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A critical review on the moderating role of contextual factors in the associations between video gaming and well-being

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ABSTRACT

The appeal of video gaming has undoubtedly withstood the test of time. In view of its increasing popularity, lay people and researchers alike have taken an interest in the psychological consequences of video gaming. However, there seems to be a paradox associated with the effect of video gaming on gamers' well-being—namely, while most video game players cite "fun" as their motivation to play video games, video games continue to hold a notorious reputation among some researchers for being detrimental to mental health and emotional well-being as measured by indicators such as happiness, perceived stress, anxiety, and depressive symptoms. We suggest that a significant contributor to the mixed literature is the oversight of contextual factors that may moderate this relationship. The current review highlights five important contextual factors that should be considered when studying the associations between the frequency of video gaming and well-being. Specifically, we suggest that unless the social context (who), type (what), motivation (why), time and day (when), and amount (how much) of video gaming activities are adequately considered, examinations of well-being outcomes in relation to video gaming will remain incomplete.

Video games have been around since the 1950s (American Physical Society, 2008), and the appeal of video gaming has withstood the test of time. Between 2015 and 2020, the number of active gamers worldwide has risen from 1.99 billion to 2.69 billion, and this figure is projected to continue increasing (Clement, 2021). The purpose of video games is also increasingly diversifying such that their use extends well beyond the traditional arena of play to include cognitive, educational, physical, and mental health aspects (e.g., Chan, Kow, & Cheng, 2017; Colder Carras et al., 2017; Ferguson & Colwell, 2017; Green & Bavelier, 2012; Green & Seitz, 2015; Molyneux, Vasudevan, & de Zúñiga, 2015). In view of its popularity, laypersons and researchers alike have taken an interest in the effects of video games (Barlett, Anderson, & Swing, 2009; Cade & Gates, 2017; Ferguson, 2013; Ferguson, Copenhaver, & Markey, 2020; Hartanto, Toh, & Yang, 2016; Markey & Ferguson, 2017; Shaw, 2010). In particular, there is growing interest in the effects of video games on well-being because of a seemingly paradoxical feature of video gaming—while most video game players cite "fun" as their motivation to play video games (Reid, 2012), video games continue to hold a notorious reputation among some researchers for being detrimental to mental health and emotional well-being as measured by indicators like happiness, perceived stress, anxiety, and depressive symptoms (e.g., Gentile, Bender, & Anderson, 2017; Rehbein, Kleimann, & Mössle, 2010; Tortolero et al., 2014). Alongside the centrality of emotional well-being to almost all aspects of life outcomes (Hernandez et al., 2018; Huppert, 2009; Prince et al., 2007) as well as the rise of mental health issues among adolescent and young adults (Hidaka, 2012; Parodi et al., 2021; Steffen, Thom, Jacobi, Holstiege, & Bätzing, 2020), a careful examination of the links between video gaming and emotional well-being is warranted.

Findings from decades of research on the relationship between video gaming frequency and emotional well-being have been inconsistent and even contradictory. While some studies have found a negative correlation between video gaming and emotional well-being (Liu et al., 2018; Lo, Wang, & Fang, 2005; Madrigal-Pana, Gómez-Figueroa, & Moncada-Jiménez, 2018; Maras et al., 2015; Mikuška & Vazsonyi, 2018; Rehbein et al., 2010; Tortolero et al., 2014; Twenge & Campbell, 2019), a growing body of research has shown that video gaming is associated with higher levels of emotional well-being (Johannes, Vuorre, & Przybylski, 2021; Jones, Scholes, Johnson, Katsikitis, & Carras, 2014; Kühn, Berna, Lüdtke, Gallinat, & Moritz, 2018; Orben & Przybylski, 2019; Viana et al., 2017). Although these mixed findings may be due, in part, to the vastly different or suboptimal methodologies used to examine this

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relationship (Johannes et al., 2021; Odgers & Jensen, 2020) or potential third variables in numerous studies (Ophir, Lipshits-Braziler, & Rosenberg, 2020; Pallavicini, Ferrari, & Mantovani, 2018), we suggest that another significant contributor to the mixed literature is the insufficient consideration of contextual factors that may affect this relationship.

