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Devoted or addicted? Modeling gaming addiction in eSports

Abstract

eSports is enjoyed by many gamers worldwide; however, gaming addiction poses a serious challenge for eSports users and society. This study employs social learning theory (SLT) as an overarching theory to examine how eSports consumption can lead to addiction and identify users who are at higher risk of developing addictive behavior. We employed a face-to-face survey of 230 Brazilian eSports users to develop and test a model of gaming addiction in eSports, which was analyzed using partial least squares structural equation modeling. The findings revealed positive and significant relationships between eSports athlete role model influence and user devotion, user devotion and gaming addiction, and gaming addiction and guilt. Furthermore, the relationship between eSports athletes role model influence and guilt is sequentially mediated by user devotion and gaming addiction, and users with lower (higher) levels of competitiveness are more (less) at risk of addiction. This is the first study to provide a consumer psychology perspective on user behavior that offers novel insights into the interplay between eSports athletes role model influence, user devotion, and competitiveness in driving addictive behavior. Importantly, the findings reveal the significant role of competitiveness in buffering against gaming addiction. Theoretically, our model, underpinned by SLT, demonstrates that the social environment, personal factors, and gaming addiction itself are reciprocally related to each other in determining addictive behavior. This conceptualization implies that interventions targeting one factor impact all other factors as gaming addiction is continually evolving in response to changes in the environment and the user.

Keywords: Gaming addiction, eSports, Competitiveness, Role Models, User Devotion, Guilt, Social Learning Theory

1. Introduction

The rapid acceleration of digital technologies has brought about an exponential worldwide increase in the popularity of eSports—a highly organized competitive (professional and amateur) sport that involves video gaming (Hamari & Sjöblom, 2017). Users are amateur eSports players who play for recreation or relaxation, not profit, while eSports athletes are professional players who make a living from eSports activities and sponsorships (Raggiotto & Scarpi, 2023). In this article, we refer to professional eSports players as athletes and amateur eSports players as users. However, we refer to players when mentioning those who play games in general (not only eSports). Users are inspired by athletes (Wong & Meng-Lewis, 2023) and are uniquely significant to the eSports ecosystem because they exhibit far more dedication and desire to engage with eSports than players in any other type of sport (Brown et al., 2018). However, this extraordinary passion for the game may result in detrimental consequences for users who lose control.

Gaming addiction poses a global health challenge; thus, gaming addiction in eSports is an important area of research, and previous studies have explored why some users are more likely to experience harm in this context. These studies have investigated a wide range of individual factors and gaming-related motives to play eSports that might account for addictive behavior, including emotional states and moods (Achab et al., 2011; Lee et al., 2021; Snodgrass et al.,

2014); personality traits such as extroversion and neuroticism (Bányai et al., 2019; Larrieu et al., 2022; Montag et al., 2022); gaming motives such as escape, coping, fantasy, and social (Bányai et al., 2019; Laconi et al., 2017; Montag et al., 2022); and even identification with an avatar (Szolin et al., 2022). However, more research to understand user behavior in eSports is necessary, and there have been recent calls for research to advance the understanding of mental health problems in eSports (Bányai et al., 2021; Brevers et al., 2023; Chan et al., 2022; Chung et al., 2019; Ramella-Zampa et al., 2022). Our study aims to answer these calls by employing social learning theory (SLT) (Bandura, 1977) as an overarching theory which considers the significance of factors both external and internal to the individual affecting addictive behavior in eSports.

This study aims to address two questions: 1) How can addiction result from eSports consumption? and 2) Which users are at higher risk of becoming addicted? We employ SLT to develop and test a conceptual model linking three factors, i.e., athletes role model influence, user devotion, and competitiveness to understand gaming addiction and its associated guilt in eSports consumption. According to SLT, addiction is determined by reciprocal relationships between the individual's social environment, personal factors internal to the individual, and the behavior itself (Smith, 2021). In our study, we consider that athletes, perceived as role models, have a significant social influence on the behavior, motivations, and emotional states of users. Athletes can motivate users to imitate their dedication and commitment to the extent that users can become devoted consumers of eSports, which could lead to addictive behavior. Considering that eSports is a hypercompetitive environment, competitiveness is a key personality trait that would be associated with the risk of developing gaming addiction. By examining these eSports-related factors, our study provides a comprehensive understanding of the pathways leading to gaming

addiction, highlighting the need for targeted interventions that consider the important influence of role models, the intensity of user devotion, and individual competitiveness. This understanding is crucial for safeguarding users, and for maintaining the industry as a safe environment.

Our study makes four key contributions to the area of gaming addiction in eSports. First, we advance a model of gaming addiction dynamics underpinned by SLT to provide a more comprehensive view of gaming addiction. Unlike previous research that examines individual factors and gaming-related motives in isolation to account for addictive behavior, our model takes a broader view by integrating the preeminent role of athletes perceived as role models by users, the uniqueness of the passionate commitment of users to the eSports experience, and users' competitiveness. Our findings show that the interplay of these elements can account for addictive behavior and subsequent negative emotions, such as guilt. Second, we empirically demonstrate that there is a link between athletes and users by showing the far-reaching influence of athlete role models on users, which is manifested through users' devotion to the eSports experience and can lead to gaming addiction and associated guilt. Third, we provide significant new insights into the role of trait competitiveness in moderating the link between devotion and addiction, suggesting that users with lower (higher) competitiveness are more (less) at risk of addiction. Finally, we contribute to the limited knowledge about negative emotions, such as guilt, resulting from gaming addiction.

2. Literature review

Electronic Sports (eSports) is a form of digital entertainment that has seen tremendous growth in popularity in the last few years, fueled by the acceleration of technological developments in online gaming (Hamari & Sjöblom, 2017). eSports is defined as:

“a form of sports where the primary aspects of the sport are facilitated by electronic systems; both the input from players and teams and the output of the eSports system are mediated through human-computer interfaces. In more practical terms, eSports commonly refer to competitive (pro and amateur) video gaming that is often coordinated by different leagues, ladders, and tournaments, and where players customarily belong to teams or other ‘sporting’ organizations which are sponsored by various business organizations.” (Hamari & Sjöblom, 2017, p.211).

eSports encompasses a complex value chain that is divided into three stages: production, distribution, and consumption (Wong & Meng-Lewis, 2023). The production stage includes game developers, publishers, and hardware manufacturers. The distribution stage includes athletes, eSports clubs, sponsors, event operators, streaming platforms, and commentators. The consumption stage involves eSports spectators and users. The term ‘user’ is specifically designated for those who play eSports regularly in an amateur capacity (as defined in this study), while spectators are those who watch eSports games (and they can be users or not). As the convergence of three major industries—media, sports, and entertainment (Wong & Meng-Lewis, 2023)—eSports is one of the most profitable technology markets worldwide and is projected to reach a revenue of \$4.3 billion in 2024 and a user base of more than 850 million by 2028 (Statista, 2024).

Literature increasingly recognizes eSports as a form of sports. Wong and Meng-Lewis (2023, p. 944) use the term “sportified electronic gaming” to refer to eSports. Jenny et al. (2017) compare eSports to traditional philosophical and sociological definitions of sports. They found that eSports involves elements of play and competition, operates under organized rules, requires a high degree of skill, and attracts a large audience. However, in their view, eSports falls short in terms of physicality and institutional recognition. Hallmann and Giel (2018) evaluated five characteristics of traditional sports (i.e., physicality, recreation, competition, organizational structures, and widespread acceptance) and assessed their applicability to eSports, finding that eSports broadly fits all characteristics. The concept of physicality results in varying opinions about activities like chess and eSports. Although eSports users and athletes may not exhibit prominent physical movements, they still require excellent hand-eye coordination, quick reaction times, and strategic thinking.

