



# **The role of social video game play and relatedness in players' well-being**

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## **Abstract**

Video games is one of the most popular forms of entertainment, and there are nearly 3 billion video game players in the world. The popularity of video games has caused a heated discussion about their influence on players' well-being. Many negative impacts on mental and physical health have been found when problematic video game use or gaming disorder has been reported. However, some studies ignored the motivation for gaming when exploring the relationship between playing video games and well-being. Self-determination theory (SDT) proposes that people's behaviours are driven by three basic psychological needs, autonomy, competence, and relatedness. Relatedness, or being connected with other people, can be achieved through social video game play, especially as the multiplayer online video games community is getting larger.

Therefore, this study explores the role of social video game play and the need for relatedness in gaming and examined whether it influenced one's well-being and life satisfaction by analysing three waves of self-reported well-being and motivation data of 87,321 video game players and their game-behaviours data. Results provided evidence that social gamers and gamers with higher relatedness satisfaction scores experienced higher affective well-being and general life satisfaction. It was also found that the effects of social gaming and relatedness on affective well-being were stronger among female players. No moderation effect of gender was found in life satisfaction. This study reveals that playing video games with others and fulfilling social needs are beneficial to one's well-being, stressing the importance of not only behaviours but also psychological satisfaction in video game studies.

*Keywords:* video games; well-being; social gaming; relatedness; self-determination theory

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# 1. Introduction

Video games are one of the most popular leisure activities and the gaming community has been growing steadily with a yearly increase of 5.6% (Gilbert, 2020). There are about 2.95 billion video game players in 2022 and the number significantly increased from 1.99 billion in 2015 (Gilbert, 2020). Its popularity has attracted scholars in diverse fields to study the link between video games and youth development, health, culture, media, and education (Adachi & Willoughby, 2013; Greenfield, 2014; LeBlanc et al., 2013; Ritterfeld & Weber, 2006; Squire, 2011). Heated discussions are around the impact of video games on players' psychological status and mental well-being, and video game play is believed to trigger many negative outcomes such as violence, aggression, and addiction (Grüsser et al., 2006; Smith et al., 2003). As a result, many countries qualify this and regulate video games to ensure safe playing for target audiences. South Korea introduced the Shutdown Law in 2011 which forbade children under the age of 16 to play online games between 12 am and 6 am (Sang et al., 2017). In 2018, Vietnam issued new regulations requiring gaming services, especially multiplayer online games, to keep the playing time under 3 hours for users who are under the age of 18 (Das, 2018). The addiction specialist from Kurihama Medical and Addiction Centre urged Japanese government to treat over-gaming as a mental disorder, which caused policy-making debates (Yoshikawa, 2019). Similarly, last year, China's National Press and Publication Administration (NPPA) decided to strictly cut the time minors spend on video game play to up to three hours per week in order to protect children's mental and physical health (Zhai, 2021).

The cases above reflect a general concern that the time spent on online video gaming is directly linked to potential mental illness, especially for teenage players, and thus needs to be regulated. However, two important factors are overlooked here. First, most of the literature

focuses on the negative outcomes of excessive video game play, or problematic video game use. While there is debate about what constitutes problematic video game use, it is clear that using time as a single factor to limit play time is inappropriate, unless there is sufficient evidence that moderate video game play has the similar potential to cause harm to players. Secondly, the video game industry has significantly changed over the past decade and it is now more than just a form of entertainment. Technological innovations and expanding demographics of gamers have led to the birth of online social games, which serves as one of the essential social channels, especially among young adults. Online gaming forums have emerged as well, enhancing the social component of video games. If we think of video games as a social activity, limiting the time spent on gaming seems not intuitive. Instead, it is the form of gaming that matters.

Indeed, as the video game community expands, more studies show positive impacts that video games have on players such as better performance, higher enjoyment, and positive emotions (Bowman et al., 2013; Granic et al., 2014; Halbrook et al., 2019). It is also not surprising that many scholars have turned their attention to social video games and found that social video game play can spur social interaction, strengthen relationships, and promote prosocial behaviours (Eklund, 2015; Fox et al., 2018; Granic et al., 2014; Shoshani et al., 2021; Snodgrass et al., 2011). Nevertheless, most of those studies use social video game play as the predictor while there is a lack of literature exploring the outcomes of social satisfaction in video games, or how players' subjectively feel about social gaming.

Therefore, the present study aims to bring new insights to the field of social gaming by taking into account the considerations mentioned above. First, social video game play is captured as a binary variable rather than the amount of time in this study. When treating video games as a social activity, it is more crucial to evaluate how gamers play and what they feel about gaming than to measure how much they play. Besides, both behaviours and

satisfactions are used to predict the outcome, and self-determination theory will be applied to illustrate the importance of psychological needs. With a focus on well-being, this study hopes to understand not only how social gaming influences but also how players' psychological satisfaction for relatedness shapes their feelings and general life satisfaction. Gender differences are also tested and discussed.

The paper is structured as follows. Section two provides an overview of related literature on video games and well-being, gaming and social life, social video gaming, self-determination theory, and gender differences in social gaming. The following section, section three, briefly talks about the research questions and hypotheses. Section four, methodology, explains and justifies the procedure from data collection, and measurement, to data analysis. Results are presented and described in section five, accompanied by visualisations. Next, section six interprets findings and discusses how findings address the research questions, as well as the limitations and implications. Section seven summarises the study, connects it to the wider conservation, and outlines future research.

## **2. Literature review**

### **2.1 Video games and well-being**

Extensive studies have examined the negative impacts of video games on mental health, such as aggressive thoughts, pro-violence attitudes, addiction, and depression (Anderson & Dill, 2000; Mentzoni et al., 2011; Wei, 2007; Weinstein, 2010). As the gaming community grows, however, researchers started to address this imbalance by exploring the positive outcomes of video games. Moderate but not excessive video game play is associated with higher well-being and mental health in general (Allahverdipour et al., 2010; Shen & Williams, 2011). It has also been found that video games contribute to stress reduction, positive emotions, visual-spatial abilities, and problem-solving skills (Adachi & Willoughby, 2017; Green & Bavelier, 2006; Przybylski, 2009; Russoniello et al., 2009; Wack & Tantleff-Dunn, 2009). The inconsistencies of the polarized studies on the effects of video games on players are usually caused by the inclusion or omission of motivation, an important factor in determining the outcomes of video game play.

Time spent on gaming has been used as a predictor among scholars to examine the relationship between video game play and well-being for a long time (Dickson et al., 2018; Whitlock & Masur, 2019). Although some argue higher video game exposure has detrimental effects, such as on one's academic performance and attentional control (Anand, 2007; Swing et al., 2010), when motivations for gaming are incorporated into the model, the relationship between time spent on gaming and well-being become minimal or even positive (Adachi & Willoughby, 2017; Johannes et al., 2021; Przybylski et al., 2009; Vuorre et al., 2021; Wang et al., 2008). This positive impact of video game play on health is more salient during the COVID-19 pandemic when playing video games reduces loneliness and boosts happiness by providing socialising opportunities and cognitive stimulation (Barr & Copeland-Stewart,

2022). Therefore, what video games bring to players has significant nuances (Shen & Williams, 2011) and, to a large extent, depends on *how* and *why* they play rather than *how much* they play.

Among many motivations and purposes of gaming, socialisation is one of the major forces driving gamers to play (Halbrook et al., 2019). The opportunities for social interactions provided by gaming – playing with other people, for example – serve as a way to enhance both online and offline social capital, which were found associated with improved well-being, health, and happiness (Barr & Copeland-Stewart, 2022; Kaye et al., 2017; Reer & Quandt, 2020). Hence, an overview of the social nature of video games is essential to construct a better understanding of their influence on well-being.

## **2.2 Video games and social life**

Social life is integral for well-being as it provides people with social support and forms meaningful relationships, which are important for one's psychological and physiological health (House et al., 1988; Taylor, 2011). As a popular social leisure activity, video games offer a place where gamers can "meet" and "play" with friends, or a space for both social interaction and sociability (Eklund, 2015). Therefore, the link between video games and social life has been studied by many researchers. Playing video games was found associated with a decrease in peer relationship problems and prosocial deficits (Kovess-Masfety et al., 2016). Similarly, exposure to prosocial video games activated the accessibility of prosocial thoughts and prosocial behaviours such as to help after a mishap or to intervene in a harassment situation (Greitemeyer & Osswald, 2010). Other researchers demonstrated the benefits of video game play in building social capital, both strong and weak ties (Perry et al., 2018). However, gamers who spend much time on online social gaming but not offline social events are more likely to allow the deterioration of their existing social relationships and,

consequently, have smaller social circles with poorer quality (Kowert et al., 2014; Williams, 2006). This phenomenon, described as “cocooning”, supports the social displacement hypothesis, which predicts a decrease in gamers’ friendship quality and their well-being if they displace in-person interactions with online communication in video games since offline social ties are believed to be more helpful in health (Kraut et al., 1998; Williams, 2006). As the line between digital and face-to-face communication become blurrier than ever in the past few years, it seems impossible to separate social life into two exclusive domains. Indeed, conducting a longitudinal study, Domahidi et al. (2018) provided evidence that did not support the social displacement hypothesis by revealing that online video game play does not have consequences, either positively or negatively, on gamers’ offline social circles or social support. This finding suggests that instead of occupying time for offline social interactions, video games help build one’s social network in an alternative way. As more and more video games allow multiple people to play together, playing video games socially is one of the approaches players use to socialise through gaming. Therefore, to detect the underlying connection between video games, social life, and well-being, it is necessary to recognise the social affordance of video games.

### **2.3 Playing video games socially**

Video game players are avidly social individuals (Herodotou et al., 2014). Designed to be a social activity, many video games have multiplayer modes, allowing a group of gamers to play together, either physically or online. Moreover, games without direct interaction between players and single-player games are hardly devoid of a social element as the game system or platform creates a feeling of “co-presence” (Stenros et al., 2009). Local multiplayer games are popular among families and friends and they were found to contribute to offline connections, healthier gaming environment, stable social groups, and well-being in offline

lives (Eklund, 2015; Snodgrass et al., 2011). Multiplayer online games (MOGs) enable gamers to communicate with their microphones or cameras switched on, aiding in both building new relationships with online gamers and enhancing existing relationships (Domahidi et al., 2014; Quwaider et al., 2019). Online gaming with others can bring positive impacts on social well-being such as greater social satisfaction and prosocial behaviours (Halbrook et al., 2019; Shoshani et al., 2021). The dynamics among gamers who play together can be, depending on the game's nature, either competitive or collaborative. Both types of games facilitate building relationships among gamers, serving as important gamer motives and reinforcing video game play (Cianfrone et al., 2011; Herodotou et al., 2014; Stenros et al., 2009). The present study covers local and online multiplayer games with diverse gaming dynamics, examining the outcomes of playing video games socially.

Social capital and social support are the two major fields the existing literature on social video game play focuses on. Bonding and bridging, often classified as strong ties and weak ties, are two forms of social capital. Bonding refers to the connections within a group or community and has thick trust whereas bridging social capital is between social groups with different sociodemographic or socioeconomic characteristics (Putnam, 2000). Although gamers who often play with other people do not differ from non-gamers or non-social gamers in social embeddedness (e.g. number of good friends), social gamers with a higher motive to gain social capital are more likely to make new friends through online gaming and have a larger social network (Domahidi et al., 2014; Shen & Williams, 2011). Online gaming is also capable of nurturing strong social ties and consequently more bonding social capital when the connections built through gaming are transferred into offline relationships, or modality switching between online and offline spheres (Domahidi et al., 2014; Ramirez & Zhang, 2007; Trepte et al., 2012). The findings are in line with the social augmentation argument

which believes the Internet has the ability to enhance users' social interaction and expand their social networks (Kraut et al., 2002; Wellman, 2001).