Numerous theories have been developed to explain how video gaming may harm well-being. One of the more popular explanations, namely the displacement hypothesis, posits that video gaming displaces time for players to engage in healthy activities (e.g., socializing, exercise; Williams, Yee, & Caplan, 2008), thus impairing health and well-being among gamers. Others have argued that video gaming causes poorer sleep (Peracchia & Curcio, 2018), which has also been found to be associated with poorer well-being (Ness & Saksvik-Lehouillier, 2018). A third line of argument suggests that the violence depicted in video games acts as a mediator between video gaming and poorer well-being (Flannery, 2016; Tortolero et al., 2014). Lastly, some have argued that poor psychological and emotional outcomes are an antecedent rather than a consequence of video gaming (e.g., Blasi et al., 2019; Loton, Borkoles, Lubman, & Polman, 2016). According to this view, those attracted to video gaming may have poorer well-being to begin with and use video games as a way to cope with negative emotional experiences. Regardless of their conclusions, these various theories are built on specific assumptions about video games that hold to different extents across contexts. Therefore, it is important that contextual factors are carefully considered when examining the relationship between video gaming and well-being.

Critical reviews that account for some contextual factors of video gaming in recent years (e.g., Adachi & Willoughby, 2017; Halbrook, O'Donnell, & Msetfi, 2019; Wiederhold, 2021), while undeniably important, often concentrate on a limited number of contextual components but overlook others that are also worth noting. Moreover, many reviews have focused on the domain of cognitive functions and aggression (Bavelier & Green, 2019; Choi et al., 2020; Dale & Green, 2017; Ferguson, Bowman, & Kowert, 2017), which were argued to correlate with video games through different assumptions and theoretical mechanisms. Hence, to guide interested researchers toward a more comprehensive assessment of the video gaming landscape, the current article highlights five important contextual factors that should be considered when studying the associations between video gaming frequency and well-being. More specifically, given the increasing complexities of modern video gaming that underlie nuances in its psychological effects (Dale & Green, 2017; also see a recent finding by; Klecka, Johnston, Bowman, & Green, 2021), we suggest that unless the social context (who), type (what), motivation (why), time and day (when), and amount (how much) of video gaming activities are considered, examinations of well-being outcomes in relation to video gaming will remain incomplete. In closing, the current article will elaborate on the challenges of studying these contextual factors and propose concrete and practical recommendations that researchers may utilize to overcome these challenges.

Who: the social context of video gaming

A common theory as to why video games may have a negative impact on well-being alludes to how video gaming is detrimental to gamers' social lives. According to the displacement hypothesis (Twenge, 2019; Williams et al., 2008), video gaming takes time away from players that could otherwise be spent on meaningful social interactions, thus negatively affecting gamers' mental health and well-being. Numerous studies have found converging evidence of the positive effects of social interactions on a wide array of factors underlying people's well-being (e.g., Berry & Hansen, 1996; Sandstrom & Dunn, 2014; Sun, Harris, & Vazire, 2020). Yet, the fact that technological advancements have paved the way for interactive online video gaming and the growing prevalence of multiplayer games in recent decades (K. Jones, 2020) indicates that this theory may not always be true. Social gaming, put simply, refers to games that are played with multiple individuals either cooperatively or competitively (Halbrook et al., 2019; Kowert, Domahidi, Festl, & Quandt, 2014). In contrast, non-social games like single-player video games lack human interaction elements that are present in social games. Indeed, modern video games have been shown to benefit social capital outcomes including establishing and maintaining social relationships with other players (Perry et al., 2018). Unsurprisingly, video games with social elements have been shown to have similar positive effects as those associated with social interaction on gamers' social well-being (Kaye, Kowert, & Quinn, 2017; Longman, O'Connor, & Obst, 2009; Mandryk, Frommel, Armstrong, & Johnson, 2020). Moreover, socially oriented video games have been found to be associated with less problematic gaming symptoms compared to games with fewer or no social components (ColderCarras et al., 2017).

Just as important is the target of the interaction during social video gaming, which can affect the depth and quality of social interactions (Dubois, Bonezzi, & De Angelis, 2016). According to a survey conducted by the Pew Research Center (2015), while 89% of gamers play video games with friends they know in person, many gamers (54%) also play with people they have only met online. A substantial number also play video games with their families (Eklund, 2015). These differences in social dynamics may play a part in influencing how social video games affect a player's well-being. For instance, a study that examined differences in gaming with family, friends, and strangers concluded that players' level of engagement in video games varies as a function of who they play with (Eklund, 2015). Another study revealed that distinct empathic responses and prosocial behaviors were elicited by different social gaming targets (Fraser et al., 2012). As the social context of video games can differentially impact players' well-being, researchers should pay close attention to the "who" when exploring the associations between video gaming and well-being.