Furthermore, Pizzo et al. (2018) demonstrate that both traditional sports and eSports are consumed in similar ways, with eSports spectators being motivated in a manner similar to traditional sports spectators. Hamari and Sjöblom (2017) argue that the key difference between eSports and traditional sports lies in where the outcome-defining activities occur. In traditional sports, these activities happen in the physical world. In eSports, the activities take place within virtual environments, requiring players to interact with a human-computer interface that links their physical movements to the digital system. This interface happens across multiple platforms such as computers, consoles, mobile devices, or streaming services. Ramella-Zampa et al. (2022) identified the main genres within eSports: Fighting Games, Real-Time Strategy (RTS), Multiplayer Online Battle Arena (MOBA), First Person Shooter (FPS), Massively Multiplayer

Online Role-Playing Games (MMORPGs), and sports games. In our study, we highlight the growing acceptance of eSports as sports, while also acknowledging that although eSports involves video gaming, not all video games are genres of eSports, but video gaming encompasses a much broader range of activities beyond the competitive sphere of eSports.

While eSports has gained recognition as a nascent commercial phenomenon with substantial social, technological, and economic implications, academic research in this area is still in its early stages, with fragmented and limited theoretical development (Cunningham et al., 2018; Pizzo et al., 2022). Given the complexity of the eSports ecosystem, this topic has received considerable attention from multiple disciplines, especially in the sports and technology literature. However, limited research has been conducted from the consumer psychology perspective (Raggiotto & Scarpi, 2023) to advance the understanding of the user experience and associated harm. Our study aims to address this important gap, as the adverse consequences of new technologies for consumers' state of wellbeing remain an underdeveloped and understudied area of research (Benvenuti et al., 2023).

Previous studies of eSports have mostly focused on athletes (Bányai et al., 2019; Meng-Lewis et al., 2022; Taylor, 2012) and spectators (Hamari & Sjöblom, 2017; Pizzo et al., 2018). However, advancing research on the behavior of users is important because the flourishing of amateur mass gamer participation in eSports is seen as the next level of playing, meaning that it is critical for the sustained success of the whole eSports market (Ke & Wagner, 2024). Importantly, little is known about the relationship between the two main constituents of eSports, namely, athletes and

users. Our novel study aims to shed light on this relationship to offer new insights into the dynamics of eSports and the development of gaming addiction in this context.

eSports provides cognitive and emotional benefits to users, including stimulating intelligence, working memory, cognitive flexibility, number-processing ability, and the development of psychological skills such as self-regulation, socialization, self-esteem, commitment, and cooperation (Raggiotto & Scarpi, 2023; Vaamonde et al., 2018); eSports also engage users in learning how to collaborate with others and in building a sense of responsibility through the completion of tasks (Chung et al., 2019). Despite the benefits, there are adverse consequences to users' lives arising from the problematic use of eSports. The adverse consequences include increased irritability, lower moods, sleep deprivation, and more social, financial, family, academic, and work difficulties (Achab et al., 2011; Boyle et al., 2012), functional impairment, continued usage despite issues, loss of interests in previous hobbies and entertainment, and failed attempts to control gaming (Carras et al., 2018). Regarding gaming time, some studies have shown addiction in eSports to be associated with increased gaming time (Cabeza-Ramírez et al., 2022; Charlton and Danforth, 2007; Maldonado-Murciano et al., 2022), but other studies have not found such an association (Bányai et al., 2021; Laconi et al., 2017). Given these mismatched findings and the harmful impact on users' lives associated with eSports' misuse, calls have been made for further investigation into the understanding of mental health problems in eSports (Bányai et al., 2021; Brevers et al., 2023; Chan et al., 2022; Chung et al., 2019; Ramella-Zampa et al., 2022). One avenue to advance knowledge in the field is to focus on the psychological factors that help explain addictive behavior in the unique context of eSports. By employing SLT,

this study aims to explain gaming addiction in eSports consumption through the interplay of the social influence of athletes on users, users' devotion to eSports, and users' trait competitiveness.

3. Theoretical Framework

3.1 Social learning theory

We employ Bandura's (1977) SLT as an overarching theory to cover and support our research model proposed in Figure 1. SLT is based on reciprocal determinism, which posits that behavior is determined by continuous and dynamic interactions between three components: the environment, personal factors, and the behavior. Using SLT, Smith (2021) proposes that addiction results from the functional relationships between an individual's social environment, personal factors, and the addictive behavior itself. We concur with Smith's (2021) perspective that a model of addiction based on reciprocal determinism is appealing, as it considers that addiction is influenced by both internal and external factors to the individual. Consequently, we use SLT to advance understanding of the topic and provide a more holistic picture of gaming addiction in the context of eSports.

SLT argues that most of the behaviors that people display are learned through observation, imitation, and modeling. This means that the social environment is of utmost importance in the context of addiction, and in fact, peers and other people in the environment could encourage or discourage the behavior (Smith, 2021). Smith's (2021) perspective on addiction is useful in addressing gaming addiction in eSports. Smith (2021, p.11) explains that "interventions that

target one component impact all other components of the model, which in turn feedback in a reciprocal manner to impact the original component targeted by the intervention”. In other words, addictive behavior is continually evolving in response to continuous changes in the external environment and the individual. Consequently, we posit that gaming addiction is determined by the continuous interplay and reciprocal influence of the social environment (athletes), user’s personal factors (psychological and personality traits), and the behavior being exhibited (addiction).

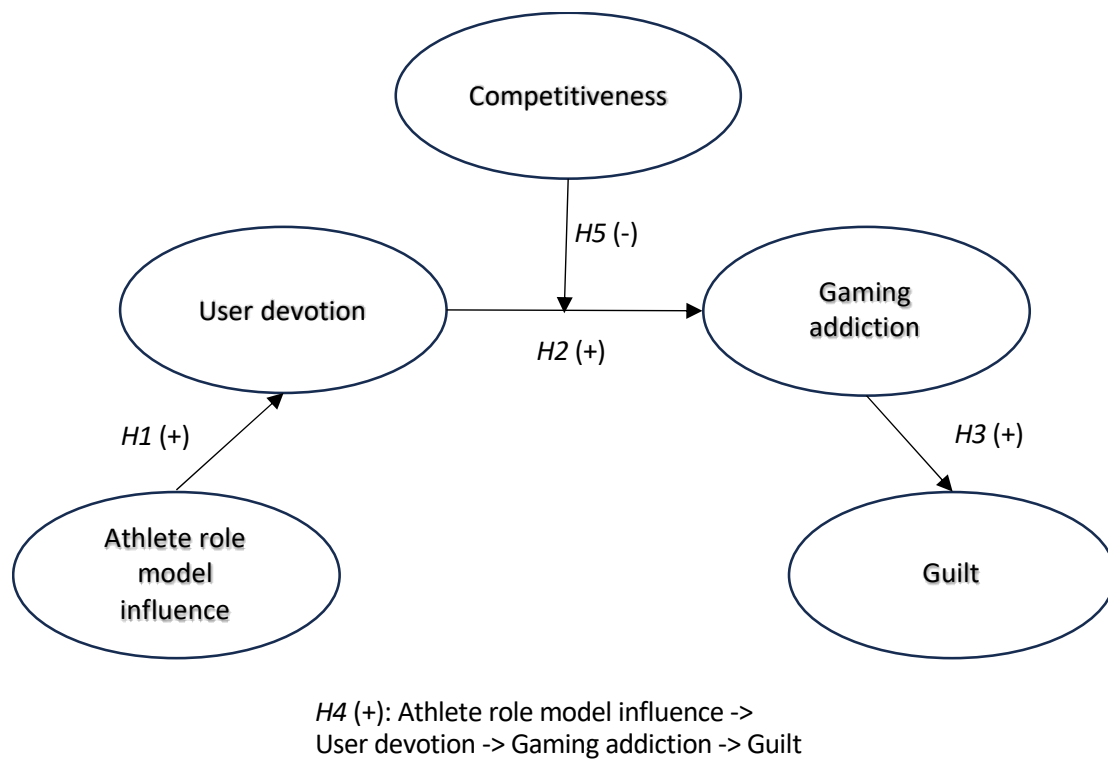


Figure 1. Model of gaming addiction in eSports.