Social support, a strong predictor of psychological well-being, has three dimensions. Informational support occurs when one person helps another understand something better or solve problems by offering information, advice, or resources. Instrumental support refers to tangible assistance such as services and financial or physical support. Emotional support means love, care and warmth one provides to another person (Kaye et al., 2017; Taylor, 2011). Playing online video games with other people could provide gamers with both online and offline social support, which increases one's social proximity and is negatively related to the feeling of loneliness (Trepte et al., 2012). However, there is a paucity of empirical studies on how those social benefits convert into overall well-being. The literature on psychological satisfactions of video game players and how those relate to their well-being presents an interesting avenue for extending our empirical understanding of the social dimensions of games.

## **2.4 Self-determination theory, relatedness, and video games**

Existing theory and empirical findings suggest that not only gamers' behaviours but also their motivations and psychological status matter in the social outcomes of playing video games.

Self-determination theory (SDT), a theory of human motivation, suggests that people are driven by three innate psychological needs – competence, autonomy, and relatedness – in their personality development and behavioural self-regulation, which facilitate them to learn, grow and thrive (Ryan & Deci, 2000, 2017; Ryan et al., 1997). Competence refers to possessing adequate knowledge or skill and the need to control outcomes. Autonomy is the desire to be in charge of one's own life and the ability to make decisions in harmony with one's integrated self. Relatedness, the focus of the present study, is the need to have

meaningful relationships or interactions with others or to have a sense of belonging. The motivation to fulfil their needs explains people's inherent tendency to seek out challenges, extend their capacities, and construct social development and personal growth (Ryan & Deci, 2000).

Satisfaction and frustration of the three needs are often applied in video game literature to study the link between video game use and outcomes (Allen & Anderson, 2018; Przybylski et al., 2010; Ryan et al., 2006). For example, it was found that levels of basic need satisfaction are positively related to time spent on gaming, video game enjoyment, and well-being (Johannes et al., 2021; Johnson et al., 2016; Przybylski et al., 2009). Low levels of need satisfaction are associated with obsessive passion whereas high levels of need satisfaction often led to more harmonious passion (Przybylski et al., 2009). Besides, other researchers (Mills et al., 2018) reveal that high levels of need satisfaction in gaming settings and high levels of need frustration in the real world both contribute to problematic video game use. In other words, playing video games is used by some gamers as an alternative way to satisfy their basic psychological needs and counterbalance the frustration they have in their lives while the outcomes on well-being could be either positive or negative depending on their gaming motivations and daily needs frustration (Allen & Anderson, 2018; Mills et al., 2018).

Being one of the major factors explaining gaming motivations, social motive, or the need for relatedness, is a major area of video game studies (Cianfrone et al., 2011). Playing video games socially is an effective way of improving gamers' emotional experiences, enhancing their feelings of social belonging, and in turn, bringing a positive impact on their social lives (Finke et al., 2018; Kaye & Bryce, 2012). Some experimental studies also suggest that more interactions with other players in gaming are correlated with higher inter-player impressions, stronger social motivations in gaming, and higher relatedness satisfaction

(Cunningham et al., 2015; Lew et al., 2020). Relatedness satisfaction in gaming plays a vital role in predicting video game enjoyment and future multiplayer game play (Ryan et al., 2006), and it is associated with higher intrinsic motivation in gaming (Cunningham et al., 2015; Ryan & Deci, 2000). However, there is not enough literature on playing video games socially, relatedness satisfaction, and their connections to gamers' life well-being.

Relatedness is not as directly related to video game play experience as autonomy or competence, but it is centrally important for promoting intrinsic motivation and internalisation (Ryan & Deci, 2000). Therefore, the present study is going to fill this gap by conducting analysis at both behavioural and psychological levels.

## **2.5 The role of gender in social video game play**

Playing video games was mainly a leisure activity for boys and men in the 1980s and 90s, which created a stereotypical image of male gamers that many studies based on (Bryce & Rutter, 2003). As more female players join this once male-dominated field, the nature and content of video games have changed significantly. There are many video games containing less gendered content, featuring female protagonists, and targeting female audiences to embrace women into the video game realm. According to many recent studies, there were no gender differences found in time spent on video games, online communication, trust in their online friends, willingness of playing video games, and problematic video game use (Cole & Griffiths, 2007; Colwell & Payne, 2000; Przybylski et al., 2017; Valkenburg & Peter, 2007). Sharing similar gaming patterns, however, male and female players show distinct differences in their gaming preferences as men were found to be more likely to play achievement-oriented games and sport-related games than women (Crawford, 2005; Williams et al., 2009).

Gender differences are also worth noting in the social gaming context. Male players, in general, make more online friends than female players and they are more likely to meet up

with online friends at a LAN meeting (Cole & Griffiths, 2007), a party of video game players where they play multiplayer games together. It is also notable that female players have less motivation to play games in social situations (Lucas & Sherry, 2004). Those differences might be on account of the unfriendly online gaming environment for women. Building new connections through online gaming is not easy, especially in competitive games as players are often under performance pressure and potentially hostile and aggressive acts from teammates (Tan & Chen, 2022). The experience is even worse for women since female players are falsely believed to be inferior or less talented than male players (Kaye et al., 2018; Shen et al., 2016; Vermeulen et al., 2016). As a consequence, female players are more prone to play local multiplayer games with family than male players (Eklund, 2015). In the online gaming environment, facing stronger threats and receiving higher performance anxiety, female players engage in coping techniques to mitigate the toxicity and hostility in gameplay, including masking their gender, misrepresentation, using male avatars, and avoiding using microphones or cameras (Cote, 2017; Fox & Tang, 2017; Tang & Fox, 2016; Vella et al., 2020). Those techniques might hinder female players from creating new social connections through video games and reduce the sociability of gaming for women.

Male and female players also experience different gratification mechanisms in video games. As men and women differ in gaming preference and anticipation, the satisfaction they gain from gaming is unlikely to be the same (Lucas & Sherry, 2004). With higher motivations for playing video games in a social situation, male players might have more positive feedback than female players even with the same level of social connection or satisfaction. Thus, in this study, gender is hypothesized to be moderating the effects of social gaming on well-being as well as the effects of relatedness on well-being.

### 3. Present study

The studies reviewed above suggest that video games have a strong social element and are inseparable from players' social lives. Considering players' motivations for gaming, the social affordance of video games, and their potential in fulfilling the need for relatedness, the present study is going to explore the link between social video game play and well-being. As mentioned before, this paper hopes to address two major gaps in the existing literature. First, instead of using time spent on video games as the predictor, as the majority of researchers do, this study emphasizes the importance of the form of gaming, either social gaming or non-social gaming. Second, it examines the link between relatedness and players' well-being, an area that few empirical studies have touched on, and avoids the behavioural-only approach which often leads to inconsistent results due to the lack of motivational effects. Therefore, the present study conducts a two-level analysis with the consideration of both behavioural data (RQ1) and psychological status (RQ2), investigating how social gaming as well as players' feelings about social gaming are associated with well-being.

***RQ1:** Do social video game players experience higher well-being than non-social video game players?*

***RQ2:** Do social video game players with higher relatedness satisfaction experience higher well-being?*

The first research question has an emphasis on behavioural data and examines whether there is a difference between gamers who play with other people and gamers who play on their own. The second research question uses relatedness satisfaction to explore the

relationship between social video game play and well-being at the psychological level. The answers to these research questions will be evaluated using multilevel model analyses with survey answers from active video game players. Since social video game play has many prosocial effects, such as contributing to social capital and social support, it is expected that social video game play is associated with higher self-reported well-being scores (H1). According to SDT, social video game players with higher perceived relatedness satisfaction are expected to experience higher well-being (H2) as their social motive is more successfully achieved through gaming.

*H1: Social video game players experience higher well-being than non-social video game players.*

*H2: Social video game players with higher relatedness satisfaction experience higher well-being.*

Gender differences, as shown in the literature above, are noticeable in the social aspect of video game play. Therefore, this study also examines the moderation effects that gender has on the relationships between social video game play and well-being, and between relatedness satisfaction and well-being. The moderation analysis will be conducted using interaction items in multilevel model analyses.

***RQ3: How does the gender of video game players moderate the effects?***

Since the online gaming environment is less friendly to female players, many of them choose to avoid socialising and mask their gender during gaming, making female players less

social-oriented compared to male players. Because of those obstacles in building social connections through online gaming, it is hypothesized that social gaming and satisfying the need for relatedness are not associated with their well-being status as strongly as male players (H3a & H3b).

*H3a: The relationship between social video game play and well-being is stronger in male players than in female players.*

*H3b: The relationship between relatedness satisfaction and well-being is stronger in male social players than in female social players.*

## 4. Methodology

### 4.1 Participants and procedure

This study was done in compliance with relevant research guidelines and obtained ethical approval (SSH\_OII\_CIA\_21\_011) before any data collection and data analysis. The dataset used in this study contains three-wave self-reported survey responses from players of seven video games – *Animal Crossing: New Horizons (AC:HN)*, *Apex Legends*, *Eve Online*, *Forza Horizon 4*, *Gran Turismo Sport*, *Outriders*, and *The Crew 2*. The survey measured video game players' social video game play, basic psychological need satisfaction, and well-being. In collaboration with the publishers of the seven games, the survey responses were collected in 2021. The game publishers recruited English-speaking participants who had been actively playing their games by sending invitations through email. Participants who responded to the first wave were then invited to answer the same questions for the second and third waves with a two-week interval between each wave.

Trying to get the largest possible sample, a great number of invitations had been sent and the initial response rate ranged from 0.05% to 3.00%. The average response rates for the second and third waves, however, increased to 38.00% and 75.79%. A total of 129,802 valid responses were collected from 87,321 participants. Among all the sampled players, the majority identified as men (87.98%), with 9.88% identified as women, and 1.03% identified as non-binary. On average, the age of participants is 34.26 years old (s.d. = 11.12) and they have 23.64 years of video game experience (s.d. = 9.76).

### 4.2 Games

Participants in this study were recruited from active players in seven games. *AC:HN* is a social simulation game where players build and live in their islands by collecting, buying,

selling, and exchanging materials. Users can visit their friends' islands and interact with them through text and reactions. *Apex Legends* is a first-person shooter game with the aim of searching for weapons, defeating other teams, and staying alive until the end. About 20 to 30 teams of two or three people are formed to start the game. *Outriders* is a third-person shooter role-playing game where players combat both monsters and human enemies. *EVE Online* is a role-playing game in the setting of space. Players can do a lot of activities such as mining, trading, exploration, and combat. *Forza Horizon 4*, *Gran Turismo Sport*, and *The Crew 2* are racing video games.

Five of the seven games have both single-player and multiplayer modes while *Apex Legends* and *EVE Online* only enable multiplayer mode. Except for *AC:HN*, all the games have strong competitive as well as collaborative elements because they allow players to work in a team but need to defeat other teams.

### **4.3 Measures**

#### ***Social video game play***

Social video game play is a binary variable measured by a single item in the survey. Participants from all three waves were asked whether they played video games with others in the past two weeks. In this study, social video game play refers to playing with others either online or in the same room. Participants with an answer of "Yes" were classified as social video game players while participants who answered "No" were considered non-social video game players. About 9.72% (n=8485) participants had different answers in three waves, meaning they experienced both single playing and social playing over the three two-week intervals.

### ***Relatedness***

Perceived satisfaction score of the need for relatedness was only reported by participants who had been playing video games with others in the two weeks prior to the survey response. Applying the player experience and need satisfaction scale (PENS) (Ryan et al., 2006), the survey contained three items measuring to what extent were participants' needs for relatedness satisfied. Participants were asked to review their experience of social video game play during the past two weeks and rate their feelings on a scale from 1 (*Strongly disagree*) to 7 (*Strongly agree*). The three items were "I found the relationships I formed in [video game name] important", "I found the relationships I formed in [video game name] fulfilling", and "I didn't feel close to other players". Since the emotional direction of the last statement was the opposite of the other two, the value of the answer to the third item was reversed in subsequent analysis. The mean value of the three answers was then calculated for each observation and served as the relatedness satisfaction score. A higher score means a higher level of satisfaction of one's need for relatedness.

### ***Well-being***

Two commonly used measures of subjective well-being, affective well-being and life satisfaction, were captured in the present study. Both are continuous variables and higher values indicate higher levels of well-being.