Why: the motivation behind video gaming

A second contextual factor that researchers should consider when examining the relationship between video gaming and well-being is the motivation behind the desire to play video games. Video gaming motivation has been largely explored through the lens of self-determination theory, which proposes that the inclination to play video games stems from players' needs for autonomy, competence, and relatedness (Przybylski, Rigby, & Ryan, 2010). Self-determination theory further suggests that individuals would experience enhancements in psychological well-being should these needs be fulfilled. Consistent with the theory's predictions, research has shown that people's well-being increments after video gaming were directly associated with the satisfaction of autonomy, competence, and relatedness needs (Ryan, Rigby, & Przybylski, 2006). On the other hand, when those needs are not met—which tends to occur when the play is solely driven by extrinsic motivation and players feel pressured to play—video gaming becomes negatively associated with well-being (Przybylski, Weinstein, Murayama, Lynch, & Ryan, 2012; Przybylski & Weinstein, 2019; Tamborini, Bowman, Eden, Grizzard, & Organ, 2010). These findings highlight the distinct effects of video gaming on well-being in accordance with the fulfilment (or non-fulfilment) of psychological needs as postulated by self-determination theory.

Aside from the fulfilment of autonomy, competence, and relatedness needs, another prevalent motivation that mediates the link between video gaming and well-being is the use of video gaming as a form of emotional coping. For instance, a study of 165 Multiplayer Online Battle Arena (MOBA) players showed that escapist motivation mediated the negative correlation between frequency of video gaming and indicators of psychological well-being, such as anxiety, insomnia, and depression (Goh, Jones, & Copello, 2019). Another study similarly found that participants' motivation to play video games as a form of distraction or to regulate negative emotions was associated with lower levels of life satisfaction, self-esteem, and trait positive affect (von der Heiden et al.,

2019). Interestingly, the same participants reported higher state positive affect while playing games, suggesting that video gaming might be a promising emotion regulation activity. This finding is consistent with an experimental study demonstrating that clinically depressed patients who were assigned to play an action video game had lower maladaptive rumination than those who were assigned to the wait-list control group (Kühn et al., 2018). Taken together, these findings highlight the importance of accounting for the motivations behind video gaming, as poorer psychological well-being may be a cause rather than a consequence of video gaming for those who use video games as a coping mechanism (Chak & Leung, 2004; Hartanto, Quek, Tng, & Yong, 2021; Ko et al., 2005). In fact, video gaming appears to be a promising activity in helping people cope temporarily with psychological distress.

What: the genre of video games

Another important context that influences the link between video gaming and well-being is the genre of video games. From action games to role-playing games and even gambling games, a wide variety of video game genres exist today. Yet, video gaming studies have tended to refer to video games as a general category (e.g., Gentile et al., 2011; Maras et al., 2015; Mikuška & Vazsonyi, 2018), neglecting the possibility that different video game genres have specific features that impose highly unique effects on well-being.

One of the most promising video game genres that can improve physical and psychological health outcomes is exergames—a genre that requires players to move physically in order to progress through the game. Consoles like the Nintendo Wii and Microsoft Kinect allow users to engage in a variety of exergames that incorporate psychomotor challenges, such as aerobic exercise routines (Kimhy et al., 2015) and dancing according to visual and rhythmic cues (Eggenberger, Wolf, Schumann, & de Bruin, 2016). Unlike the typical sedentary video game, exergames resemble moderate-intensity physical exercise with increased energy expenditure, heart rate, and oxygen consumption during gameplay (Haddock, 2012; Wu, Wu, & Chu, 2015). Considering the well-established psychological benefits of physical exercise (Zhang & Chen, 2019), exergames may likewise be highly beneficial for psychological health. Indeed, research on exergames has consistently revealed associations between higher frequency of playing exergames and better emotional outcomes, such as fewer depressive symptoms, reduced anxiety, and greater positive affect across different age groups (Viana et al., 2017; Zheng, Li, Salmon, & Theng, 2020). Thus, instead of taking time away from players to engage in physical exercise, exergames can actually serve as a fun source of exercise and motivate people to keep physically fit.