3.2 The research model

SLT and Smith's (2021) perspective on addiction—based on SLT—constitute a useful theoretical framework for our research, as our study aims to answer how addiction can result from eSports consumption and which individuals are at a higher risk of addiction. Based on this theoretical framework, our research model focuses on gaming addiction by integrating the social environment (athlete role model influence), personal factors (user devotion and competitiveness) and behavior (gaming addiction) and their dynamic interrelationships. The model incorporates user devotion, as a mediating psychological mechanism between eSports athlete role model and gaming addiction, and competitiveness as a personality trait moderating the relationship between user devotion and gaming addiction; it also incorporates guilt as a consequence of gaming addiction to provide a fuller understanding of addiction in eSports.

Considering the significance of the social environment (such as athletes, peers, family, and friends) in the context of eSports, extant literature has explored social aspects of gaming motivation in eSports, such as consumer socialization and social interaction (Bányai et al. 2019; Billieux et al., 2013; Dindar & Akbulut, 2014; Lee & Schoenstedt, 2011). However, to our knowledge, no previous study has examined the link between athletes and users, through what mechanisms athletes can influence users' motivations, emotions, and behaviors; whether this influence can lead to adverse consequences for users; and which users are more at risk of harm. Our proposed model of gaming addiction in eSports aims to address these gaps.

4. Hypothesis development

From our research model, five hypotheses were developed to investigate how gaming addiction can result from eSports consumption and which individuals are at a higher risk of addiction, as follows:

4.1 The impact of the social environment on users

4.1.1 The athlete as vicarious role model

SLT proposes that individuals develop general behaviors and attitudes by observing, imitating, and modeling the behavior of others, and these models often become role models for the individual (Bandura, 1977). A role model can be anyone with whom the individual comes into contact, directly or indirectly, who can affect the individual's decisions or behavior (Bandura, 1986). Martin and Bush (2000) posit that there are two types of role models that can influence behavior: direct role models such as parents, family, and friends and vicarious role models such as favorite athletes or artists. Only a few studies have examined social influences on problematic gaming. For example, Gong et al. (2020) found that the gaming frequency and opinions of important referents (such as friends, family, colleagues, and other gaming community members) positively affected excessive gaming. While Gong et al. (2020) provided valuable insights into the influence of direct role models on players' dysfunctional behavior, the influence of vicarious role models on gaming addiction remains unexplored. Consequently, this topic is addressed for the first time in our study in view of the high popularity of athletes and professional teams in the context of eSports.

Morgenroth et al. (2015, p.468) define role models “as individuals who influence role aspirants’ achievements, motivation, and goals by acting as behavioral models, representations of the possible, and/or inspirations.” As behavioral models, role models demonstrate how to perform a skill and achieve a goal. As representations of the possible, role models show that the goal is attainable, thus lowering users’ perceptions of barriers by “evoking shared social identity with the role aspirant” (Morgenroth et al., 2015, p.472), as users can envision themselves attaining the role or being like the role model (i.e., shared group membership), which enhances their self-identity and sense of community. Through vicarious learning, users can increase their perceptions of self-efficacy and their expectations regarding their ability to achieve their goals, which increases their motivation to pursue them (Bandura, 1986). Finally, role models act as inspirations. In this function, users must perceive a role model as desirable, which increases their motivation, resulting in identification, internalization, and admiration. This inspirational quality strongly influences users by means of shared group membership with the role model and his or her competence, sociability, and values. Meng-Lewis et al. (2021) found that the most important reason for admiring famous people was the attraction to the professional talent, knowledge, and skills of the admired, followed by their physical attractiveness, beliefs, attitudes, and values, inasmuch as these attributes are perceived as relevant to an individual’s own expectations and experiences.

The sports literature shows that sports athlete brands enjoy celebrity status and are perceived as role models by their followers (Taniyev & Gordon, 2022), who aim to imitate their idol’s personality and behavior and look up to them for ethical behavior (Guest & Cox, 2009). Like other sports athlete brands, successful eSports athletes are athlete brand idols who are perceived

as vicarious role models to users because they are relevant to their identity since they share the same domain of interest and are experts in that domain (Ruvio et al., 2013). Meng-Lewis et al. (2022) argue that users are inspired by the success of role model champions to work hard toward their goals in the hope of becoming professionals. As noted by Wong and Meng-Lewis (2023, p.950), “eSports athletes have massive social media following and have earned millions based on their skill and popularity, in addition to their sponsorship income.” We argue that athletes who are perceived by users as role models can influence users’ motivations, emotions, and behaviors because they are self-relevant. This influence seems to be unique to the eSports experience, characterized by extraordinary passion for and dedication to the game (Brown et al., 2018).

4.1.2 Athlete role model influence manifested through user devotion

The extreme passion of users is similar to the concept of consumer devotion. Pimentel and Reynolds (2004, p.1) describe the extraordinary level of passion, intimacy, and dedication of a devoted consumer as that of the “ultimate committed customer.” Devoted consumers do not hesitate to sacrifice their time, money, and energy to maintain their passionate relationship with the brand (Pichler & Hemetsberger, 2007). Users are extraordinarily involved in specific games and exhibit levels of dedication and desire for continuous engagement that are greater than those of fans of any other type of sport (Brown et al., 2018). This intense motivation can be characterized as devotion, defined as “a state of passionate dedication to a product, a brand, or an experience through which the consumer in part defines him- or herself” (Ortiz et al., 2013, p.7). Accordingly, we define user devotion as a user’s passionate dedication to the eSports

experience—including the athletes, brands, merchandise, other users, and guilds, as well as the practice of the game—through which the user in part defines himself or herself.

Furthermore, athlete brand idols exert far-reaching social influence on users by shaping their social identity through social group bonds and affiliations with a collective (Bagozzi et al., 2021) worldwide through playing, watching, and streaming games. Since athletes, and their associated teams, leagues, and sponsors strongly influence consumers' experiences, emotions, and behaviors (Arai et al., 2013), athletes are key to the socialization of users, as seen in the context of eSports. Socialization is an antecedent of consumer devotion, as individuals enjoy interacting with others who have similar interests (Ortiz et al., 2013). Mao (2021) found that in-game friends significantly influence eSports users' involvement. Self-relevant athletes can act as role models for the user in the three ways described by Morgenroth et al. (2015): as behavioral models, representations of the possible, and inspiration. Athletes who are perceived as role models by users have an impact on their followers' user devotion. This is because an athlete brand image represents a marketable lifestyle, athletic performance, and attractive appearance (Arai et al., 2013) that is self-relevant and fulfills the user's needs and goals (Park & MacInnis, 2018). The link between role models and devotion is emphasized by Ortiz et al. (2013, p.9), who argue that "the higher the level of devotion, the greater the need of consumers to continually identify with the reference group" because the reference group becomes part of self-identity. A reference group is "an actual or imaginary individual or group conceived of having significant relevance upon an individual's evaluations, aspirations, or behavior" (Park & Lessig, 1977). Therefore, we argue that athletes are users' reference group and as such the influence of athlete role models on users is manifested through user devotion to the eSports experience. In turn, user devotion reflects the

user's personal psychological factor through which he or she in part defines himself or herself. Therefore, we hypothesize the following:

H1. Athlete role model influence is positively related to user devotion.

4.2 The behavior itself: Gaming addiction in the context of eSports

4.2.1 Gaming addiction and its relationship with user devotion

The literature shows that online gaming in general can be addictive for some users (Kuss & Griffiths, 2012; Rosendo-Rios et al., 2022), but given the range of measures used to estimate addiction, the actual prevalence of players affected is still uncertain (Hussain et al., 2015). Importantly, previous research (Kuss & Griffiths, 2012; Hussain et al., 2015) points out that gaming addiction is not dichotomous but runs on a continuum ranging from low to high risk of addiction. eSports can be especially addictive, as users and athletes often overexpose themselves to the game to achieve and/or maintain their league status, which may result in gaming addiction being a widespread problem in this context (Meng-Lewis et al., 2022). For example, both users and athletes have a growing tendency to use amphetamines to improve concentration and mitigate the fatigue of staring at a screen for hours on end (Hamstead, 2020). Lu (2016) condemned the ever-expanding eSports industry, arguing that it has become “electronic heroin” for those who become addicted and lose interest in their studies. Lu (2016, p.2201) further argues that in China, “parents, educationists and doctors have expressed growing concern over the social and health costs of the eSports industry.” As eSports are played by young users who may be more susceptible to the systemic pressure of these games (Brevers et al., 2023), reports on

gaming addiction have hindered further involvement of some young players due to parental and societal opposition (Meng-Lewis et al., 2022).