Affective well-being was assessed with the Scale of Positive and Negative Experiences (SPANE) (Diener et al., 2010). A total of 12 items were used in the survey with 6 items measuring positive feelings such as pleasantness, happiness, and joy and the other 6 items evaluating negative feelings such as sadness and anger. Participants were asked to rate their experiences on a scale from 1 (*Very rarely or never*) to 7 (*Very often or always*). The

final score of affective well-being was calculated by subtracting the mean of negative items from the mean of the positive items.

Participants' general life satisfaction was measured in the survey by one single item. The item was designed based on Cantril's Self-Anchoring scale which aims to measure people's attitudes towards their life through a simple visual scale (Kilpatrick & Cantril, 1960). Cantril's Self-Anchoring scale asked participants to imagine "a ladder with steps numbered from 0 at the bottom to 10 at the top" where the top of the ladder represents the best possible life and the bottom of the ladder represents the worst possible life. Participants responded on a scale from 0 to 10 to indicate on which step of the ladder they personally feel they stood "over the past two weeks".

#### **4.4 Analysis**

All the statistical analyses were conducted in R (R Core Team, 2021). Multilevel model analysis was applied to measure the relationship between social video game play, relatedness satisfaction, and well-being. Multilevel analysis is a suitable approach when analysing data with a hierarchical or clustered structure and it allows for residual components at each level of the data (Snijders & Bosker, 2011). In this study, for example, some observations might come from the same individual since the survey data was collected from three waves.

Therefore, participant is the first-level grouping variable. In addition, game serves as a second-level grouping variable with the assumption that participants playing the same game might have some similar traits depending on the nature of the game. Multilevel models allow for random effects for each level. That is to say, each group can have its own average (intercept) and coefficient (slope). In the present study, random intercepts are fitted for each participant and game while random slopes are only fitted for each game. Since only a small proportion of participants (9.72%) had completed the second or third wave of the survey,

estimating random slopes for each participant was impossible due to a large number of parameters and low degrees of freedom. Therefore, the associations between independent and dependent variables were assumed to be the same for all participants. Besides, answers in the second or third waves were mixed with those in the first wave because the unit of the analysis was observation rather than participant. More details will be discussed in the next section.

Two regressions were run to measure the behavioural effects of social video game play on well-being (RQ1) with one using affective well-being and the other using life satisfaction as the dependent variable. Since some participants had more than one wave of data and they came from different games, participant and game were used as the first- and second-level grouping variables. Wave was not used as a grouping variable because the study design did account for lag effects across different waves. Random effects were fit for each game. The same approaches were applied to answer RQ2 which assessed the effects at a psychological level using relatedness satisfaction as the independent variable. Moderation effects were evaluated to answer RQ3. A couple of interaction items of independent variable and gender were added to the regression equations to test whether and how gender moderated the effects of social video game play and relatedness satisfaction on affective well-being and life satisfaction.

No outliers were observed in the dataset, according to influence plots. Scatterplots displayed a linear pattern between relatedness and both affective well-being and life satisfaction. QQ-plots of all models showed symmetric patterns. Residual checks and Breusch-Pagan tests were performed for all the models and there was no discernible evidence against normal distribution and heteroscedasticity.

## 5. Results

### 5.1 Descriptive statistics

#### *Social video game play*

About 27.74% of the responses indicated that participants had played video games with others in the two weeks before the data collection, 67.10% reported playing on their own, and 5.16% had missing values. The proportion varied across different games. Among the seven games, *Apex Legends* (75.15%) and *EVE Online* (60.00%) had the highest number of social video game players. Other games had about 22.39% to 41.64% of observations of social video game play. The majority of the participants (90.28%) did not change their answers across multiple waves of survey responses, which means they either played video games on their own during the whole process of data collection, or they play socially at least once over each of the three two-week periods.

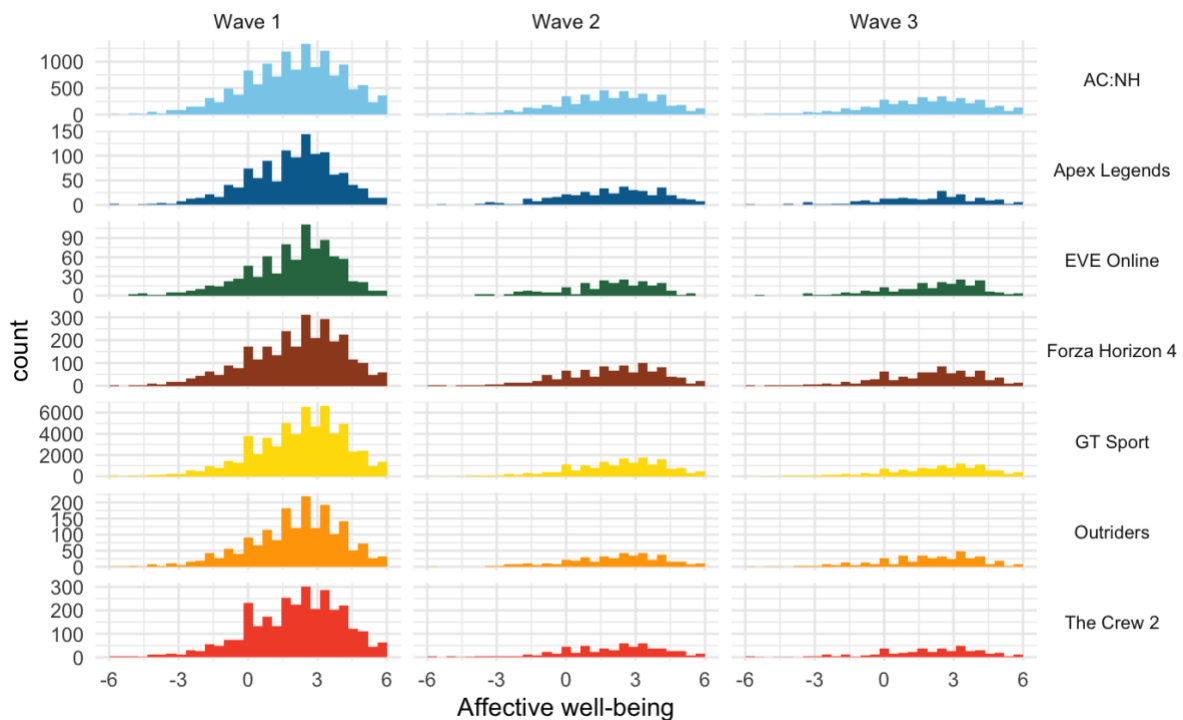
#### *Relatedness*

Among all the responses suggesting social video game play, relatedness satisfaction had an average score of 4.43, with a standard deviation of 1.34. The minimum was 1.00 and the maximum was 7.00. There was little variance across three waves but a relatively large variance across different games. On average, *EVE Online* and *AC:HN* had the highest relatedness scores of 5.00 (s.d. = 1.26) and 4.92 (s.d. = 1.25). *Forza Horizon 4* and *Outriders* had mean relatedness scores of 4.12 (s.d. = 1.33) and 4.19 (s.d. = 1.39), which were the lowest among the seven games. The distribution of relatedness satisfaction score was largely normal with a slight negative skewness and a high concentration of around 4. For *AC:HN* and *EVE Online*, most of the values were distributed on the right side of the histogram, which was consistent with the statistics mentioned above. There were a lot of missing values

(69.74%) for relatedness because only social video game players were asked for their perceived relatedness satisfaction score.

### ***Well-being***

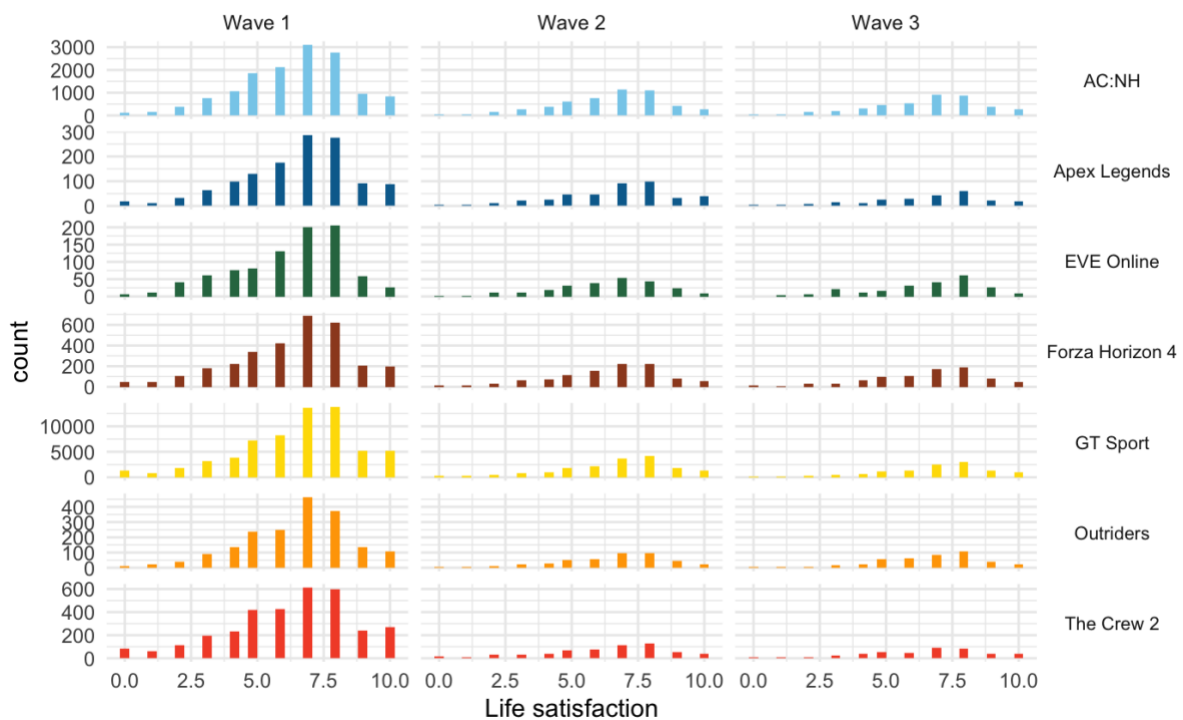
On average, participants' affective well-being score was 2.16, indicating that they had more positive feelings than negative feelings overall. It had a minimum of -6.00 and a maximum of 6.00 with a standard deviation of 2.03. About 17.82% of responses had missing values for affective well-being. Its distribution was largely the same for each wave and game, with *GT Sport* having a slightly higher mean of 2.25 (s.d. = 1.98). From Figure 1 we can see that affective well-being is negatively skewed for all the games. This asymmetry explains why the mean score was positive.



***Figure 1.*** Distribution of affective well-being by each game and wave

Another dimension of well-being, life satisfaction, had a mean score of 6.52 and a standard deviation is 2.23, with 14.69% missing values. Its values spread from 0.00 to 10.00,

which was the range given by the survey question. Again, *GT Sport* had the highest mean value of 6.57 (s.d. = 2.26) while *The Crew 2* had the lowest mean value of 6.29 (s.d. = 2.40). There was only marginal difference across three waves ( $M_{\text{wave1}} = 6.49$ ,  $M_{\text{wave2}} = 6.56$ ,  $M_{\text{wave3}} = 6.65$ ). Similar to affective well-being, the distribution of life satisfaction was negatively skewed with more values on the right side of the histogram, clustered around 7.50 (see Figure 2).

