75% of the participants had an undergraduate education, 24% had postgraduate

education, and 1% were PhD students. In addition, 41% of participants said that, on average, they spent less than 30 minutes on online mobile games per day, whereas 27% spent 30 to 59 minutes daily, 13% spent 90 to 120 minutes daily, 12% spent more than 120 minutes daily, and 9% spent 60 to 89 minutes daily. Over three-quarters of the participants (77%) said that they had not made any in-app purchase for online mobile gaming during the past six months, 15% said they had made 1-5 purchases, 6% said that they had made 6-10 purchases, and 2% said that they made more than 10 in-app purchases. Finally, 39% of participants said they had less than six months experience of playing online mobile games, 16% said they had one year, and 12% participants said they had two years, 33% said they had more than three years. Table 1 shows the demographic profile of participants.

Table 1: Demographic profile of participants (N=345)

4.2 Hypothesis testing

Second-generation analysis of partial least squares structural equation modelling (PLS-SEM) was utilized. *SmartPLS 3.3.2* (Ringle et al., 2015) was used to analyze the framework and for hypotheses testing. PLS-SEM is a powerful method to assess measurement and structural models simultaneously, especially when the model is complex in nature (Hair, Thomas, Hult, Ringle, & Sarstedt, 2017). To assess the validity and reliability of the measures, the guidelines of Hair et al. (2017) and Ramayah, Cheah, Chuah, Ting, and Memon (2018), were used. The analysis assessed the loadings, the average variance extracted (AVE), and the composite reliability (CR). The cut-off values suggested that the loadings are ≥ 0.7 , AVE ≥ 0.5 and CR ≥ 0.7 .

The model contained both unidimensional constructs (in-app purchase and loyalty) and a multi-dimensional construct (online mobile gaming addiction; seven dimensions). Therefore, the unidimensional constructs and the first-order dimensions were assessed before assessing second-order construct validity and reliability. As shown in Table 2, all the unidimensional constructs and the first-order dimensions exhibited acceptable loadings, AVE, and CR. The seven dimensions of the online mobile gaming addiction construct also exhibited acceptable loadings, AVE, and CR, confirming the convergent validity and reliability of the measurement model in the present study.

Table 2: Assessment of the measurement model

Next, discriminant validity was assessed following the recommendations of Franke and Sarstedt (2019) by looking at the heterotrait-monotrait (HTMT) ratios. If the HTMT ratios are less than 0.85 or 0.90, it can be concluded that the measures are discriminant. As shown in Table 3, all the HTMT ratios were lower than 0.85, confirming discriminant validity.

Table 3: Discriminant validity

4.3 Permutation analysis and structural model

Henseler, Ringle, and Sarstedt (2016) suggest that before conducting multigroup analysis (MGA), researchers should test for measurement invariance. The measurement invariance of composites (MICOM) is regarded as more suitable for PLS-SEM. MICOM is a three-step process involving (i) configural invariance assessment; (ii) establishment of compositional invariance assessment; and (iii) an assessment of equal means and variances (Rasoolimanesh, Ringle, Jaafar, & Ramayah,

2017). The MICOM procedure was run, available in *SmartPLS* 3.3.2. As shown in Table 4, only partial measurement invariance was established for both groups. Since partial invariance was established, the analysis proceeded to test the group specific differences using MGA.

To test the group specific differences, the PLS-MGA and parametric test, and the Welch-Satterthwait tests were used. As shown in Table 5, the direct relationships between addiction and loyalty, with a path difference of 0.195 ($p < 0.01$), and loyalty and in-app purchasing, with a path difference of 0.238 ($p < 0.01$), were statistically significant using all the three tests for groups differences, supporting both H₁ and H₂. The mediation effect of addiction, loyalty, and in-app purchasing showed a path difference of 0.196 ($p < 0.01$) and was also statistically significant using all three test methods, supporting H₃. The direct path analysis results are shown in Figures 2a and 2b.