The World Health Organization (2020) defines gaming disorder as a pattern of gaming behavior (“digital gaming” or “video gaming”) characterized by impaired control over gaming, increasing priority given to gaming over other activities to the extent that gaming takes precedence over other interests and daily activities and continuation or escalation of gaming despite the occurrence of negative consequences”. Since the key characteristic of addiction is that it has negative consequences for the individual, “it is possible that the same high degree of computer use exhibited by two people might be considered either pathological or non-pathological depending upon the impact that this has upon their life” (Charlton & Danforth, 2007, p.1533). This view is supported by previous studies (Billieux et al., 2013; Király et al., 2017; Deleuze et al., 2018) which found that an increased commitment to online games does not necessarily interfere with user’s life. In our case, this implies that user devotion, defined above as a user’s passionate dedication to eSports, is not pathological per se, which is in line with the distinction made by Vallerand et al.’s (2003) passion theory between harmonious versus obsessive passion toward an activity. Previous studies found that while harmonious use of videogames provides benefits to users, obsessive use was related to problematic online gaming (Lafrenière et al., 2009; Deleuze et al., 2018). To the best of our knowledge no study has examined consumer devotion in the context of dysfunctional behavior and so the association between consumer devotion and addiction has yet to be studied. Our study aims to answer calls to investigate whether consumer devotion is related to pathological consumption (Ortiz et al., 2013; Pichler & Hemetsberger,

2007; Pimentel & Reynolds, 2004). Therefore, we propose to investigate the association between user devotion and gaming addiction in eSports, as follows:

H2. User devotion is positively related to gaming addiction.

4.2.2 Gaming addiction and its associated guilt

Users' families often resist their dedication to eSports, resulting in users' estrangement from the public outside the eSports context (Taylor, 2012). Their need to dedicate many hours to playing the game and their exceptional levels of involvement with gaming peripherals (Brown et al., 2018; Gkasionis et al., 2021; Lee & Schoenstedt, 2011; Nielsen & Karhulahti, 2017) contribute to their families' and society's reticence to accept users' behavior (Nielsen & Karhulahti, 2017). Therefore, users often lie about the amount of time they dedicate to gaming (Nielsen, 2015; Nielsen & Karhulahti, 2017), a defensive behavior to hide their transgression of social and/or personal norms (Antonetti & Maklan, 2014) that is not unlike guilt. Guilt is a painful emotional experience of regret, remorse, self-blame, and self-punishment (Mosher, 1980), the discomfort that arises from a personal failure—often a transgression of an ethical standard (Arli et al., 2016).

McLean et al. (2022) find similar feelings of guilt in consumers' perceptions of time wasted in other technology settings, such as the overuse of a retailer's mobile application, although such guilt does not prevent consumers from continuing to engage in the behavior. This behavior can be explained by the fact that guilt is a withdrawal symptom (among others, such as restlessness, anger, or anxiety) experienced from addiction, which compels individuals to perform the behavior to relieve this symptom (Charlton & Danforth, 2007). Although guilt is a negative

emotion, it can also be adaptive (i.e., motivates positive change) because it increases perceived self-efficacy and is associated with problem-solving or active coping (Han et al., 2014; Pounders et al., 2019; Tangney & Dering, 2002). There is limited research on the negative emotions resulting from gaming addiction (Cheah et al., 2022), and only a handful of studies have explored guilt. The qualitative studies by Beranuy et al. (2013) and Chappell et al. (2006) noted that users who realize that they are engaging in an excessive number of hours of online gaming or are experiencing symptoms of addiction experience guilt. Our research extends these qualitative studies by quantitatively measuring the relationship between gaming addiction and guilt as outcomes in our model by proposing the following:

H3. Gaming addiction is positively related to guilt.

4.3 The relationships between the social environment, personal factors, and gaming addiction and its associated guilt in the context of eSports

In our three proposed hypotheses we discuss how constructs are related to each other in our model. We now propose two mediating effects to provide a more comprehensive understanding of the dynamics at play in gaming addiction in eSports. Using SLT as the overarching theoretical framework for our model, and in line with Smith's (2021) perspective on addiction (also based on SLT), we propose that gaming addiction is determined by the continuous and dynamic interactions resulting from the functional relationships between three key factors. These three key factors are the user's social environment (athlete role model influence), user's personal factors (user devotion and competitiveness, the latter we use as a moderator in our last hypothesis) and gaming addiction itself and its associated guilt. To examine comprehensively the

dynamic interplay between these three factors, we propose that the association between athlete role model influence and guilt is sequentially mediated by user devotion and gaming addiction.

Despite the significance of athletes as role models, no previous study has investigated their influence on users, through what mechanisms such influence can be exerted on users' motivations, emotions, and behaviors, and whether this influence can lead to adverse consequences for users. Research focusing on the adverse impact of role models on consumers within the technological milieu has predominantly centered on social media influencers, including their role in inducing anxiety (Deng & Jiang, 2023) and evoking the fear of missing out (Barari, 2023). We argue that the greater the users' motivation to imitate their athlete role models through increased dedication to eSports is, the greater their user devotion, which, in turn, may lead to addictive behavior and subsequent guilt. This may be similar to Junaid et al.'s (2022) findings that brand love can lead to brand addiction, resulting in negative behaviors. In this vein, we argue that athlete role model influence has a positive impact on user devotion, which may lead to adverse consequences. While the extant literature shows that consumer devotion does not engender guilt (Ortiz et al., 2013), we argue that it does so indirectly through addiction. Therefore, we propose that athlete role model influence on guilt is transmitted through two consecutive mediators, user devotion and gaming addiction, and we hypothesize the following serial mediation effect:

H4. The association between athlete role model influence and guilt is sequentially mediated by user devotion and gaming addiction.

4.4 *Personal factors: The moderating role of trait competitiveness*

In our previous hypotheses, developed within the framework of SLT, we have discussed the impact of the social environment (athlete role model influence) on one user's personal factor (psychological, i.e., user devotion) and how such personal factor relates to gaming addiction. We have also discussed the relationship between athlete role model influence and guilt as sequentially mediated by user devotion and gaming addiction. We now turn to the other user's personal factor (personality, i.e., competitiveness) that we employ in our study and discuss its role in our gaming addiction model.

We employ competitiveness as a moderator illuminating the boundary conditions of the relationship between user devotion and gaming addiction, offering a deeper understanding of this link. Competitiveness—"the enjoyment of interpersonal competition and the desire to win and be better than others" (Spence & Helmreich, 1983)—is a personality trait that is directly linked to the motivation to reach personal goals. Competitiveness is important to our study for two reasons: first, because eSports is a highly competitive environment, and second, because further research on personality traits in technology and wellbeing is needed (Benvenuti et al., 2023).

Previous studies have shown that competitiveness is one of the most essential motivations for users (Bányai et al., 2019; Billieux et al., 2013; Lee & Schoenstedt, 2011; Weiss & Schiele, 2013). Players are motivated by a desire for achievement and for overcoming obstacles in the game that fills them with a sense of pleasure and self-fulfillment (Ghazali et al., 2018), which implies that competition is fun. However, this might not be the case for users with low competitiveness, as the lack of pleasure and fulfillment from achieving goals and overcoming

obstacles in the game may add stress, potentially leading to adverse consequences (Brevers et al., 2023). This is consistent with Montag et al.'s (2022) findings that playing for recreation is negatively associated with disordered gaming in eSports. This is important, as an understanding of the predisposition of different personalities to addictive forms of devotion can contribute to avoiding potential harm (Pichler & Hemetsberger, 2007). Therefore, we anticipate that the relationship between user devotion and gaming addiction will vary depending on users' personalities, in our case, trait competitiveness, with a stronger connection expected for those who derive less enjoyment from competing against others:

H5. The association between user devotion and gaming addiction is stronger (weaker) for gamers with lower (higher) competitiveness.