At the other end of the spectrum, violent video games have often been implicated as a cause of reduced emotional well-being (Kim & Ahn, 2016; C. M.; Weaver, Borkowski, & Whitman, 2008). Proponents of this view (e.g., Flannery, 2016; Tortolero et al., 2014) have argued that the intense and aggressive content of such games may induce anxiety and depression, citing research that found indirect exposure to real-life violence (e.g., as a witness of violent crime) to be associated with negative affectivity and poorer mental health (Fowler, Tompsett, Braciszewski, Jacques-Tiura, & Baltes, 2009; Gollub, Green, Richardson, Kaplan, & Shervington, 2019; Shukla and Wiesner, 2015). While evidence for the link between violent video games and depression is limited and contentious (Ferguson & Wang, 2019; Tortolero et al., 2014; Valadez & Ferguson, 2012), there is some preliminary evidence that playing violent video games compared to non-violent video games can increase stress levels as measured by cardiovascular activity, such as increased blood pressure, heart rate variability (Porter & Goolkasian, 2019), and cardiac coherence (Hasan, Bègue, & Bushman, 2013). However, this effect could be sex specific. For example, a study indicated that violent video game exposure increased stress only for girls, which was mainly attributed to the lack of familiarity over (and thus, frustration toward) the game's mechanics (Ferguson et al., 2016). Another study showed that video gaming was associated with lower anxiety symptomatology in boys but was positively associated with higher anxiety symptomatology in girls, which was also attributed to the lack of preference toward violent video games among female video game players (Ohannessian, 2009, 2018). These various lines of research highlight the need to consider the role of gameplay preferences and mechanics, as well as how they affect players' enjoyment of video gaming and satisfaction of psychological needs, when analyzing the impact of video games on emotional outcomes.

When: the time and day of video gaming

The "when" factor, regarding the time and day of gaming, is another contextual aspect that may moderate the association between video gaming and well-being. Consider, for instance, the impact of video gaming at different times of the day on a key factor of health and well-being: sleep. Taking a zero-sum approach to time, the displacement hypothesis (Twenge, 2019; Williams et al., 2008) predicts that video gaming at night is more detrimental to well-being compared to daytime video gaming because of the loss of time that should be used for sleeping (King et al., 2013; Nie & Hillygus, 2002). Indeed, late-night video gamers reportedly feel that game time is "never enough" and are less capable of regulating themselves to get more sleep (King & Delfabbro, 2009). Unlike other well-being activities, such as social interaction or physical activities, the displacement of sleep cannot be mitigated by different types of gameplay, such as multiplayer, social, or exercise games. Thus, the displacement of sleep is unique compared to other types of displacement. Knowing that sleep deprivation can increase negative mood states like anxiety and depressive symptoms (Babson, Trainor, Feldner, & Blumenthal, 2010; Kahn-Greene, Killgore, Kamimori, Balkin, & Killgore, 2007), there is a need to consider the potential moderating effect of gaming time and pre-sleep gaming on the link between video gaming and well-being.

Some preliminary evidence exists on how the association between video gaming and well-being depends on day-versus night-time engagement. Video gaming has been shown to increase arousal and cognitive alertness, which suggests that late-night gaming may cause sleep disturbance (E. Weaver, Gradisar, Dohnt, Lovato, & Douglas, 2010). Additionally, sleep quality was found to mediate the positive correlation between night-time media usage before sleep and depressive symptoms (Adams & Kisler, 2013; Lemola, Perkinson-Gloor, Brand, Dewald-Kaufmann, & Grob, 2015). More importantly, a study of 646 adolescents and young adults showed that habitual computer gaming between 10pm and 6am was significantly associated with increased risk of depressive symptoms, and this effect was partly mediated by daytime sleepiness (Lemola et al., 2011). On the contrary, these associations were not found when gaming occurred at earlier timings.