Table 4: Results of measurement invariance test using permutation

Table 5: Results of hypothesis testing

Figure 2 (a): Structural Model Path Analysis for Chronotype: Evening

Figure 2 (b): Structural Model Path Analysis for Chronotype: Morning

5 Discussion

The present study proposed and found empirical support for all three hypotheses. The first hypothesis proposed that evening type individuals with an addiction to online mobile gaming would have a higher tendency to be loyal compared to morning type individuals. The results supported the hypothesis and suggested that those individuals who stay awake late at night and are addicted to online mobile games are more loyal and have higher stickiness to these online games. This result is in line with past studies which have also suggested that individuals who stay awake until late night are more addicted to online games and internet (Randler, Horzum, & Vollmer, 2014; Vollmer, Randler, Horzum, & Ayas, 2014). One possible reason for this is that evening types have longer screen time, and have greater mobile phone and internet use compared to morning types (Kauderer & Randler, 2013; Randler et al., 2014). This also allies with the fact that mobile games can be played easily due to mobile portability (Bose & Yang, 2011).

The second hypothesis proposed that evening type individuals with loyalty to online mobile gaming would have a higher tendency to make in-app purchases compared to morning type individuals. The results supported the notion that the loyalty of evening types is more likely to be translated into in-app purchase intention. The results further suggested that those individuals who stay awake until late night and are addicted to playing online mobile games are more likely to make in-app purchases while playing these games (e.g., to buy coins, power-ups, and boosters to level up and compete with their opponent players). Previous studies on the relationship between addiction and in-app purchases have supported this finding, and shown that addiction to mobile games is associated with a higher inclination towards in-app purchases (Putra, Sedera, & Fenitra, 2024). In addition, these purchases help players to unlock specific features of the games to move

forward to higher levels while playing the games and overcoming in-game obstacles (Faster Capital, 2024). Eventually these in-app purchases help player to enjoy the games and to keep on purchasing coins, boosters, etc.

Lastly, the present study proposed that loyalty would act as a mediator between addiction and in-app purchases for online mobile gaming. The results suggested that loyal players were more likely to make in-app purchases. These findings are supported by previous research which showed that loyalty is pivotal for making in-app purchases (Goltermann; Hsiao & Chen, 2016; Putra et al., 2024). For example, if individuals are addicted to playing games online but do not stick to playing one game (i.e., loyalty), they may end up playing different games and not make in-app purchases. Conversely, if individuals have loyalty for a specific game or games, they will be more inclined to make in-app purchases to level up or unlock the features to progress in that game and compete with other players (Balakrishnan & Griffiths, 2018; Cost Center, 2023; Faster Capital, 2024).

5.1 Theoretical Implications

The present study is one of the first attempts in consumer behavior and behavioral addiction research to explore individuals' in-app purchase intentions toward online mobile gaming with respect to their chronotypes. Past studies have focused on understanding online mobile gaming addiction, the role of gender and age, and various associated variables (Pan, Chiu, & Lin, 2019). The role of individual chronotypes, which is very much associated with individuals' sleep cycle and affects their gaming behavior, has not been well researched. Therefore, the present study posited that addiction to online mobile gaming would increase loyalty among evening-type online mobile gamers. It further highlighted that loyalty appears to lead to higher intention to make in-

app purchases among evening types. Moreover, understanding the role of loyalty as a mediator is missing from the extant literature and was examined in the present study, emphasizing the importance of loyalty for in-app purchase intention.

Moreover, the present study utilized the SOR framework to describe the relationship among given variables whereby online mobile gaming users in-app purchase occur (response) due to loyalty (organism) and addiction (stimulus). The study further suggested that individuals' chronotypes (i.e., their sleep wake cycle) may cause them to exhibit a particular behavior (i.e., being more loyal to online mobile games). Since evening types have longer screen times, and high mobile and internet use, this corresponds with their loyalty behavior. It is similarly true for in-app purchase intention whereby the chronotype as an internal state or biological disposition may cause them to have higher in-app purchase intention. Therefore, the present study contributed to the existing literature by incorporating individuals' biological disposition in the SOR framework.