5. Methodology

5.1 Participants and design

Participants were young adult male Brazilian users of CounterStrike: Global Offensive (CS:GO), the most popular eSports game since 2012 (Wong & Meng-Lewis, 2023) and part of the FPS genre of eSports. Brazil ranks seventh globally in terms of the number of eSports fans and eighth in terms of the number of active athletes (Possamai, 2023). We focused on young males because they constitute the majority of eSports' fan base (Hamari & Sjöblom, 2017; Wong & Meng-Lewis, 2023), the prevalence of online gaming disorders tends to be greater among men than women, and young people are considered the group most vulnerable to gaming disorders (Mihara & Higuchi, 2017).

A questionnaire was developed, translated, and pretested for validity purposes (Douglas & Craig, 2007). An iterative process of translation and back-translation of the original scales in English into Portuguese by a team of bilingual professionals was used to ensure conceptual equivalence (Brislin et al., 1973). We conducted a final pretest of the questionnaire with 50 young male users to detect ambiguity and improve the wording and sequencing of the items, as well as the response time. After the pretest results were analyzed and minor amendments were made, the final version was deemed satisfactory. Our study obtained ethical approval from our university to be conducted.

5.2 *Measures*

Athlete role model influence was measured with five items from Bush et al.'s (2004) role model influence scale; user devotion, with nine items from Ortiz et al.'s (2013) consumer devotion scale; gaming addiction, with the seven items tapping core addiction criteria from Charlton and Danforth's (2007) online gaming addiction scale; guilt, with four items from Aquino and Medeiros's (2009) guilt scale; and competitiveness, with nine items from Houston et al.'s (2023) enjoyment of competition subscale of the revised competitiveness index. All items were measured on a five-point Likert scale ranging from (1) strongly disagree to (5) strongly agree.

5.3 *Sample and procedure*

Following previous studies in eSports (e.g., Weiss & Schiele, 2013), the final questionnaire was administered to users who attended the Blast Pro Series event in Brazil, which hosts a large influx of CS:GO enthusiasts from across Brazil. Users were recruited among the spectators of the event to participate in the survey. Potential participants were approached at the event, and 276 of those who met the inclusion criteria agreed to participate in the survey. Inclusion criteria were being male, 18 years old or older, and playing CS:GO on a regular basis as amateurs at least once a week. We did not provide any compensation or incentive for their participation in the research. Before starting the questionnaire, participants were informed that their participation was voluntary, that they could withdraw from the study at any time, that their data would be analyzed anonymously, and about the expected duration to complete the survey. The questionnaire was self-administered and returned on the spot to the researcher. Although the researcher was available to clarify the questions, 46 questionnaires were removed due to having several incomplete answers, response set bias, and multiple selections of choices when a single response was needed. The final sample consisted of 230 male CS:GO users with average age of 23. The majority (89%) were single, and the remaining (11%) were married. Most (78%) were living with their parents, 12% were living with a spouse or friend, and only 10% were living alone.

We employed the inverse square root method of Kock and Hadaya (2018) to verify if the sample size was sufficient. Considering the minimum absolute significant path coefficient of 0.23, statistical power of 80% and a significance level of 1%, the minimum sample was 190 respondents, indicating that the actual number of 230 complete responses was sufficient. This number is also in the range of sample sizes employed in relevant prior studies that tested models of gaming behavior (e.g., Deleuze et al., 2018; Raggiotto & Scarpi, 2023).

6. Data analysis and results

We used partial least squares structural equation modeling (PLS-SEM) to test the conceptual model (Figure 1), as this method is valuable for estimating highly complex models (Hair et al., 2022), particularly when theoretical explanation is limited (Chin, 1998). The model was controlled for age, marital status, and household composition. None of the control variables interacted in a significant way with the model, thus, they are not shown in the analysis.

6.1 *Measurement model*

All the constructs had Cronbach's alphas and composite reliability values above 0.70 (Table I), indicating high levels of reliability (Hair et al., 2022). We assessed convergent validity through analysis of factor loadings and the average variance extracted (AVE) (Hair et al., 2022). Three items related to user devotion and five related to competitiveness were removed due to lower factor loadings (< 0.40) (Hair et al., 2022). Except for the seven items of gaming addiction (0.60 to 0.68), one item of athlete role model influence (0.68), and one item of competitiveness (0.68), all the items presented factor loadings that exceeded the 0.70 benchmark (Table II).

Our analysis of AVE indicators shows that all AVEs, but one, i.e., gaming addiction (0.42), showed satisfactory values above 0.50 (Hair et al., 2022). The lower than 0.50 AVE for gaming addiction is due to factor loadings of this construct being lower than the 0.70 threshold and, consequently, the AVEs (the mean value of the square of the loadings of each indicator on a

construct) would also be lower. However, all the loadings of gaming addiction are 0.60 or greater. We argue that for this construct, the lower AVE of 0.42 would be acceptable (Hair et al., 2022). According to Hair et al. (2022, p.77), items with loadings lower than 0.70 and AVEs between 0.40 and 0.70 should be retained “when the extent to which its removal affects content validity, which refers to the extent to which a measure represents all facets of a given construct”. Therefore, we have retained all seven items of gaming addiction to protect the conceptual integrity of the gaming addiction construct. Charlton and Danforth’s (2007) scale is an established and widely used scale, comprising seven items measuring all four core criteria for addiction (conflict, behavioral salience, relapse and reinstatement, and withdrawal symptoms). Retaining all seven items of the construct is important in demonstrating the different facets affecting users’ lives due to gaming addiction. Furthermore, according to Hair et al. (2022), convergent validity can be established for AVE values above 0.40 if the values for composite reliability are above 0.70. In our case, gaming addiction showed values above 0.40 and composite reliability above 0.70, so we can say that convergent validity was established for all the constructs (Table I). Nevertheless, we acknowledge the issue of the lower AVE for gaming addiction in our limitation section.

Discriminant validity was examined using Fornell-Larcker’s (1981) criterion. As shown in Table III, the square root of the AVE of each construct exceeds its correlation with each of the other constructs (one item related to guilt was removed to meet this criterion). In addition, heterotrait-monotrait ratio (HTMT) of the correlations was utilized to assess further discriminant validity (Henseler et al., 2015). As shown in Table I, all the values are lower than the threshold of maximum 0.85, indicating that the constructs are distinct from each other. Furthermore, a full

collinearity test was conducted to assess the potential impact of common method bias (CMB) that could compromise reliability of the results (Kock & Lynn, 2012). Table II shows no collinearity issues since all the variance inflation factor (VIF) values for all the relationships were below the threshold of 3, as recommended by Hair et al. (2022). Furthermore, all the VIFs from the full collinearity test were lower than 3.30, a value suggested by Kock (2015) as indicative of multicollinearity and CMB presence. This evidence confirms that our model is not affected by CMB.

Table I. Reliability and validity of the measurement model and quality of the structural model.

	M (SD)	α	CR	AVE	HTMT ratio				R²	Q²
					1	2	3	4		
1. Athlete role model influence	4.06 (1.16)	0.83	0.88	0.59						
2. User devotion	3.87 (1.23)	0.88	0.91	0.63	0.43				0.15	0.13
3. Gaming addiction	2.65 (1.50)	0.77	0.84	0.42	0.18	0.32			0.19	0.10
4. Guilt	2.50 (1.38)	0.73	0.85	0.65	0.12	0.14	0.79		0.37	0.10
5. Competitiveness	4.43 (1.09)	0.76	0.85	0.58	0.12	0.12	0.41	0.46		

Notes: M, mean; SD, standard deviation; α , Cronbach's alpha; CR, composite reliability; AVE, average variance extracted; HTMT, heterotrait-monotrait ratio; R², coefficient of determination; Q², cross-validated redundancy.