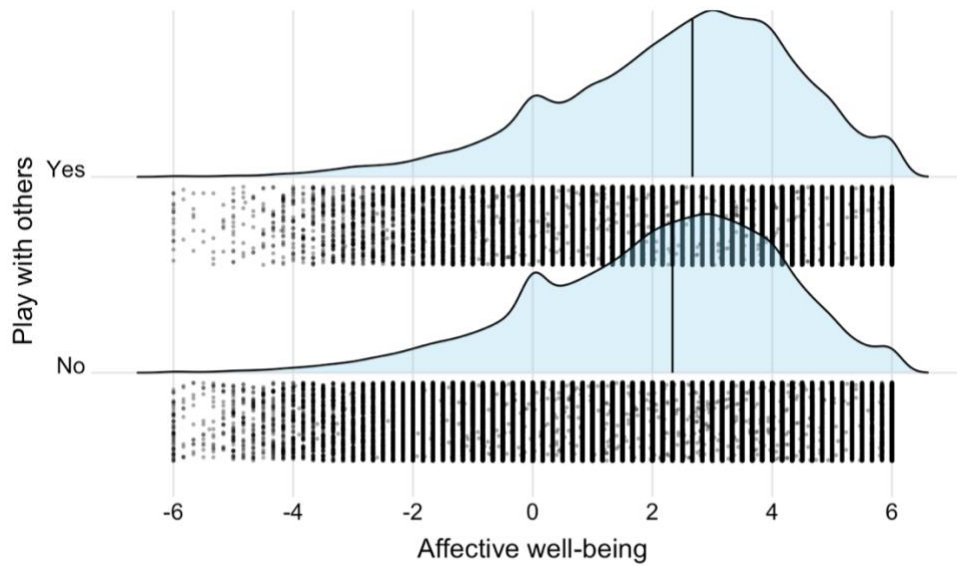


**Figure 2.** Distribution of life satisfaction by each game and wave

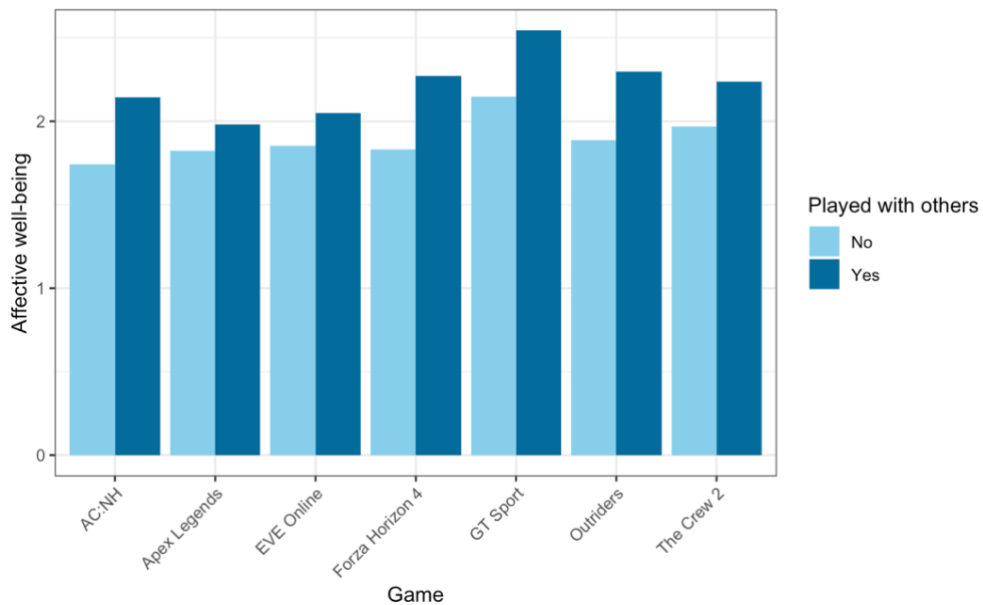
## 5.2 Social video game play and well-being

To answer RQ1, two multilevel models were created to examine the relationship between social video game play and well-being. The outcome variables for Model 1 and Model 2 were affective well-being and life satisfaction, respectively. In addition to the fixed predictor, social video game play, both models calculated random intercepts at the participant level and random slopes at the game level. The results were a mix of between-subject and within-

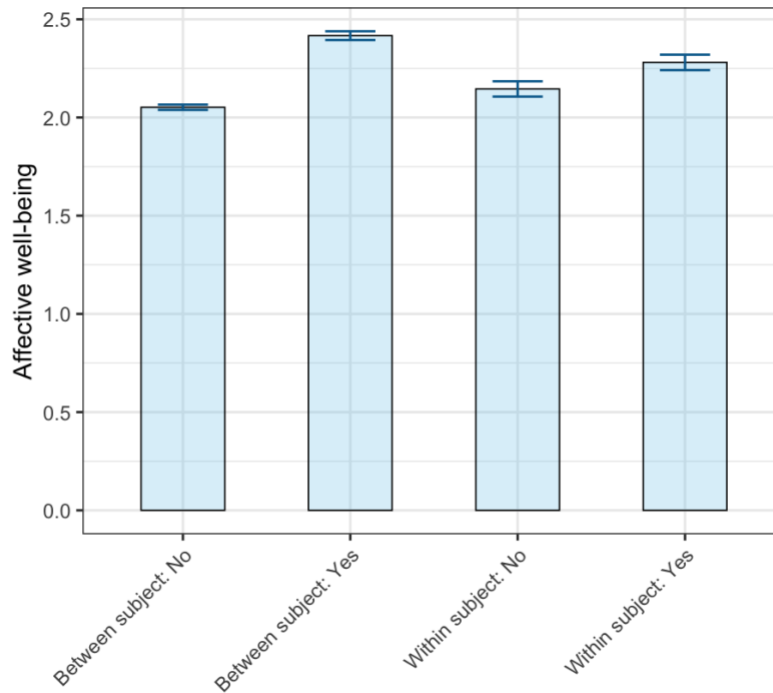
subject tests because some participants – though a small proportion – had more than one observation. Since social video game play is a binary variable, a sum-to-zero contrast was applied to calculate the average and the deviation from the grand mean of each treatment.



**Figure 3.** Distribution and mean values of affective well-being of social gaming cases and non-social gaming cases



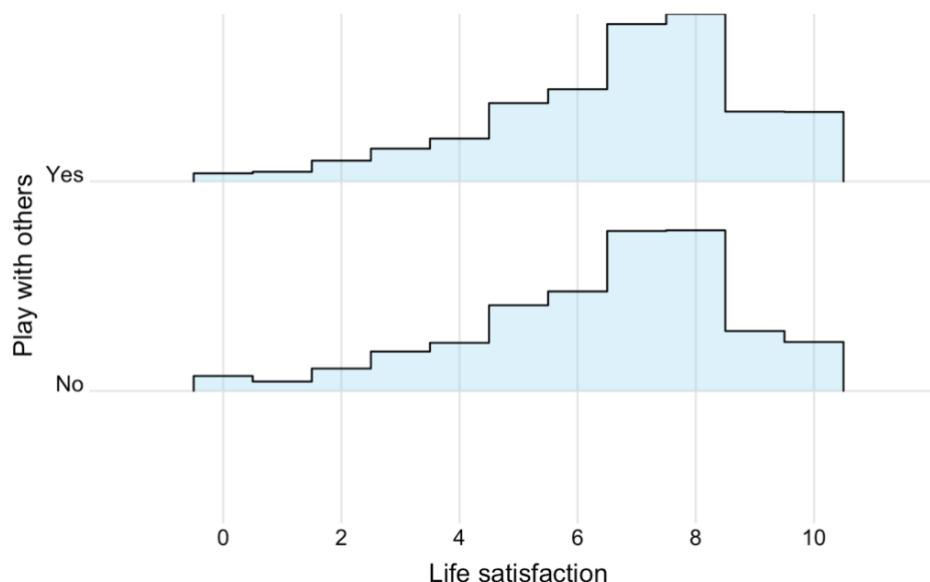
**Figure 4.** Mean values of affective well-being of social gaming cases and non-social gaming cases for all seven games



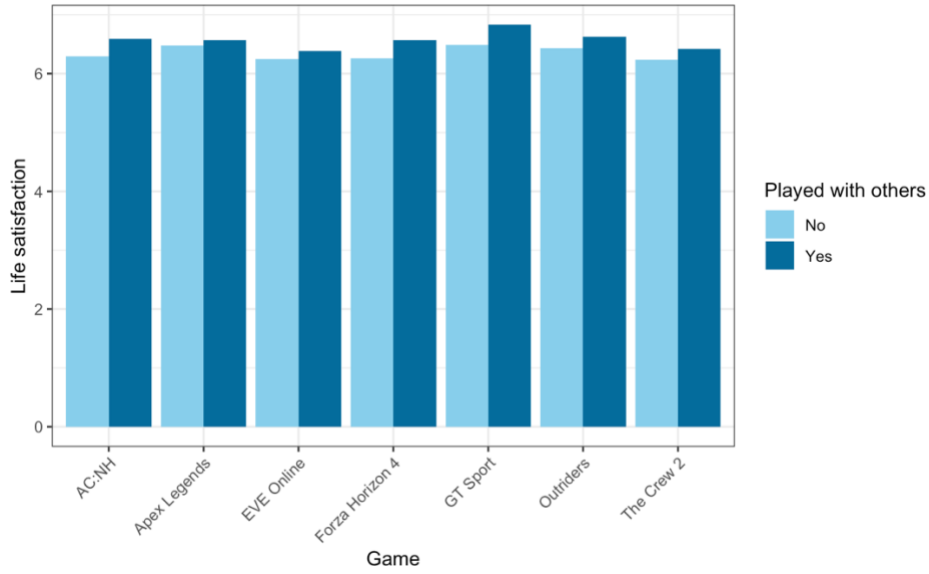
**Figure 5.** Mean values and confidence intervals of affective well-being of between-subject and within-subject cases

Playing video games with others was shown to have a significant and positive effect on affective well-being. The mean values of affective well-being of the two conditions are marked in Figure 3, which shows the distribution of affective well-being scores of social gaming cases (Play with others: Yes) and non-social gaming cases (Play with others: No). Figure 4 displays a side-by-side comparison across seven games. Figure 5 was created to provide a clear comparison at the participant level. Participants with different social gaming behaviours (those who had different answers to the question about social gaming over multiple waves) were separated from participants whose social gaming behaviours were consistent (those who always played with others or always played on their own) or those who only had one wave of response. The mean values of affective well-being under two social gaming conditions were calculated for both between-subject group and within-subject group. We can see from Figure 5 that for both groups, social gaming is associated with a higher affective well-being score, which is consistent with the overall pattern. For the between-

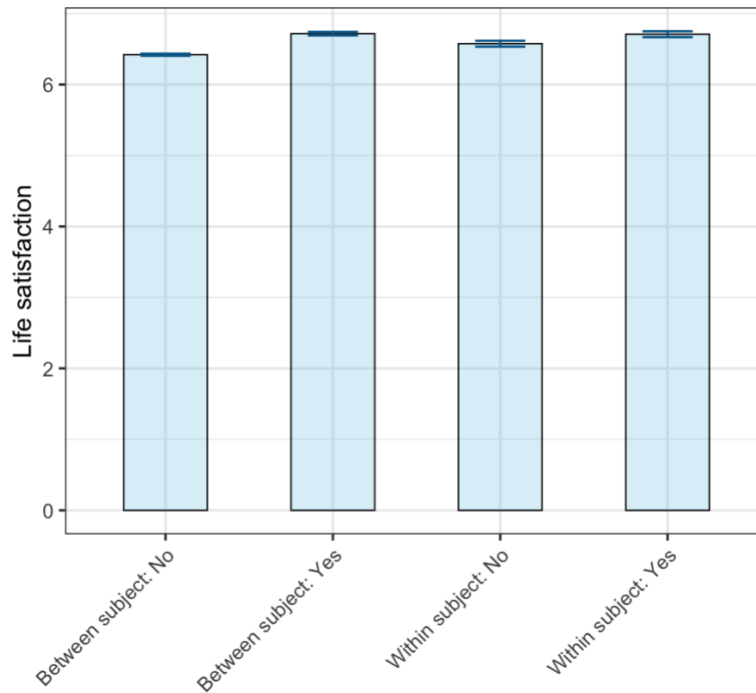
subject group, the gap between social gaming and non-gaming is wider and the confidence intervals are narrower. Model 1 showed that social players had an average affective well-being score of 2.18, about 0.13 ([0.12, 0.14]) point higher than the grand mean and 0.26 point higher than those who played video games on their own. An ANOVA-like table for random effects was computed to check the significance of random effects terms in the model. The random intercepts for both participant and game were significant, but the random effect of social video game play was not ( $p$ -value = 0.77). That is to say, the effect of social video game play on affective well-being did not vary significantly across different games. The residual variance on the first level was 1.17 and the game-level residual variance was very small (0.02), indicating the average affective well-being scores for the seven games were similar. There was a relevantly large residual variance at the participant level (2.82). Model 1 had a marginal  $R^2$  of 0.013, suggesting that the fixed predictor, social video game play, explained about 1.2% of the total variance of the outcome variable, affective well-being.