5.2 Practical Implications

In recent years, there has been a marked worldwide increase in online mobile gaming and many marketers and practitioners are trying to understand the behavior of the gamers and are utilizing various strategies to increase their revenues. One of the revenue streams for online mobile gaming companies is in-app purchases. Therefore, knowing more about those individuals who have a higher intention for in-app purchases in online mobile gaming is of interest for gaming industry operators. The present study offered the following implications in relation to this segment of gamers.

The present study's findings suggest that gamers who sleep late and use mobile devices for longer hours are more vulnerable to addiction and have a higher tendency to make in-app purchases for online games (Haider et al., 2020). This finding provides a clear indication of a loyal proportion of online mobile gamers, providing an opportunity for game developers and marketers to focus on them. Since loyalty is central to the success of any product, marketers could have more targeted campaigns for evening type mobile gamers (e.g., by offering discounts or limited time offers).

However, gaming companies should not be marketing their products to the point where a minority of individuals become addicted to them. Therefore, any such marketing must be done in a socially responsible way. Moreover, there is also a conflict for the game developers or marketers between revenue generation and social responsibility because targeting evening type gamers might further trigger late night sleep behavior, and have severe effects on players' health and daily life activities (Peracchia & Curcio, 2018). Therefore, the present study also highlights how addictive online mobile gaming behavior is associated with the sleep wake cycle where online late sleepers (evening types) do not sleep and become engaged with online mobile games by becoming loyal to them. This provides insight for those who are trying to understand addictive behavior among mobile gamers. Lastly, there is a tension between the revenue generation goal of marketers and social responsibility in protecting players. This indicates a need to have a policymaking body to balance the two, by regulating the online mobile gaming business.

5.3 Limitations and future research directions

The present study had a number of limitations. It only focused on a modest number of university students for data collection, which hinders the generalizability of the results to other demographic

cohorts. Moreover, owing to the limitation of non-probability (convenience) sampling, the present study cannot be generalized to other populations. Moreover, all the data were self-report which are subject to many established methods biases. Consequently, future research should explore the concepts of the present study by utilizing longitudinal studies because the present study's cross-sectional design could not determine causation among the study variables. Moreover, such research needs to be carried out among larger and more representative samples both inside and outside of Pakistan as well as among other cohorts. Lastly, future studies can attempt to identify other contingent variables to improve the variance explained by loyalty for in-app purchase intention (as shown in Figure 2a).

5.4 Conclusion

The present study was an initial attempt to investigate the role of chronotypes in developing loyalty and in-app purchase intention among mobile gamers, a minority of who may be addicted to playing such games. It is also one of the few studies that has empirically investigated the role of loyalty as a mediator between in-app purchase intention among online mobile gamers. The findings of the present study suggest that evening type individuals are more inclined to be loyal to online mobile games. Similarly, they tend to have a higher intention to purchase in-app offers. The present study also suggests that loyalty acts as a pivotal construct for developing in-app purchase intention for online mobile gamers.