Table II. Scale items, factor loadings and variance inflation factor (VIF).

Construct and items	Loadings	VIF
Athlete role model influence (Bush et al., 2004)		
My favorite CS:GO athlete...		
Provides a good model for me to follow.	0.77	2.42
Leads by example.	0.80	2.57
Sets a positive example for others to follow.	0.83	2.84
Exhibits the kind of work ethic and behavior that I try to imitate.	0.68	1.34
Acts as a role model for me.	0.77	1.46
User devotion (Ortiz et al., 2013)		
I am really passionate about CS:GO.	0.71	1.63
I am a committed fan of CS:GO.	0.79	1.92
Being a fan of CS:GO is important in my life.	0.80	2.04
I am extremely attached to CS:GO.	0.86	2.60
I identify with CS:GO very much.	0.80	2.08
CS:GO is a part of me.	0.80	2.03
Gaming addiction (Charlton & Danforth, 2007)		
My social life has sometimes suffered because of my online game playing (CS:GO). [conflict]	0.66	1.57
Playing online games (CS:GO) has sometimes interfered with my work or study. [conflict]	0.68	1.52

When I am not playing online games (CS: GO), I often feel restless. [withdrawal symptoms]	0.66	1.32
I have made unsuccessful attempts to reduce the time I spend playing online games (CS:GO). [relapse and reinstatement]	0.65	1.30
Arguments have sometimes arisen at home because of the time I spend on online games (CS: GO). [conflict]	0.60	1.27
I often fail to get enough sleep because of playing online games (CS:GO). [behavioral salience]	0.65	1.45
I often miss meals because of playing online games (CS:GO). [behavioral salience]	0.66	1.41
Guilt (Aquino & Medeiros, 2009)		
I feel guilty for not managing my time better.	0.82	1.56
I feel guilty for not having the willpower to accomplish my purposes.	0.82	1.57
I usually feel guilty for not having time for the people I love.	0.79	1.33
Competitiveness (Houston et al., 2023)		
I don't like competing against other people.*	0.68	1.38
I find competitive situations unpleasant.*	0.77	1.35
I dread competing against other people.*	0.84	1.79
I try to avoid competing with others.*	0.74	1.61

Notes: *Reverse coded items.

Table III. Results of Fornell-Larcker criterion for discriminant validity.

	1	2	3	4	5
1. Athlete role model influence	0.77				
2. User Devotion	0.39	0.80			
3. Gaming addiction	0.01	0.21	0.65		
4. Guilt	0.01	0.06	0.61	0.81	
5. Competitiveness	0.02	0.08	-0.34	-0.35	0.76

Note: Bold values are the square root of AVE.

6.2 *Structural model*

We used three criteria to verify the quality of the structural model: coefficient of determination (R^2), cross-validated redundancy (Q^2), and effect size (f^2) (Hair et al., 2022). We used the bootstrap resampling method with 5,000 samples to evaluate the path coefficients, t values, and their statistical significance (p values). R^2 values of 0.75, 0.50 and 0.25 can be considered substantial, moderate, and weak, respectively (Hair et al., 2022). Table I shows R^2 values between 0.15 and 0.37. In particular, the model explained 37% of the variance in guilt, 19% of the variance in gaming addiction, and 15% of the variance in user devotion. The Q^2 indicators in Table I demonstrated the good predictive capacity of the model, as all the constructs had Q^2 values above the reference values ($Q^2 > 0$) (Hair et al., 2022).

All the proposed paths had a significant effect size (f^2), in which f^2 values of 0.02, 0.15 and 0.35 represented small, medium, and large effects, respectively (Hair et al., 2022). As shown in Table

IV and Figure 2, we found significant, positive direct effects of athlete role model influence on user devotion ($H1: \beta = 0.39, p < 0.000, f^2 = 0.17$), of user devotion on gaming addiction ($H2: \beta = 0.27, p < 0.000, f^2 = 0.08$) and of gaming addiction on guilt ($H3: \beta = 0.63, p < 0.000, f^2 = 0.60$). The classification of mediation was determined by the decision tree proposed by Nitzl et al. (2016). The results in Table IV indicate the significant indirect effect of the relationship between athlete role model influence and gaming addiction through user devotion ($\beta = 0.10, p < 0.01$) and between user devotion and guilt through gaming addiction ($\beta = 0.17, p < 0.01$). There is evidence for serial mediation, with user devotion and gaming addiction serving as mediators between role model influence and guilt ($H4: \beta = 0.06, p < 0.01$). User devotion and gaming addiction remained correlated even after we adjusted for role model influence ($r_{\text{partial}} = 0.24, p < 0.001$), which suggested that one mediator affects the other and confirmed the serial mediation effect (Hayes, 2013). Since the direct effects of athlete role model influence on gaming addiction ($\beta = -0.12, p = 0.13$) and user devotion on guilt ($\beta = -0.09, p = 0.18$) are not significant, we infer that full mediation is occurring.

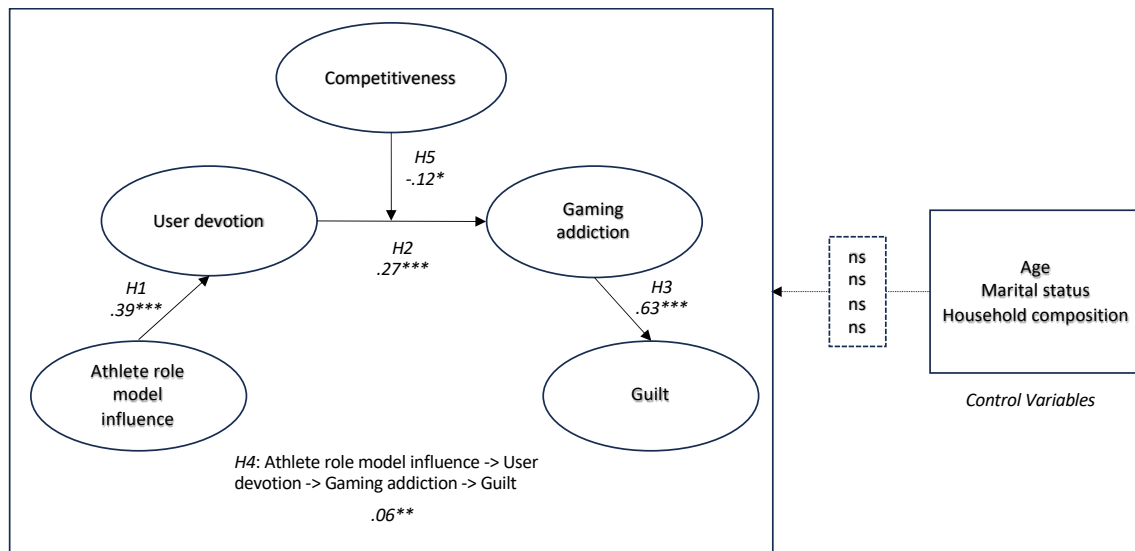
Finally, we found support for $H5$ ($\beta = -0.12, p < 0.05$), which posited that the association between user devotion and gaming addiction is stronger (weaker) for gamers with lower (higher) competitiveness, as shown in Figure 3. The negative slope suggests that competitiveness acts as a buffer against addiction. Users who enjoy competition, play for recreation (Montag et al., 2022), or experience pleasure and self-fulfillment (Ghazali et al., 2018) have a lower risk of becoming addicted.

Table IV. Path coefficient results.