Aside from the time of day, another temporal variable that may moderate the relationship between video gaming and well-being is whether video games are played on weekdays or weekends. Tracing back to the displacement hypothesis, weekday gaming usually forces the gamer to play later at night due to fixed day-time activities such as work or school, thereby decreasing the time available for sleep (Mahmassani, Chen, Huang, Williams, & Contractor, 2010). Meanwhile, playing on the weekends would less likely decrease gamers' overall sleep duration due to greater flexibility over their awake timings compared to playing on weekdays when awake periods are more rigid (Drummond & Sauer, 2019; Hartanto, Toh, & Yang, 2018; Roepke & Duffy, 2010). Supporting these predictions, a study found that sleep duration in children was more affected by gaming on weekdays than on weekends (Li et al., 2007). Similarly, a survey of 2546 secondary school students in Belgium demonstrated that frequent video gaming led to shorter sleep durations only on weekdays, whereas only the time of awakening was delayed while sleep duration was unperturbed on weekends (Van Den Bulck, 2004). Given that weekday gaming can result in inadequate sleep compared to weekend gaming and that a healthy circadian rhythm is

crucial for well-being (Lemola et al., 2011), weekday gaming is likely to be worse than weekend gaming for well-being. Indeed, a study on Swedish adolescents revealed that weekday gamers faced a higher probability of suffering from depressive, musculoskeletal, and psychosomatic symptoms than weekend gamers (Hellström, Nilsson, Leppert, & Åslund, 2015). Relatedly, studies on screen-time exposure and social media use, which have similar stimulating effects as video gaming on wakefulness and sleep (He et al., 2020; Levenson, Shensa, Sidani, Colditz, & Primack, 2017; Munezawa et al., 2011), show that weekday consumption of media is more detrimental than weekend consumption (e.g., Garett, Liu, & Young, 2018; Przybylski & Weinstein, 2017). Taken together, findings on the differential impact of the time and day of video gaming on well-being highlight the importance of taking temporal variables into account.

How much: excessive video gaming

Lastly, the excessiveness of video gaming is another important context that should be considered in studies of video gaming and well-being. From a displacement perspective, the negative effects of media use and video gaming in particular should be directly proportional to exposure or time spent on those activities. However, a growing number of studies have demonstrated a contrasting beneficial effect of moderate video gaming on emotional well-being and cognitive functioning, such as increased calmness, improved visuospatial processing, and better mood states (Durkin & Barber, 2002; Ferguson, 2007; C. M. Jones et al., 2014). To explain this phenomenon, researchers have proposed the digital Goldilocks hypothesis that media or technology use is not harmful at moderate levels and may even be advantageous, whereas excessive use can indeed displace time that would be better spent on well-being activities and thus jeopardize the user (Przybylski & Weinstein, 2017a). In other words, a moderate amount, rather than complete abstinence or excessive video gaming, would produce the most satisfactory outcomes for well-being. In support of the digital Goldilocks hypothesis, a large study of English adolescents revealed a concave downward quadratic relationship between screen time and mental well-being (Przybylski & Weinstein, 2017a). Similar studies on other electronic media activities have also demonstrated the same quadratic trend (e.g., Ferguson, 2017; Przybylski, Orben, & Weinstein, 2020; Przybylski & Weinstein, 2017b; Sanders, Parker, delPozo-Cruz, Noetel, & Lonsdale, 2019; Twenge & Campbell, 2018), although it is important to note that the effect sizes reported by these studies tend to be small.

While video game studies have largely and traditionally focused on the negative effects of gaming on well-being (Jones et al., 2014), related findings from the technology-use literature have cautioned against studies that only examine a linear relationship between video gaming and well-being. In fact, several studies have surfaced revealing that video gaming might, to some extent, be beneficial for well-being (Desai, Krishnan-Sarin, Cavallo, & Potenza, 2010; Durkin & Barber, 2002; Lemmens, Valkenburg, & Peter, 2011; Wang, Khoo, Liu, & Divaharan, 2008), thus highlighting the potential importance of viewing the amount of time spent on video gaming along a continuum and evaluating potential non-linear relations between video gaming and well-being.