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Figures

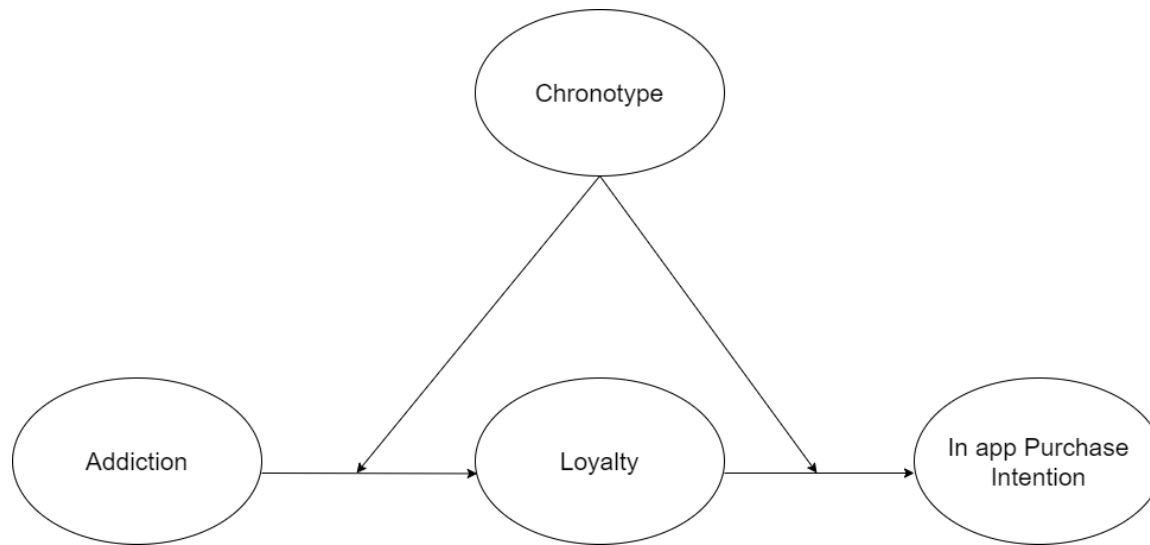


Figure 1: Research Framework

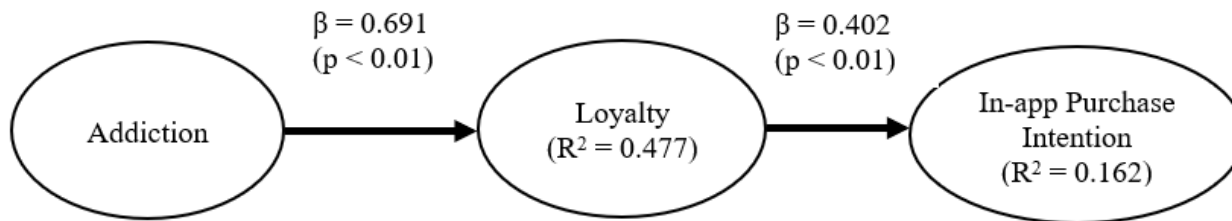


Figure 2 (a): Structural Model Path Analysis for Chronotype: Evening

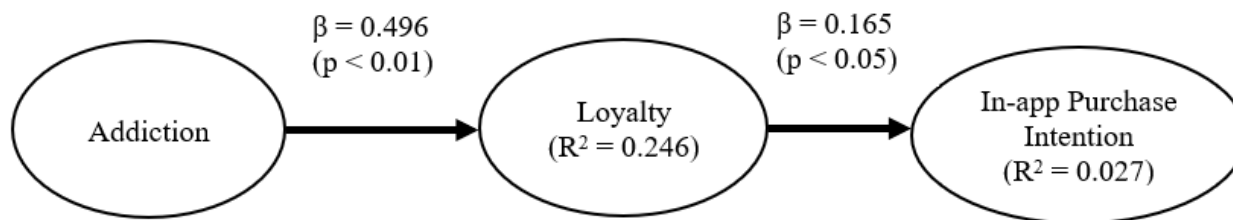


Figure 2 (b): Structural Model Path Analysis for Chronotype: Morning

Tables

Table 1: Demographic profile of participants (N=345)

Characteristics		Frequency	Percentage
Gender	Male	208	60.3
	Female	137	39.7
Age	18-20 years	42	12.2
	21- 25 years	278	80.6
	26-30 years	18	5.2
	31 years and above	7	2.0
Education	Undergraduate	257	74.5
	Postgraduate	83	24.1
	PhD student	5	1.4
Average time spent on online mobile games daily	More than 120 minutes	44	12.8
	90 to 120 minutes	40	11.6

	60 to 89 minutes	30	8.7
	30 to 59 minutes	91	26.4
	Less than 30 minutes	140	40.6
In-app purchases during last six months	Above 10 purchases	8	2.3
	6 to 10 purchases	19	5.5
	1 to 5 purchases	52	15.1
	None	266	77.1
Experience of playing online mobile games	Less than six months	133	38.6
	One year	55	15.9
	Two years	42	12.2
	Three years or more	115	33.3