Path	Path coefficients	t-values	p-values	95% CI
Direct effects:				
<i>H1</i> : Athlete role model influence → User devotion	0.39	6.11	0.000***	[0.28, 0.52]
<i>H2</i> : User devotion → Gaming addiction	0.27	3.66	0.000***	[0.13, 0.41]
<i>H3</i> : Gaming addiction → Guilt	0.63	13.27	0.000***	[0.53, 0.72]
Athlete role model influence → Gaming addiction	-0.12	1.53	0.13	[-0.26, 0.04]
User devotion → Guilt	-0.09	1.35	0.18	[-0.22, 0.04]
Total indirect effects:				
User devotion → Guilt	0.17	3.48	0.001**	[0.08, 0.27]
Athlete role model influence → Gaming addiction	0.10	2.99	0.003**	[0.04, 0.18]
Specific indirect effects:				
<i>H4</i> : Athlete role model influence → User devotion → Gaming addiction → Guilt	0.06	2.84	0.005**	[0.03, 0.12]
<i>H5</i> : Competitiveness x User devotion → Gaming addiction	-0.12	2.50	0.012*	[-0.24, -0.04]

Notes: CI, confidence interval. Total effect values are not reported because they did not differ from direct and total indirect effect

values. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$



* $p < .05$; ** $p < .01$; *** $p < .001$

Figure 2. Structural model.

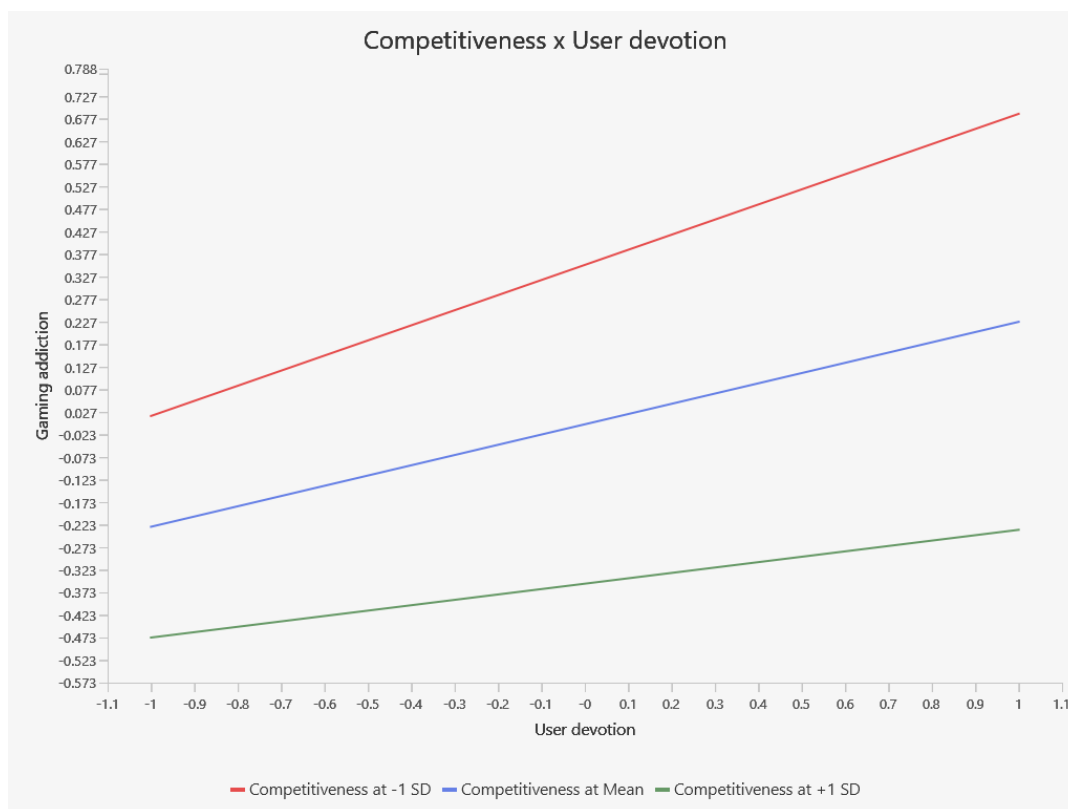


Figure 3. Simple slope analysis of the moderating effect of competitiveness between user devotion and gaming addiction.

7. Discussion

This study examined the antecedent factors of gaming addiction and the associated negative emotion of guilt in the context of eSports. Using SLT, we developed our research model to test five hypotheses aimed at answering the study's two research questions. This discussion is organized around the findings related to each hypothesis in the context of the relevant literature.

First, our findings provide support for the impact of athlete role model influence on user devotion (*H1*). This result is consistent with Ortiz et al.'s (2013) findings, demonstrating a connection between social influences and consumer devotion. Second, we found that user devotion is positively related to gaming addiction (*H2*). This is a novel finding as the role of the consumer devotion construct had not yet been examined in a pathological consumption context. Third, the findings confirm that gaming addiction is positively associated with guilt (*H3*), which is consistent with previous studies on technology-related addiction (Beranuy et al., 2013; Chappell et al., 2006; Charlton & Danforth, 2007; McLean et al., 2022).

Fourth, the findings show that user devotion and gaming addiction serve as mediators in the relationship between athlete role model influence and guilt, providing support for our serial mediation hypothesis (*H4*). Furthermore, we found that the effect of athlete role model influence on guilt is completely transmitted by user devotion and gaming addiction (full mediation effect). These results demonstrate the extent to which athlete role models influence the variables of the model, including not only user devotion,

which is directly impacted, but also gaming addiction and guilt, which are indirectly impacted.

Finally, our findings support the moderating role of competitiveness in the relationship between user devotion and gaming addiction (*H5*), i.e., gaming addiction is stronger (weaker) for gamers with lower (higher) competitiveness. Overall, our findings for *H1*, *H2*, *H3*, and *H4* offer empirical support for RQ1, while *H5* addresses RQ2.

7.1. Theoretical implications

The findings from this study offer several important implications for theory. First, by using SLT (Bandura, 1977; 1986) and Smith's (2021) perspective on addiction to explain gaming addiction in eSports, we answer calls to develop more understanding of mental health problems in eSports (Bányai et al., 2021; Brevers et al., 2023; Chan et al., 2022; Chung et al., 2019; Ramella-Zampa et al., 2022). Our model demonstrates that the social environment, personal factors, and addictive behavior in eSports are reciprocally related to each other in determining gaming addiction. This conceptualization implies that interventions targeting one component impact all other components, which in turn feedback reciprocally to impact the original targeted component. In other words, gaming addiction is continually evolving in response to continuous changes in the external environment and the individual. By providing empirical evidence for Smith's (2021) proposed perspective of addiction, our findings offer a significant original contribution to the area of gaming addiction and the eSports literature.

Second, by considering that addiction is influenced by factors both internal and external to the user, we offer a more holistic understanding of how gaming addiction can take place in eSports. In modeling the dynamic interplay of these factors, our study uncovers the link between the two main constituents of eSports, i.e., athletes and users. No previous study has examined the role of athlete role model influence on users' behavior, the mechanisms through which this influence may be exerted, whether this influence can lead to adverse consequences for users, or, in this case, which users are more at risk of harm. Our study addresses these gaps in the literature.

Third, our findings show that our model is unique because it positions athlete role model influence as the starting point of our model of addiction. Our model shows that self-relevant, vicarious role model athletes have a significant influence on the behavior, motivations, and emotional states of users, fostering users' extreme dedication and commitment to the eSport experience, which could lead to gaming addiction and associated feelings of guilt. Our focus on the social environment advances the field beyond previous research examining gaming addiction resulting from individual traits such as extroversion and neuroticism (Bányai et al., 2019; Larrieu et al., 2022; Montag et al., 2022), gaming motives such as escape, coping, fantasy, and social (Bányai et al., 2019; Laconi et al., 2017; Montag et al., 2022), and emotional states and moods (Achab et al., 2011; Lee et al., 2021; Snodgrass et al., 2014).