Discussion and recommendations

The literature on video gaming and well-being is replete with mixed and inconclusive findings, and there is a widespread but problematic view of video games as a convenient culprit for poorer psychological outcomes. In light of these mixed and inconclusive findings, we emphasized the need to consider contextual factors (i.e., who, why, what, when, and how much) when performing research on the links between video gaming and well-being. As shown in our review of important contexts that moderate the psychological dynamics of video gaming, failure to account for contextual factors would render any conclusions regarding the negative impact of video games on well-being premature. For instance, whether a video gamer is playing in isolation or engaging in social gaming with others (Kowert et al., 2014; Perry et al., 2018) or whether they were playing to fulfill their psychological needs or to cope with negative emotions (Ryan et al., 2006; Von Der Heiden et al., 2019) can lead to very different emotional well-being outcomes. Thus, we hope that the contexts specified in this paper will allow researchers to achieve greater nuance in their studies of video gaming effects.

While the various aforementioned contextual factors are individually important in their own way, there is also incremental value in examining the interactions between them as the effects of some contextual factors may be strengthened or diminished by others. For example, studies examining the benefits of social video gaming (who) revealed that improvements in psychological outcomes were greater among players who played moderately (how much) and for social purposes (why) compared to players who played excessively (Longman et al., 2009) with an achievement-oriented purpose (ColderCarras et al., 2017) or for escapism (Hagström & Kaldo, 2014). Similarly, a study indicated that the amount of time spent on video games (how much) and the day of video gaming (when) interactively influenced well-being such that video gaming in small amounts was related to improved psychological well-being during the weekends (a quadratic relationship), whereas video gaming of any duration was linearly associated with poorer psychological well-being during weekdays (Sanders et al., 2019). Hence, the knowledge gained from studying the interactions between multiple contextual factors is likely to be substantial.

Moving forward

While we stress the necessity of paying more attention to contextual factors in future investigations on video gaming and well-being, it is important to recognize that several factors, including the increasing complexity of video games, possible reverse causations, outdated measures of video game exposure, inaccuracy of self-reported video-gaming behavior, and issues related to publication bias and small effect sizes, can impose substantial difficulties on this endeavor. To provide interested scholars with clearer guidelines on how contextual video gaming effects can be examined, we discuss these challenges and propose several practical and concrete steps for future research to achieve a more holistic understanding of the relationship between video gaming and well-being.

One difficulty in capturing the contextual factors of video gaming is the ever-increasing complexity of video games. With the rise of online games and "hybrid genres" (Clement, 2021; Dale & Green, 2017), tracking differences in video gaming using categories such as genres may be increasingly unviable. Today, many popular games incorporate multiple game modes that allow players to choose whether they would like to play independently or with others. For example, popular games like World of Warcraft and Final Fantasy XIV allow players to not only pursue independent quests but also interact with and play alongside other players in the same online virtual world. Many games also incorporate and blend elements from multiple genres to appeal to a wider range of audiences. For instance, action-adventure video games (e.g., Star Wars Jedi: Fallen Order (2019), Marvel's Spider-Man (2018)) engage players' reflexes (like an action game) while also offering a storyline (like an adventure game). As such, focusing on traditional categories like genres to understand the effects of video gaming on well-being may no longer be ideal; instead, researchers should focus on how the mechanisms of video games affect well-being (see Dale & Green, 2017 for a comprehensive review). For example, rather than classifying games as "multiplayer" versus "single-player" games, researchers should consider asking participants to report *who* they interacted with while playing video games and the nature of those interactions to gain a richer understanding. Researchers can also ask players to describe the specific characteristics of the games they played,

such as whether they were exposed to violent or gory stimuli. By capturing the precise features of video games instead of relying on traditional classifications, researchers can examine with greater rigor the specific explanatory mechanisms (e.g., the displacement hypothesis, digital Goldilocks hypothesis, psychological benefits of physical exercise) that underlie the well-being effects of video gaming and elucidate the nuances of video gaming amidst an increasingly sophisticated video game market.

Additionally, the overwhelming use of cross-sectional designs in the current literature to uncover the psychological correlates of video gaming gives rise to a serious limitation: the inability to determine the causal nature of observed relationships. As mentioned earlier, some research has suggested that poorer well-being may be an antecedent to rather than a consequence of video gaming for individuals with certain motivations (Chak & Leung, 2004; Hartanto et al., 2021; Ko et al., 2005). Yet, cross-sectional studies do little to untangle the directionality of this relationship. We suggest the use of longitudinal daily diary designs with random intercept cross-lagged panel analysis or dynamic structural equation modelling to examine bidirectionality and the possibility of reverse-causation in future studies of video gaming and well-being (Asparouhov, Hamaker, & Muthén, 2018; Hamaker, Kuiper, & Grasman, 2015; Leszczensky & Wolbring, 2019). Researchers can, for example, measure gaming intentions as well as fluctuations in gaming behaviors and emotional well-being over time, which will allow for a comprehensive examination of how the motivation to play may moderate the longitudinal association between video gaming and well-being in an ecological and temporal context.