**Figure 6.** *Distribution of life satisfaction of social gaming cases and non-social gaming cases*



**Figure 7.** Mean values of life satisfaction of social gaming cases and non-social gaming cases for all seven games



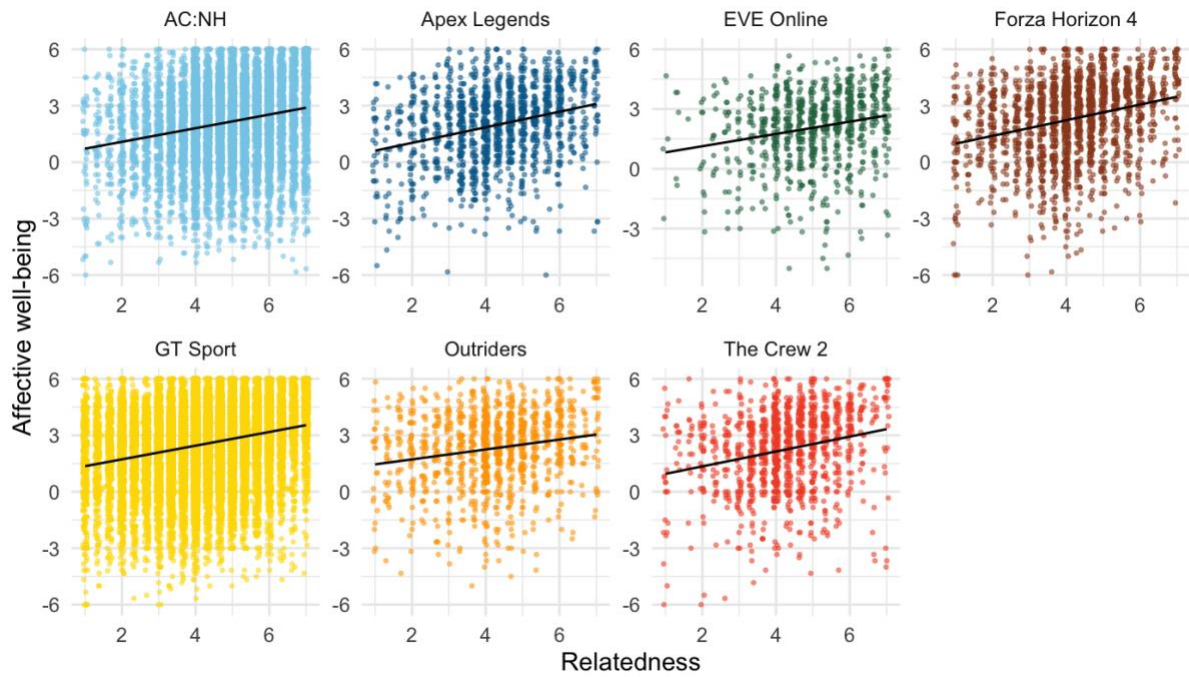
**Figure 8.** Mean values and confidence interval of life satisfaction of between-subject and within-subject cases

Similar to affective well-being, social video game players also experienced higher life satisfaction ( $M_{\text{social}} = 6.54$ ) than non-social players ( $M_{\text{non-social}} = 6.33$ ). We can see from

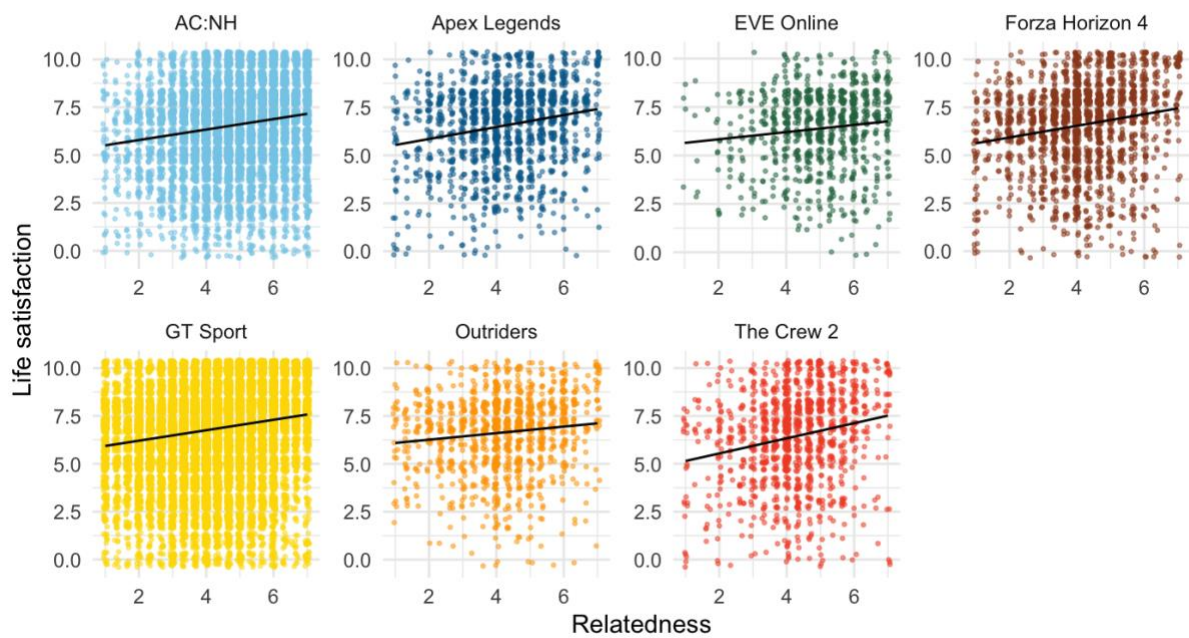
Figure 6 and Figure 7 that for social video game players, there are more values on the right side of the bar chart than for non-social players. Figure 8 shows the mean and confidence interval of between-subject and within-subject groups separately. Although the effect of social gaming on life satisfaction seems to be smaller than affective well-being, the difference in the between-subject group is still more obvious than in the within-subject group. The random effect of social video game play on life satisfaction was significant but tiny (random effect = 0.00; p-value = 0.02). Model 2 had a first-level residual variance of 2.27, which was about the same size as the participant-level residual variance (2.68). Again, residual variance on game-level was very small (0.01). The marginal  $R^2$  of Model 2 (0.004) was smaller than Model 1, indicating a lower power of social video game play in predicting life satisfaction than affective well-being.

### **5.3 Relatedness and well-being**

To estimate the relationship between social video game players' perceived relatedness satisfaction score and well-being, two additional multilevel models were fitted. Relatedness was a statistically significant predictor of both affective well-being (Model 3) and life satisfaction (Model 4) (see Figure 9 and Figure 10), supporting H2, which hypothesizes that social video game players with higher relatedness satisfaction experience higher well-being. The pattern held true for both between-subject and within-subject groups and there was no discernible difference observed.



*Figure 9. Scatterplots and linear relationship between affective well-being and relatedness for seven games*



*Figure 10. Scatterplots and linear relationship between life satisfaction and relatedness for seven games*

In Model 3, the effect of relatedness was positive and moderate ( $b = 0.31$ ,  $[0.28 - 0.34]$ ). In other words, for social video game players, when their relatedness satisfaction score increases by one point, their affective well-being increases by 0.31 points. The residual variance was 1.09 at the first level, 2.61 at the participant level, and 0.07 at the game level. There was no significant variance ( $p$ -value = 0.97) in the relationship between relatedness and affective well-being across different games, matching the visualisation in Figure 9. The intraclass correlation coefficient (ICC) for this model was 0.71, indicating that about 71% of the variance can be explained by the grouping structure in the model (Hox et al., 2017). The fixed effects of Model 3 explained about 4.4% (marginal  $R^2$ ) of the total variance and about 72.4% (conditional  $R^2$ ) of the variance can be explained by both fixed and random terms.

Model 4 explored the effects of relatedness on life satisfaction with the same grouping variables as Model 3. It also showed a positive pattern ( $b = 0.24$ ,  $[0.22-0.26]$ ), which means that a one-point increase in relatedness is associated with a 0.24-point increase in life satisfaction score on a scale from 0 to 10 (Cantril's Self-Anchoring scale). Compared to affective well-being, the residual variance (2.09) of Model 4 was higher at the first level but was slightly smaller at the participant level (2.59) and the game level (0.04). Again, no discernible variation had been observed in this relationship among different games ( $p$ -value = 0.93) (see Figure 10). An ICC of 0.56 indicates a moderate explaining power of the grouping structure. Using the same predictor and grouping variables, the multilevel models explained less variability in life satisfaction (Model 3) than affective well-being (Model 3), both by fixed-term only (2.2%) and by the entire model (56.7%).

## **5.4 Moderating effects of gender**

Model 5-8 were fitted to test whether the effects of social video game play and relatedness on well-being differ between male and female players. Other two categories of gender ("Non-

binary” and “Prefer not to say”) were included in the regression but the results are not of interest here due to their small sample sizes.

According to the results shown in Table 3, There was a significant difference in the relationship between social video game play and affective well-being between men and women (Model 5: Social video game play \* Gender1:  $\beta = 0.05$ , p-value = 0.01). On average, the affective well-being scores of male social players were about 0.24 points higher than male non-social players. For women, social players’ affective well-being score was about 0.46 points higher than non-social players’ affective well-being. Unexpectedly, the positive effects of playing video games with others on affective well-being were found to be stronger in female players than male players. However, no significant moderating effect was found on the interaction between gender and social video game play in predicting life satisfaction (Model 6: Social video game play \* Gender1:  $\beta = 0.02$ , p-value = 0.52).

Similar patterns were detected in Model 7 and Model 8 (see Table 4) when using relatedness as the independent variable. Focusing only on social video game players, the moderating effects of gender was significant in predicting affective well-being (Model 7: Relatedness \* Gender1:  $\beta = 0.09$ , p-value = 0.00) but not life satisfaction (Model 8: Relatedness \* Gender1:  $\beta = 0.06$ , p-value = 0.05). Using the coefficients of the relatedness score and the interaction between gender and relatedness in Model 7, we can calculate that when the relatedness score goes up by one point, the increases in affective well-being for male and female players are 0.30 and 0.48, respectively. Among social video game players, females were found to be more susceptible to the effects of relatedness than males.

Overall, gender acted as a moderator when predicting affective well-being using social video game play and the relatedness satisfaction score. In both models, female participants experienced stronger effects than male participants, rejecting both H3a and H3b. The moderation effect of gender was not observed in life satisfaction.