Fourth, we incorporate user devotion—the passion of users to the eSports experience—by borrowing this concept from consumer devotion literature to demonstrate the psychological significance of the contextual specificities of eSports in the development

of addiction. In doing so, we also answer calls to examine whether consumer devotion is related to pathological consumption (Ortiz et al., 2013; Pichler & Hemetsberger, 2007; Pimentel & Reynolds, 2004). Our findings provide empirical evidence for this novel relationship by demonstrating that user devotion is an antecedent of gaming addiction; it is a psychological mechanism that shows how athlete role model influence is manifested in users and transmitted to gaming addiction. Our research is different from Ortiz's et al. (2013) model of consumer devotion in two important ways: 1) Our model conceptualizes consumer devotion as an antecedent of gaming addiction and guilt. This is in marked contrast to Ortiz et al.'s (2013) model which emphasises that consumer devotion relates to positive behavior (e.g., evangelization), not dysfunctional behavior nor guilt. We extend the model by applying the concept to dysfunctional behavior, i.e., addiction; and 2) In Ortiz et al.'s (2003) model, devoted consumers are motivated by primary social influences, such as family and friends. We extend this view of devoted consumers by examining vicarious influences on devotion, i.e., athletes. In testing consumer devotion, our research is novel by showing not only that athletes have an impact on user devotion, but also that consumer devotion is a useful construct in the context of eSports. Consumer devotion demonstrates that vicarious influences on users are manifested in users' passionate commitment and dedication to the eSports experience. It also shows for the first time that although consumer devotion is not harmful per se, it can lead to dysfunctional behavior and negative emotions depending on the context, in our case, eSports.

Fifth, in addition to demonstrating the significant role of one personal factor, i.e., user devotion in gaming addiction, our study examines the role of another personal factor, i.e., competitiveness, extending the current limited knowledge on this personality trait

(Clark et al., 2016; Parke et al., 2004). Our model demonstrates that trait competitiveness plays an essential role in gaming addiction in eSports because, by its definition, eSports is a highly competitive context. Our findings show that users with lower (higher) competitiveness are more (less) at risk of addiction. This insight demonstrates the differential impact that enjoying gameplay has on users (Montag et al., 2022; Ghazali et al., 2018).

Finally, our model extends beyond the antecedents of gaming addiction by investigating guilt as a consequence of addiction, an understudied emotion. This also expands the limited knowledge on negative emotions associated with gaming addiction (Beranuy et al., 2013; Chappell et al., 2006; Charlton & Danforth, 2007; Cheah et al., 2022; McLean et al., 2022). The inclusion of guilt in our model is important because guilt, although a negative emotion, can also be adaptive as it increases perceived self-efficacy and is associated with problem-solving or active coping (Han et al., 2014; Pounders et al., 2019; Tangney & Dering, 2002), which could help alleviate gaming addiction.

7.2 *Practical implications*

Considering that gaming addiction poses a significant global public health problem (Chan et al., 2022; Chung et al., 2019; Lu, 2016), the eSports industry should develop effective interventions to address gaming addiction in eSports. As discussed earlier, interventions that target one of the three components that determine gaming addiction (environment, personal factors, behavior) impact the other two component as addiction is continually evolving in response to continuous changes in the external environment and the individual. For interventions to be effective, it is necessary to understand the

underlying psychological mechanisms of gaming addiction in eSports. For example, this research shows the importance of users' personality traits differences. Devoted users who are more competitive are more protected from addictive behavior because they enjoy competition. In contrast, devoted users who find competition less enjoyable are more at risk of addiction. Consequently, users need to be aware that not enjoying competition poses a risk to their wellbeing. Addiction is a serious health problem, and users, their families, and friends should pay attention and seek professional help to protect themselves from harm, when playing eSports interferes with normal activities such as work and study, social and family life, sleep, and having regular meals.

Practitioners of eSports companies have an important role in addressing problematic gaming and maintaining socially responsible behavior toward users and society at large. For example, they can implement strategies to manage user vulnerabilities, including effective communication campaigns to create awareness and warn against dysfunctional behavior among their users. Athlete brand role models should be aware of their crucial role and the substantial responsibility they bear in shaping the behaviors, attitudes, and emotions of their followers. Consequently, they should capitalize on the strong impact that their brand image, role model status, and influencer activities confer to them to promote healthy habits. They can do so while streaming and having other interactions with users with whom they enjoy a unique relationship facilitated by the digital nature of eSports (Hamari & Sjöblom, 2017).

Policies to curb the influence of athletes on users could be enacted to foster greater involvement, transparency, fairness, and accountability among athletes. For example, athletes could be required to undergo training to ensure they understand their key role in

the user experience and the responsibilities this entails. This is important as our findings show athletes' significant impact both on user devotion and addiction. Training should be given to athletes to prevent or minimize harm to users more at risk of addiction, i.e., those with low competitiveness, by providing such users with guidance and support. Furthermore, game platforms should be able to identify addicted users with the help of their databases, so that those at risk can be provided with assistance and protective action. In addition, users could be required to take a personality test to detect low competitiveness, making them aware that this trait can put them at higher risk of addiction and related feelings of guilt.

Another intervention is that game platforms should be required to display in-game warning messages to all users regarding the risks of addiction posed by extreme levels of devotion to the eSports experience. This should allow users to reflect on their own behavior and make more informed decisions related to their wellbeing. For example, reflecting on whether gameplay interferes with some aspects of their ability to function, e.g., deterioration of social life and experiencing guilt because of such interferences. Lastly, given guilt's role as an adaptive emotion, which can increase user's perception of self-efficacy, related eSports organizations could develop other appropriate interventions, for example, by identifying those more at risk of addiction and offering them problem-solving skills training to develop effective coping strategies to address gaming addiction and guilt. All these proactive initiatives to protect users would ultimately increase users' trust in their role model athletes, game platforms, related eSports organizations, and the total eSports experience.

In sum, eSports is a global multibillion business, and the flourishing of amateur gamer participation is critical for the sustained success of the whole eSports market (Ke & Wagner, 2024). Consequently, maintaining the industry as a safe environment is a crucial endeavor to protect users and ameliorate resistance by families and negative public opinion (Lu, 2016; Taylor, 2012), which hinders the further involvement of some young players (Meng-Lewis et al., 2022). The development of awareness programs and effective initiatives to protect users should involve collaboration between eSports actors such as athletes, sponsor brands, and eSports companies. In any case, policymakers and regulators should be involved in minimizing harm and ensuring aid for those already affected.

8. Limitations and future research

Our novel findings provide important theoretical and practical contributions to the field of eSports; however, these results should be considered in light of their limitations.

First, there is the issue of the quality of our gaming addiction construct not achieving the minimum 0.50 AVE threshold. In Section 6.1 we have explained that the lower value of 0.42 is acceptable to establish convergent validity when composite reliability is above 0.70 and retaining factor items that are 0.60 or greater ensures content validity of the construct (Hair et al., 2022). However, it is worth noting that while we employed Charlton & Danforth's (2007) scale because it is an established and widely used scale of gaming addiction, future studies could use other scales, for example, the Game Addiction Scale (GAS; Lemmens et al., 2009) to further test our model. It is also important to clarify that since we measured gaming addiction via self-reported responses to Charlton and Danforth's (2007) scale, our gaming addiction construct

reflects participants' perceived gaming addiction rather than clinical addiction, and while our sample represents regular users of eSports, future studies could employ a clinical sample to assess clinical addiction in eSports.

Second, we assessed the relationships between a limited set of constructs using a parsimonious and sound theoretical model of eSports gaming addiction; however, future research could examine additional variables. For example, we tested the role of guilt, but studies could examine other negative emotions such as frustration, sadness, anger, or shame resulting from gaming behavior addiction.

Third, we employed trait competitiveness as a moderator; however, future studies could examine other relevant personality traits to expand our understanding of the role of personality in technology research. Fourth, our participants were from one country, Brazil, which may limit the generalizability of the findings to other cultures.

Consequently, future cross-cultural research can highlight cultural differences in eSports user behavior. Finally, as eSports continues to grow markedly, and in light of our findings, we call for additional research on user behavior to better understand gaming addiction in eSports, as well as research focusing on intervention programs to limit harm and promote healthy engagement with eSports.

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