Apart from study design, there is a need to move from self-report assessments of time spent on video games to objective data-logged measurements of actual video gaming activity to allow for more precise observations of video-gaming habits, which speak particularly to the "when" and "how much" factors. Recent studies have shown that subjective evaluations of screen time are often inaccurate, biased, and vulnerable to memory distortion (Hodes & Thomas, 2021; Parry et al., 2021; Shaw et al., 2020). This is especially true for video gaming—because of the habitual and engaging nature of video gaming, video gamers may lose track of time and underestimate how long they spend on games, resulting in inaccurate reports of actual video gaming (Bisson & Grondin, 2013). Objective data-logged measures can facilitate the collection of highly accurate and precise data on the time and day of video gaming, and numerous widely used gaming platforms (e.g., Steam), consoles (e.g., Nintendo Switch, PS4), and games (e.g., FIFA 21, Uncharted 4) already have in-built time trackers detailing how much time one spends on a game (Singh, 2020; Stanton, 2019, 2020). Even for mobile games, the in-built iOS and Android Screen Time functions have been shown to be reliable in assessing screen time (Ohme et al., 2020). Future research should tap on these available features to improve data quality, through which a better understanding of how time spent and time and day of video gaming might differentially affect well-being can be attained.

Next, the examination of excessive video gaming (the "how much" context) based on the digital Goldilocks hypothesis should not rely solely on the quadratic trend of time spent on video games. As mentioned earlier, evidence of the quadratic effect of screen time on emotional well-being is somewhat tenuous with inconsistent results and small effect sizes, which may have occurred because time spent on video gaming does not account for differences between positive and negative video gaming experiences as well as between problematic and normative video gaming engagements (Charlton, 2002). We suggest the use of longitudinal methods to track how video gaming interferes with important life needs and responsibilities and how this interference may predict emotional well-being (Ferguson, Coulson, & Barnett, 2011). This operationalization of excessive video gaming will allow researchers to rigorously assess whether excessive video gaming is problematic or simply the symptoms of underlying mental health problems.

Lastly, other than accounting for the proposed contextual factors, it is also crucial that researchers embrace transparent scientific practices when investigating the links between video gaming and emotional well-being, such as pre-registration of studies and the utilization of the open science framework. Despite the benefits of pre-registration in reducing false positives and confirmation bias (Simmons, Nelson, & Simonsohn, 2020), only a few studies of video gaming and well-being were pre-registered (Ferguson & Wang, 2021; Orben & Przybylski, 2019). As publication bias and undisclosed flexibility in data analysis have been observed in the video gaming literature (e.g., Ferguson & Wang, 2021; Hilgard, Engelhardt, & Rouder, 2017; Przybylski & Weinstein, 2019), the utilization of open science practices can enhance the quality of research on how video gaming and emotional well-being are connected. Furthermore, closer scrutiny of the literature on video gaming and well-being has revealed that many of the effect sizes reported in previous studies were small despite the significant p values found (e.g., Lobel, Engels, Stone, Burk, & Granic, 2017; Maras et al., 2015; Przybylski & Weinstein, 2017a; Tortolero et al., 2014). Thus, it is of paramount importance that future studies use consistent effect size reporting, perform replications with larger sample sizes, and pay more attention to the interpretation of effect size estimates and the crud factor (Orben & Lakens, 2020; for a guide on effect size, see; Ferguson, 2009).

Conclusion

In sum, many theories and studies that attempt to explain the links between video gaming and well-being in the current literature are based on a limited understanding of the contextual factors associated with video gaming. Drawing on research that has demonstrated important variations in the relationships between video gaming and well-being as a function of context, we stress that a careful consideration of contextual factors can help researchers reconcile conflicting observations in the current literature and execute more robust investigations of these relationships. While the factors we highlighted may not be exhaustive, we hope that the current paper serves as an important step toward uncovering the rich complexities that underlie video gaming and well-being.

Declaration of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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