Table 2: *Assessment of the measurement model*

First order constructs	Loadings		CR		AVE	
	Morning	Evening	Morning	Evening	Morning	Evening
<i>Salience</i>			0.847	0.908	0.648	0.767
Sal1: Do you think about playing online mobile games all day long?	0.811	0.885				
Sal2: Do you spend a lot of free time playing online mobile games?	0.759	0.847				
Sal3: Have you felt addicted to an online mobile game?	0.843	0.894				
<i>Tolerance</i>			0.845	0.923	0.646	0.800
Tol1: Do you play online mobile games longer than intended?	0.841	0.910				

Tol2: Do you play online mobile games longer than intended?	0.855	0.927			
Tol3: Are you unable to stop once you started playing online mobile games?	0.807	0.845			
<i>Mood modification</i>			0.872	0.913	0.696
Mood1: Do you play online mobile games to forget about real life?	0.747	0.815			
Mood2: Do you play online mobile games to release stress?	0.905	0.913			
Mood3: Do you played online mobile games to feel better?	0.844	0.916			
<i>Relapse</i>			0.849	0.884	0.652
					0.717

Rel1: Are you unable to reduce your time spent playing online mobile games?	0.798	0.842				
Rel2: Do others unsuccessfully try to reduce the time you spend playing online mobile games?	0.805	0.860				
Rel3: Do you fail when trying to reduce the amount of time playing online mobile games?	0.810	0.839				
<i>Withdrawal</i>			0.890	0.939	0.730	0.838
With1: Do you feel bad when you are unable to play online mobile games?	0.827	0.888				
With2: Do you become angry when you are unable	0.866	0.940				

to play online mobile games?

With3: Do you become stressed when you are unable to play online mobile games?

0.870 0.917

Conflict

Conf1: Do you have fights with others (e.g., family, friends) over the time you spend playing online mobile games?

0.826 0.882 0.867 0.911 0.686 0.773

Conf2: Do you neglect others (e.g., family, friends) because you are playing online mobile games?

0.876 0.907

Conf3: Do you lie about time spent playing online mobile games?	0.780	0.848				
<i>Problems</i>						
Prob1: Does your time playing online mobile games cause sleep deprivation?	0.829	0.878	0.812	0.871	0.594	0.693
Prob2: Do you neglect other important activities (e.g., school, work, sports) to play online mobile games?	0.830	0.860				
Prob3: Do you feel bad after playing online mobile games for a long time?	0.637	0.754				
Loyalty			0.912	0.930	0.839	0.870
Loyalty1: The online games were overall satisfactory enough to reuse later	0.914	0.927				

Loyalty2: I would re-use these online games when I want to play online games later	0.918	0.938				
In-app purchasing			0.915	0.933	0.684	0.733
PP1: I intend to continue purchasing online mobile game in-game apps	0.859	0.871				
PP2: I strongly recommend others to purchase online mobile game in-game apps	0.870	0.860				
PP3: I find purchasing online mobile game in-game apps to be worthwhile	0.851	0.875				
PP4: I am likely to frequently purchase online mobile game in-game apps in the future	0.796	0.803				

PP5: I plan to spend more on purchasing online mobile game in-game apps	0.755	0.881				
Second order constructs						
Online mobile gaming addiction						
Saliency	0.790	0.851	0.891	0.934	0.552	0.669
Tolerance	0.792	0.884				
Mood modification	0.732	0.740				
Relapse	0.693	0.840				
Withdrawal	0.743	0.791				
Conflict	0.768	0.807				
Problems	0.676	0.800				

Note: Names in italics represent the online mobile gaming addiction dimensions

Table 3: *Discriminant validity (HTMT_{0.85} criterion)*

Morning	<i>1*</i>	2	3	4	5	6	7	8	9	10
Addiction*										
Conflict										
In-app purchasing	<i>0.508</i>	0.519								
Loyalty	<i>0.570</i>	0.458	0.177							
Mood modification		0.561	0.269	0.525						
Problems		0.764	0.435	0.428	0.628					
Relapse		0.510	0.531	0.300	0.562	0.574				
Salience		0.547	0.248	0.544	0.653	0.474	0.583			
Tolerance		0.637	0.391	0.576	0.657	0.658	0.736	0.801		
Withdrawal		0.817	0.485	0.404	0.588	0.495	0.560	0.520	0.560	

Note: Names and numbers in italics are used to denote higher-order construct values.