**Table 1.** Summary of Model 1 and Model 2

<i>Predictors</i>	<b>Model 1</b> <b>Affective well-being</b>		<b>Model 2</b> <b>Life satisfaction</b>	
	<i>Estimates</i>	<i>CI</i>	<i>Estimates</i>	<i>CI</i>
(Intercept)	<b>2.05***</b>	1.94 – 2.16	<b>6.43***</b>	6.35 – 6.52
play with others: no	<b>-0.13***</b>	-0.14 – -0.12	<b>-0.11***</b>	-0.13 – -0.09
<b>Random Effects</b>				
$\sigma^2$	1.17		2.27	
$\tau_{00}$	2.82 pid		2.68 pid	
	0.02 Game		0.01 Game	
$\tau_{11}$	0.00 Game.play with others: no		0.00 Game.play_with_others: no	
N	85883 pid		87321 pid	
	7 Game		7 Game	
Observations	127999		129802	
Marginal R <sup>2</sup>	0.013		0.004	

**Table 2.** Summary of Model 3 and Model 4

<i>Predictors</i>	<b>Model 3</b> <b>Affective well-being</b>		<b>Model 4</b> <b>Life satisfaction</b>	
	<i>Estimates</i>	<i>CI</i>	<i>Estimates</i>	<i>CI</i>
(Intercept)	<b>0.85***</b>	0.66 – 1.03	<b>5.49***</b>	5.35 – 5.64
Relatedness	<b>0.31***</b>	0.29 – 0.32	<b>0.24***</b>	0.22 – 0.26
<b>Random Effects</b>				
$\sigma^2$	1.09		2.09	
$\tau_{00}$	2.61 pid		2.59 pid	
	0.05 Game		0.03 Game	
$\tau_{11}$	0.00 Game.Relatedness		0.00 Game.Relatedness	
N	28960 pid		29255 pid	
	7 Game		7 Game	
Observations	38936		39280	
Marginal R <sup>2</sup>	0.135		0.047	

**Table 3.** Summary of Model 5 and Model 6

<i>Predictors</i>	<b>Model 5</b> Affective well-being		<b>Model 6</b> Life satisfaction	
	<i>Estimates</i>	<i>CI</i>	<i>Estimates</i>	<i>CI</i>
(Intercept)	<b>1.59***</b>	1.49 – 1.70	<b>6.01***</b>	5.90 – 6.11
play with others: no	<b>-0.17***</b>	-0.21 – -0.13	<b>-0.09**</b>	-0.14 – -0.03
Gender1: male	<b>0.50***</b>	0.45 – 0.55	<b>0.47***</b>	0.41 – 0.53
Gender2: non-binary	<b>-0.87***</b>	-0.97 – -0.77	<b>-0.68***</b>	-0.79 – -0.57
Gender3: prefer not to say	0.02	-0.09 – 0.14	-0.09	-0.21 – 0.04
play with others: no*Gender1: male	<b>0.05**</b>	0.01 – 0.09	-0.02	-0.07 – 0.03
play with others: no*Gender2: non-binary	-0.05	-0.13 – 0.02	-0.04	-0.13 – 0.05
play with others: no*Gender3: prefer not to say	-0.01	-0.11 – 0.08	0.10	-0.01 – 0.21
<b>Random Effects</b>				
$\sigma^2$	1.17		2.27	
$\tau_{00}$	2.79 pid		2.66 pid	
	0.02 Game		0.01 Game	
$\tau_{11}$	0.00 Game, play with others: no		0.00 Game, play with others: no	
ICC			0.54	
N	85686 pid		87120 pid	
	7 Game		7 Game	
Observations	127774		129573	
Marginal R <sup>2</sup>	0.031		0.006	

**Table 4.** Summary of Model 7 and Model 8

<i>Predictors</i>	<b>Model 7</b> Affective well-being		<b>Model 8</b> Life satisfaction	
	<i>Estimates</i>	<i>CI</i>	<i>Estimates</i>	<i>CI</i>
(Intercept)	0.05	-0.24 – 0.34	<b>4.77***</b>	4.47 – 5.07
Relatedness	<b>0.39***</b>	0.33 – 0.44	<b>0.30***</b>	0.24 – 0.35
Gender1: male	<b>0.87***</b>	0.62 – 1.12	<b>0.78***</b>	0.50 – 1.06
Gender2: non-binary	-0.43	-0.92 – 0.07	-0.44	-1.00 – 0.13
Gender3: prefer not to say	<b>-1.03***</b>	-1.58 – -0.47	<b>-0.92**</b>	-1.55 – -0.29
Relatedness * Gender1: male	<b>-0.09**</b>	-0.14 – -0.04	-0.06	-0.12 – 0.00
Relatedness * Gender2: non-binary	-0.09	-0.19 – 0.01	-0.04	-0.16 – 0.07
Relatedness * Gender3: prefer not to say	<b>0.22***</b>	0.11 – 0.34	<b>0.15*</b>	0.02 – 0.29
<b>Random Effects</b>				
$\sigma^2$	1.09		2.09	
$\tau_{00}$	2.59 pid		2.56 pid	
	0.04 Game		0.02 Game	
$\tau_{11}$	0.00 Game.Relatedness		0.00 Game.Relatedness	
ICC	0.71			
N	28892 pid		29187 pid	
	7 Game		7 Game	
Observations	38860		39204	
Marginal R <sup>2</sup>	0.049		0.055	

\*\*\*  $p < .001$ .

\*\*  $p < .01$ .

\*  $p < .05$ .

## 6. Discussion

Given the fundamentally social aspects of video games, it is crucial to understand the social dimensions of video games in order to evaluate their impacts on well-being. With the aim to explore the role of social playing in video games, the results above revealed the relationships between both social video game play and relatedness and players' well-being. The following section will summarise the findings, discuss the potential implications of the results, and point out several limitations of the study.

Playing video games with others is getting more and more popular among the gaming community and many players agree that video games promote social interaction (Entertainment Software Association, 2022). The results of the present study showed that about 30 percent of participants played video games socially while most participants played alone. It is important to distinguish playing socially from playing in a multiplayer mode. Multiplayer games allow players to interact with other individuals who are playing at the same time and in a shared game environment. Playing socially – measured in the current study – emphasizes the social interactions with other gamers and can also refer to the action of playing games together with people they know in real life. For example, a user of *EVE Online* (multiplayer mode) playing in their bedroom might identify themselves as playing alone if they switch off their microphone and never talk to their teammates during the game. Conversely, couples, friends, or families playing *Animal Crossing* (single-player mode) together can be unquestionably treated as a form of social play. However, due to the social interaction affordances of multiplayer video games, it is not surprising that games with multiplayer mode only (*Apex Legends* and *Eve Online*) had the highest proportions of social players.

My first research question concerned the extent to which players who play socially experience higher well-being than the players who play alone. Results showed that social players had statistically significant higher mean values in both affective well-being and life satisfaction than non-social players, which implies that social interactions with other people contribute to video game players' positive feelings and general satisfaction. This pattern was observed in both between-subject and within-subject groups, but the effects of social gaming on affective well-being and life satisfaction were larger in the between-subject group. In other words, the influence of behavioural change of the same person from non-social gaming to social gaming on well-being is not as significant as the difference between social gamers and non-social gamers whose social gaming behaviours are consistent during a longer period of time (six weeks versus two weeks, in this case). This finding reveals that while social gaming behaviours have an impact on players' well-being, even within the same group of people, the differences in their personality traits may also be accountable for explaining the degree to which social gaming behaviours influence their well-being. Besides, the positive relationship was observed in all seven games, indicating the positive effect of social play on well-being remains stable regardless of cooperative or competitive game dynamics. The increases in affective well-being (0.26) and life satisfaction (0.21) caused by playing socially are of similar size (they have similar scale sizes as well). About 80% of the variance in subjective well-being is caused by personality and genetics (Lykken & Tellegen, 1996; Lyubomirsky et al., 2005), suggesting it is a relevant stable variable and hard to be changed by short-term life situations. This might explain why the effects of social playing and relatedness on well-being seemed to be marginal. However, we can decide the magnitude of the effects by comparing the sizes with other studies measuring subjective well-being. For example, the effect sizes found in the present study were larger than the effects of marital status on affective well-being and life satisfaction (Geerling & Diener, 2020).

Relatedness score was only captured from social players and it measured the extent to which they feel relationships built in video games satisfying. The highest average relatedness scores were found in *EVE Online* and *AC:HN*, the only two among the seven games that were neither PvP (player versus player) nor shooter games. This finding discloses an interesting point – although more evidence and in-depth research are required – playing against other gamers or intensely competition might hinder the process of satisfying players' needs for relatedness in video games.

Evidence of positive associations between relatedness and well-being in all seven games spoke directly to my second research question. Generally, social video game players with higher relatedness satisfaction scores had significantly higher affective well-being and life satisfaction, and the associations were the same for between-subject and within-subject groups. In addition to the behaviour of playing video games socially (RQ1), a higher level of satisfaction of the need for relatedness in video games also positively contributes to one's well-being. In other words, socialisation in video games helps players in two ways – when social interactions exist, and when social needs are fulfilled. Different from social play, the relatedness score has a larger positive effect on affective well-being (0.31) than on life satisfaction (0.24). This is not unexpected since the effects might vary by the type of subjective well-being measured (Geerling & Diener, 2020). In this case, psychological status such as fulfilment of social connectedness is more closely related to one's emotions rather than their general satisfaction with life. Therefore, a stronger relationship between relatedness and affective well-being was observed.

Gender differences in social video game play have been extensively reviewed in many studies (Bryce & Rutter, 2003; Crawford, 2005; Kaye et al., 2018; Shen et al., 2016; Vella et al., 2020; Williams et al., 2009), but how does gender influence the relationship between social gaming and well-being? This question, or my third research question, was

answered by the moderator analysis conducted in Model 5-8. Contrary to expectations, both social playing and relatedness had stronger effects on affective well-being in female participants, which might be caused by the different ways of addressing social connections between female and male gamers. Women prefer to play video games with families or friends while men are more open to making new friends through gaming and playing with online-only friends (Eklund, 2015). Therefore, female players might achieve better moods and greater feelings after social playing because they can receive stronger support and build deeper connections with families and friends. Besides, although male players make more friends online, female players are more likely to talk about sensitive topics with their online friends and transfer those connections to offline friendships (Cole & Griffiths, 2007). Female players in romantic relationships also have higher general happiness than their male counterparts when playing video games together (Williams et al., 2009). Those examples suggest that women have a stronger emotional attachment to their online friends, which might be the reason for the stronger effects of social gaming and relatedness on their affective well-being.

The effects of social playing and relatedness on life satisfaction, however, did not differ by gender. This can be addressed by the following reasons. First, compared to affective well-being, life satisfaction captures one's evaluation of their life from a longer-term perspective, so life satisfaction is more likely to remain stable across different periods of life for both males and females (Ye et al., 2021). Furthermore, women, in general, have a higher level of negative feelings than men, and despite the same level of happiness as men, women are believed to have more intense positive emotions which can balance their higher negative affect (Fujita et al., 1991; Reid, 2004). In other words, compared to life satisfaction, female players' affective well-being is more liable to be influenced, in both directions. Those

findings, taken together, help to explain why there was a significant gender difference in affective well-being but not life satisfaction.

Keeping this interesting series of results in mind, it is important to understand that the present study is qualified by a couple of limitations which merit highlighting. First, causality between social gaming or relatedness and well-being cannot be achieved through the results. Analysing all survey responses together, this study captures the association between predictors and outcomes rather than the cross-lag effects between the two. To form a causal relationship, temporal precedence and longer interval should be applied when collecting longitudinal data. Second, the proportion of male participants (87.98%) is much higher than female participants (9.88%). Although this gender distribution is consistent with previous studies (Herodotou et al., 2014; Trepte et al., 2012), the most recent overview of the video game industry suggests the number of female players is about the same as males (Entertainment Software Association, 2022). The small sample size of female players might lead to the low statistical power of the moderation test, which potentially harms the validity of the moderation effects of gender. Third, the statistical models failed to conduct random effects on each individual and generated mixed results of within-subject and between-subject observations. Again, this is caused by the small sample size of participants who answered multiple waves of surveys. Visualisations were created as an alternative way to present the results of within-subject and between-subject tests separately. Finally, potential selection bias should be noted as well. All the respondents of the first wave were contacted and they voluntarily answered the second or the third waves. It is possible that compared to the majority of the participants who only responded to the first wave, participants who answered more than one wave of data possess different personality traits which might influence the results. For example, they might be more willing to help, to share opinions with others, or to

express them online, including in the online gaming environment. More evidence is needed to determine the potential effects of the participant selection procedure.