Evening	<i>1*</i>	2	3	4	5	6	7	8	9	10
<i>Addiction*</i>										
Conflict										
In-app purchasing	<i>0.557</i>	0.486								
Loyalty	<i>0.766</i>	0.590	0.475							
Mood modification		0.507	0.412	0.636						
Problems		0.852	0.463	0.666	0.622					
Relapse		0.778	0.469	0.693	0.700	0.756				
Saliency		0.660	0.485	0.745	0.703	0.718	0.761			
Tolerance		0.741	0.471	0.740	0.718	0.781	0.833	0.836		
Withdrawal		0.738	0.577	0.578	0.573	0.667	0.770	0.664	0.639	

Note: Names and numbers in italics are used to denote higher-order construct values.

Table 4: Results of measurement invariance test using permutation

Constructs	Configural	Compositional				Equal Mean Assessment				Equal Variance				Full
	Invariance	C=1	LL	UL	Partial	Differences	LL	UL	Equal	Differences	LL	UL	Equal	Measurement
Addiction	Yes	1.000	0.999	1.000	Yes	0.425	-	0.214	No	0.587	-	0.295	No	No
							0.210				0.284			
Conflict	Yes	1.000	0.999	1.000	Yes	0.272	-	0.219	No	0.374	-	0.317	No	No
							0.214				0.313			
In-app purchasing	Yes	0.997	0.990	1.000	Yes	0.224	-	0.212	No	0.426	-	0.332	No	No
							0.201				0.353			
Loyalty	Yes	1.000	0.998	1.000	Yes	0.160	-	0.211	Yes	0.053	-	0.217	Yes	Yes
							0.213				0.240			
Mood modification	Yes	1.000	0.998	1.000	Yes	0.269	-	0.225	No	0.257	-	0.256	No	No
							0.212				0.242			
Problems	Yes	0.999	0.995	1.000	Yes	0.289	-	0.203	No	0.291	-	0.279	No	No
							0.221				0.319			

Relapse	Yes	0.999	0.997	1.000	Yes	0.216	-	0.206	No	0.173	-	0.240	Yes	No
							0.203				0.246			
Salience	Yes	1.000	0.999	1.000	Yes	0.456	-	0.210	No	0.420	-	0.273	No	No
							0.212				0.249			
Tolerance	Yes	1.000	0.999	1.000	Yes	0.509	-	0.216	No	0.539	-	0.284	No	No
							0.205				0.250			
Withdrawal	Yes	1.000	0.999	1.000	Yes	0.309	-	0.222	No	0.487	-	0.304	No	No
							0.207				0.308			

Table 5: Results of hypothesis testing

Hypothesis	Relationship	Path coefficient		Confidence intervals		Path difference	p-value difference			Supported
		Evening	Morning	Evening	Morning		1	2	3	
H₁	Addiction - Loyalty	0.691	0.496	[0.594, 0.752]	[0.350, 0.606]	0.195	0.003	0.003	0.004	Yes/Yes/Yes
H₂	Loyalty - In-app purchasing	0.402	0.165	[0.267, 0.515]	[-0.124, 0.291]	0.238	0.006	0.009	0.002	Yes/Yes/Yes
H₃	Addiction - Loyalty - In-app purchasing	0.278	0.082	[0.171, 0.376]	[-0.044, 0.161]	0.196	0.001	0.002	0.004	Yes/Yes/Yes

Note: 1 = PLS-MGA, 2 = Parametric Test, 3 = Welch-Satterthwait Test. Subsample size (n) = Morning type: 162, Evenin