## 7. Conclusion

Given the constantly growing popularity of video games, it is critically important to understand not only what people play but also how they play and how they feel, especially for policymakers seeking to safely regulate the video game industry. As social gaming becomes prevalent, video games work as a social activity for many gamers and help them to build connections, make friends, or even find partners. Analysing a large scale of survey responses from active players of seven video games, this study reveals that playing video games socially and subjective relatedness scores are positively associated with players' affective well-being and life satisfaction, adding to the existing literature by acknowledging the essential role of players' psychological satisfaction in social gaming and well-being. With those features, video games should not be treated as a singular phenomenon anymore. Instead, multiple facets of gaming should be considered together when we examine how video games relate to well-being, forming an opposite view to the social displacement hypothesis. Video games offer players social embeddedness and satisfaction of the need for relatedness, which reduces the chance of problematic video game play (Wu et al., 2013). The amount of time spent on gaming should not be used as a single criterion in video game regulations considering its social attributes. However, it is equally important to recognise the entertainment nature of video games and the potential harm caused by problematic or excessive video game use. In August 2021, South Korea abolished the Shutdown Law in favours of the country's "choice permit" system (Hardawar, 2021; Taylor, 2021). That means the threshold of excessive video gaming will be decided by teenagers' parents and guardians, who know better about their children's conditions and needs. The end of the gaming curfew in South Korea should be an inspiring example for other policymakers to consider how to

take into account players' psychological needs and motivations, especially their social preferences when regulating video game use.

This study and my data analysis provide preliminary evidence that female players may reliably experience and report more pronounced effects of social gaming and relatedness on well-being compared to males, while further evidence and studies based on a more gender-balanced sample are needed to establish a solid conclusion. In addition to the moderating effects of gender, a comparison between different dynamics among social gamers would be another direction of future research. Players of games with less competitive elements had higher average relatedness scores, leaving the question of whether this was caused by the relationships among gamers, either inter-team or intra-team. Social gaming, in the present study, refers to both playing multiplayer games online and playing together with others offline. However, there might be distinct differences between online and offline social gaming as they enable different ways of communication. Finally, the positive effects of social gaming on well-being might be applicable to the clinical environment. It would be inspiring to see how the social effects of gaming help people who suffer from mobility and communication difficulties such as autism and physical disability.

## References

- Adachi, P. J., & Willoughby, T. (2017). The link between playing video games and positive youth outcomes. *Child Development Perspectives, 11*(3), 202-206.
- Adachi, P. J., & Willoughby, T. (2013). Do video games promote positive youth development?. *Journal of Adolescent Research, 28*(2), 155-165.
- Allahverdipour, H., Bazargan, M., Farhadinasab, A., & Moeini, B. (2010). Correlates of video games playing among adolescents in an Islamic country. *BMC public health, 10*(1), 1-7.
- Allen, J. J., & Anderson, C. A. (2018). Satisfaction and frustration of basic psychological needs in the real world and in video games predict internet gaming disorder scores and well-being. *Computers in Human Behavior, 84*, 220-229.
- Anand, V. (2007). A study of time management: The correlation between video game usage and academic performance markers. *CyberPsychology & Behavior, 10*(4), 552-559.
- Anderson, C. A., & Dill, K. E. (2000). Video games and aggressive thoughts, feelings, and behavior in the laboratory and in life. *Journal of personality and social psychology, 78*(4), 772.
- Barr, M., & Copeland-Stewart, A. (2022). Playing video games during the COVID-19 pandemic and effects on players' well-being. *Games and Culture, 17*(1), 122-139.
- Bowman, N. D., Weber, R., Tamborini, R., & Sherry, J. (2013). Facilitating game play: How others affect performance at and enjoyment of video games. *Media Psychology, 16*(1), 39-64.
- Bryce, J., & Rutter, J. (2003). The gendering of computer gaming: Experience and space. *Lsa Publication, 79*, 3-22.

- Cianfrone, B. A., Zhang, J. J., & Ko, Y. J. (2011). Dimensions of motivation associated with playing sport video games: Modification and extension of the Sport Video Game Motivation Scale. *Sport, Business and Management: An International Journal*.
- Cole, H., & Griffiths, M. D. (2007). Social interactions in massively multiplayer online role-playing gamers. *Cyberpsychology & behavior, 10*(4), 575-583.
- Colwell, J., & Payne, J. (2000). Negative correlates of computer game play in adolescents. *British Journal of psychology, 91*(3), 295-310.
- Cote, A. C. (2017). "I can defend myself" women's strategies for coping with harassment while gaming online. *Games and Culture, 12*(2), 136-155.
- Crawford, G. (2005). Digital gaming, sport and gender. *Leisure Studies, 24*(3), 259-270.
- Cunningham, R., Alex, L., Frederick, C., Via, C., & Kring, J. (2015, September). Studying human relatedness through a shared gaming experience. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (Vol. 59, No. 1, pp. 1824-1828). Sage CA: Los Angeles, CA: SAGE Publications.
- Das, K. (2018, April 25). *Vietnam: New Regulations for Online Gaming, Social Networks, and Information Websites*. Vietnam Briefing. <https://www.vietnam-briefing.com/news/vietnam-new-regulations-online-gaming-social-networks-information-websites.html/>
- Dickson, K., Richardson, M., Kwan, I., MacDowall, W., Burchett, H., Stansfield, C., ... & Thomas, J. (2018). Screen-based activities and children and young people's mental health and psychosocial wellbeing: A systematic map of reviews.
- Diener, E., Wirtz, D., Tov, W., Kim-Prieto, C., Choi, D. W., Oishi, S., & Biswas-Diener, R. (2010). New well-being measures: Short scales to assess flourishing and positive and negative feelings. *Social indicators research, 97*(2), 143-156.

- Domahidi, E., Breuer, J., Kowert, R., Festl, R., & Quandt, T. (2018). A longitudinal analysis of gaming-and non-gaming-related friendships and social support among social online game players. *Media Psychology, 21*(2), 288-307.
- Domahidi, E., Festl, R., & Quandt, T. (2014). To dwell among gamers: Investigating the relationship between social online game use and gaming-related friendships. *Computers in human behavior, 35*, 107-115.
- Eklund, L. (2015). Bridging the online/offline divide: The example of digital gaming. *Computers in Human Behavior, 53*, 527-535.
- Entertainment Software Association (2022). *2022 Essential Facts About the Video Game Industry*. Retrieved from <https://www.theesa.com/wp-content/uploads/2022/06/2022-Essential-Facts-About-the-Video-Game-Industry.pdf>
- Finke, E. H., Hickerson, B. D., & Kremkow, J. M. (2018). “To Be Quite Honest, If It Wasn't for Videogames I Wouldn't Have a Social Life at All”: Motivations of Young Adults With Autism Spectrum Disorder for Playing Videogames as Leisure. *American Journal of Speech-Language Pathology, 27*(2), 672-689.
- Fox, J., Gilbert, M., & Tang, W. Y. (2018). Player experiences in a massively multiplayer online game: A diary study of performance, motivation, and social interaction. *New Media & Society, 20*(11), 4056-4073.
- Fox, J., & Tang, W. Y. (2017). Women’s experiences with general and sexual harassment in online video games: Rumination, organizational responsiveness, withdrawal, and coping strategies. *New media & society, 19*(8), 1290-1307.
- Fujita, F., Diener, E., & Sandvik, E. (1991). Gender differences in negative affect and well-being: the case for emotional intensity. *Journal of personality and social psychology, 61*(3), 427.

- Granic, I., Lobel, A., & Engels, R. C. (2014). The benefits of playing video games. *American psychologist*, 69(1), 66.
- Geerling, D. M., & Diener, E. (2020). Effect size strengths in subjective well-being research. *Applied Research in Quality of Life*, 15(1), 167-185.
- Gilbert, N. (2020). *Number of Gamers Worldwide 2022/2023: Demographics, Statistics, and Predictions*. FinancesOnline. <https://financesonline.com/number-of-gamers-worldwide/>
- Green, C. S., & Bavelier, D. (2006). Effect of action video games on the spatial distribution of visuospatial attention. *Journal of experimental psychology: Human perception and performance*, 32(6), 1465.
- Greenfield, P. M. (2014). *Mind and media: The effects of television, video games, and computers*. Psychology Press.
- Greitemeyer, T., & Osswald, S. (2010). Effects of prosocial video games on prosocial behavior. *Journal of personality and social psychology*, 98(2), 211.
- Grüsser, S. M., Thalemann, R., & Griffiths, M. D. (2006). Excessive computer game playing: evidence for addiction and aggression?. *Cyberpsychology & behavior*, 10(2), 290-292.
- Halbrook, Y. J., O'Donnell, A. T., & Msetfi, R. M. (2019). When and how video games can be good: A review of the positive effects of video games on well-being. *Perspectives on Psychological Science*, 14(6), 1096-1104.
- Hardawar, D. (2021, August 25). *South Korea to end its controversial gaming curfew*. Engadget. <https://www.engadget.com/south-korea-gaming-shutdown-law-end-163212494.html>
- Herodotou, C., Kambouri, M., & Winters, N. (2014). Dispelling the myth of the socio-emotionally dissatisfied gamer. *Computers in human behavior*, 32, 23-31.

- House, J. S., Landis, K. R., & Umberson, D. (1988). Social relationships and health. *Science*, 241(4865), 540-545.
- Hox, J. J., Moerbeek, M., & Van de Schoot, R. (2017). *Multilevel analysis: Techniques and applications*. Routledge.
- Johannes, N., Vuorre, M., & Przybylski, A. K. (2021). Video game play is positively correlated with well-being. *Royal Society Open Science*, 8(2), 202049.
- Johnson, D., Gardner, J., & Sweetser, P. (2016). Motivations for videogame play: Predictors of time spent playing. *Computers in Human Behavior*, 63, 805-812.
- Kaye, L. K., & Bryce, J. (2012). Putting the fun factor into gaming: The influence of social contexts on the experiences of playing videogames. *International Journal of Internet Science*, 7(1), 24-38.
- Kaye, L. K., Pennington, C. R., & McCann, J. J. (2018). Do casual gaming environments evoke stereotype threat? Examining the effects of explicit priming and avatar gender. *Computers in Human Behavior*, 78, 142-150.
- Kaye, L. K., Kowert, R., & Quinn, S. (2017). The role of social identity and online social capital on psychosocial outcomes in MMO players. *Computers in Human Behavior*, 74, 215-223.
- Kilpatrick, F. P., & Cantril, H. (1960). Self-anchoring scaling: A measure of individuals' unique reality worlds. *Journal of Individual Psychology*, 16(2), 158.
- Kovess-Masfety, V., Keyes, K., Hamilton, A., Hanson, G., Bitfoi, A., Golitz, D., ... & Pez, O. (2016). Is time spent playing video games associated with mental health, cognitive and social skills in young children?. *Social psychiatry and psychiatric epidemiology*, 51(3), 349-357.

- Kowert, R., Domahidi, E., Festl, R., & Quandt, T. (2014). Social gaming, lonely life? The impact of digital game play on adolescents' social circles. *Computers in human behavior, 36*, 385-390.
- Kraut, R., Patterson, M., Lundmark, V., Kiesler, S., Mukopadhyay, T., & Scherlis, W. (1998). Internet paradox: A social technology that reduces social involvement and psychological well-being? *American Psychologist, 53*, 1017-1031.
- Kraut, R., Kiesler, S., Boneva, B., Cummings, J., Helgeson, V., & Crawford, A. (2002). Internet paradox revisited. *Journal of social issues, 58*(1), 49-74.
- LeBlanc, A. G., Chaput, J. P., McFarlane, A., Colley, R. C., Thivel, D., Biddle, S. J., ... & Tremblay, M. S. (2013). Active video games and health indicators in children and youth: a systematic review. *PloS one, 8*(6), e65351.
- Lew, V. K., Smith, J., Reuss, N., Zhang, X., Gulliuozzo, J., & Frederick, C. M. (2020). Relatedness in gaming: the effect in-Game touch has on player connection. *SN Applied Sciences, 2*(1), 1-6.
- Lucas, K., & Sherry, J. L. (2004). Sex differences in video game play: A communication-based explanation. *Communication research, 31*(5), 499-523.
- Lykken, D., & Tellegen, A. (1996). Happiness is a stochastic phenomenon. *Psychological science, 7*(3), 186-189.
- Lyubomirsky, S., Sheldon, K. M., & Schkade, D. (2005). Pursuing happiness: The architecture of sustainable change. *Review of general psychology, 9*(2), 111-131.
- Mentzoni, R. A., Brunborg, G. S., Molde, H., Myrseth, H., Skouverøe, K. J. M., Hetland, J., & Pallesen, S. (2011). Problematic video game use: estimated prevalence and associations with mental and physical health. *Cyberpsychology, behavior, and social networking, 14*(10), 591-596.

- Mills, D. J., Milyavskaya, M., Heath, N. L., & Derevensky, J. L. (2018). Gaming motivation and problematic video gaming: The role of needs frustration. *European Journal of Social Psychology, 48*(4), 551-559.
- Mills, D. J., Milyavskaya, M., Mettler, J., & Heath, N. L. (2018). Exploring the pull and push underlying problem video game use: A Self-Determination Theory approach. *Personality and Individual Differences, 135*, 176-181.
- Perry, R., Drachen, A., Kearney, A., Kriglstein, S., Nacke, L. E., Sifa, R., ... & Johnson, D. (2018). Online-only friends, real-life friends or strangers? Differential associations with passion and social capital in video game play. *Computers in Human Behavior, 79*, 202-210
- Przybylski, A. K., Rigby, C. S., & Ryan, R. M. (2010). A motivational model of video game engagement. *Review of general psychology, 14*(2), 154-166.
- Przybylski, A. K., Ryan, R. M., & Rigby, C. S. (2009). The motivating role of violence in video games. *Personality and social psychology bulletin, 35*(2), 243-259.
- Przybylski, A. K., Weinstein, N., & Murayama, K. (2017). Internet gaming disorder: Investigating the clinical relevance of a new phenomenon. *American Journal of Psychiatry, 174*(3), 230-236.
- Przybylski, A. K., Weinstein, N., Ryan, R. M., & Rigby, C. S. (2009). Having to versus wanting to play: Background and consequences of harmonious versus obsessive engagement in video games. *CyberPsychology & Behavior, 12*(5), 485-492.
- Putnam, R. D. (2000). *Bowling alone: The collapse and revival of American community*. Simon and schuster.
- Quwaider, M., Alabed, A., & Duwairi, R. (2019). The impact of video games on the players behaviors: A survey. *Procedia Computer Science, 151*, 575-582.

- R Core Team (2021). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.
- Ramirez Jr, A., & Zhang, S. (2007). When online meets offline: The effect of modality switching on relational communication. *Communication monographs*, 74(3), 287-310.
- Reer, F., & Quandt, T. (2020). Digital games and well-being: An overview. *Video games and well-being*, 1-21.
- Reid, A. (2004). Gender and sources of subjective well-being. *Sex Roles*, 51(11), 617-629.
- Ritterfeld, U., & Weber, R. (2006). Video games for entertainment and education. *Playing video games: Motives, responses, and consequences*, 399-413.
- Russoniello, C. V., O'Brien, K., & Parks, J. M. (2009). The effectiveness of casual video games in improving mood and decreasing stress. *Journal of CyberTherapy & Rehabilitation*, 2(1), 53-66.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist*, 55(1), 68.
- Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Publications.
- Ryan, R. M., Kuhl, J., & Deci, E. L. (1997). Nature and autonomy: An organizational view of social and neurobiological aspects of self-regulation in behavior and development. *Development and psychopathology*, 9(4), 701-728.
- Ryan, R. M., Rigby, C. S., & Przybylski, A. (2006). The motivational pull of video games: A self-determination theory approach. *Motivation and emotion*, 30(4), 344-360.
- Sang, Y., Park, S., & Seo, H. (2017). Mobile game regulation in South Korea: A case study of the shutdown law. In *Mobile gaming in Asia* (pp. 55-72). Springer, Dordrecht.

- Shen, C., Ratan, R., Cai, Y. D., & Leavitt, A. (2016). Do men advance faster than women? Debunking the gender performance gap in two massively multiplayer online games. *Journal of Computer-Mediated Communication, 21*(4), 312-329.
- Shen, C., & Williams, D. (2011). Unpacking time online: Connecting internet and massively multiplayer online game use with psychosocial well-being. *Communication Research, 38*(1), 123-149.
- Shoshani, A., Braverman, S., & Meirou, G. (2021). Video games and close relations: Attachment and empathy as predictors of children's and adolescents' video game social play and socio-emotional functioning. *Computers in Human behavior, 114*, 106578.
- Smith, S. L., Lachlan, K., & Tamborini, R. (2003). Popular video games: Quantifying the presentation of violence and its context. *Journal of Broadcasting & Electronic Media, 47*(1), 58-76.
- Snijders, T. A., & Bosker, R. J. (2011). *Multilevel analysis: An introduction to basic and advanced multilevel modeling*. sage.
- Snodgrass, J. G., Lacy, M. G., Dengah II, H. F., & Fagan, J. (2011). Enhancing one life rather than living two: Playing MMOs with offline friends. *Computers in human behavior, 27*(3), 1211-1222.
- Squire, K. (2011). Video games and learning. *Teaching and participatory culture in the digital age*.
- Stenros, J., Paavilainen, J., & Mäyrä, F. (2009, September). The many faces of sociability and social play in games. In *Proceedings of the 13th International MindTrek Conference: Everyday Life in the Ubiquitous Era* (pp. 82-89).

- Swing, E. L., Gentile, D. A., Anderson, C. A., & Walsh, D. A. (2010). Television and video game exposure and the development of attention problems. *Pediatrics*, *126*(2), 214-221.
- Tan, W. K., & Chen, L. M. (2022). That's not my fault: Excuses given by players exhibiting in-game intra-team aggressive behavior in online games. *Computers in Human Behavior*, *127*, 107045.
- Tang, W. Y., & Fox, J. (2016). Men's harassment behavior in online video games: Personality traits and game factors. *Aggressive behavior*, *42*(6), 513-521.
- Taylor, M. (2021, August 26). *South Korea is getting rid of its controversial gaming curfew law*. Pcgamer. <https://www.pcgamer.com/south-korea-is-getting-rid-of-its-controversial-gaming-curfew-law/>
- Taylor, S. E. (2011). Social support: A review.
- Vuorre, M., Johannes, N., Magnusson, K., & Przybylski, A. K. (2021). Time spent playing video games is unlikely to impact well-being.
- Trepte, S., Reinecke, L., & Juechems, K. (2012). The social side of gaming: How playing online computer games creates online and offline social support. *Computers in Human behavior*, *28*(3), 832-839.
- Valkenburg, P. M., & Peter, J. (2007). Preadolescents' and adolescents' online communication and their closeness to friends. *Developmental psychology*, *43*(2), 267.
- Vella, K., Klarkowski, M., Turkay, S., & Johnson, D. (2020). Making friends in online games: gender differences and designing for greater social connectedness. *Behaviour & Information Technology*, *39*(8), 917-934.
- Vermeulen, L., Castellar, E. N., Janssen, D., Calvi, L., & Van Looy, J. (2016). Playing under threat. Examining stereotype threat in female game players. *Computers in Human Behavior*, *57*, 377-387.

- Wack, E., & Tantleff-Dunn, S. (2009). Relationships between electronic game play, obesity, and psychosocial functioning in young men. *CyberPsychology & Behavior, 12*(2), 241-244.
- Wang, C. K. J., Khoo, A., Liu, W. C., & Divaharan, S. (2008). Passion and intrinsic motivation in digital gaming. *CyberPsychology & Behavior, 11*(1), 39-45.
- Wei, R. (2007). Effects of playing violent videogames on Chinese adolescents' pro-violence attitudes, attitudes toward others, and aggressive behavior. *Cyberpsychology & behavior, 10*(3), 371-380.
- Weinstein, A. M. (2010). Computer and video game addiction—a comparison between game users and non-game users. *The American journal of drug and alcohol abuse, 36*(5), 268-276.
- Wellman, B. (2001). Computer networks as social networks. *Science, 293*(5537), 2031-2034.
- Whitlock, J., & Masur, P. K. (2019). Disentangling the association of screen time with developmental outcomes and well-being: Problems, challenges, and opportunities. *JAMA pediatrics, 173*(11), 1021-1022.
- Williams, D. (2006). Groups and goblins: The social and civic impact of an online game. *Journal of Broadcasting & Electronic Media, 50*(4), 651-670. Zimbardo
- Williams, D., Consalvo, M., Caplan, S., & Yee, N. (2009). Looking for gender: Gender roles and behaviors among online gamers. *Journal of communication, 59*(4), 700-725.
- Wu, A. M., Lei, L. L., & Ku, L. (2013). Psychological needs, purpose in life, and problem video game playing among Chinese young adults. *International Journal of Psychology, 48*(4), 583-590.
- Ye, S., Yu, L., & Li, K. K. (2012). A cross-lagged model of self-esteem and life satisfaction: Gender differences among Chinese university students. *Personality and Individual Differences, 52*(4), 546-551.

Yoshikawa, M. (2019, March 14). *Addiction specialist urges Japan to treat over-gaming as a mental disorder*. The Japan Times.

<https://www.japantimes.co.jp/news/2019/03/14/national/social-issues/japanese-doctor-wages-war-internet-addiction-advising-rehab-online-gamers/>

Zhai, K. (2021, August 30). *China Limits Online Videogames to Three Hours a Week for Young People*. The Wall Street Journal. <https://www.wsj.com/articles/china-sets-new-rules-for-youth-no-more-videogames-during-the-school-week-11630325781>

## Appendix A

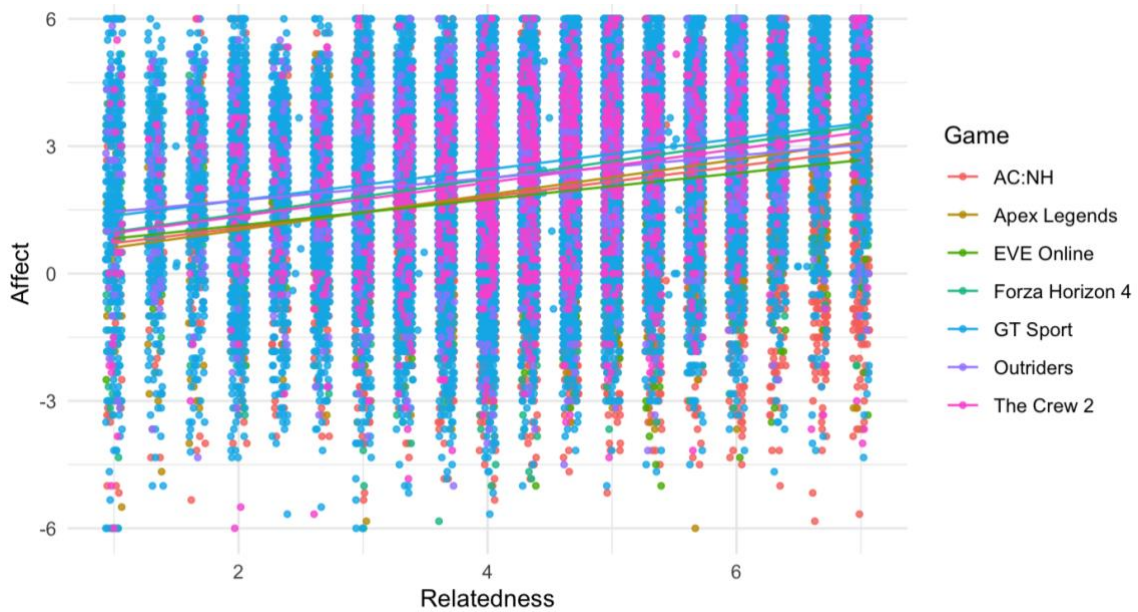
*Table A.1. Percentage of social gaming and non-social gaming cases for each game*

<b>Game</b>	<b>Yes</b>	<b>No</b>	<b>Missing</b>
AC:NH	0.54	0.41	0.04
Apex Legends	0.17	0.75	0.08
EVE Online	0.36	0.60	0.04
Forza Horizon 4	0.57	0.39	0.04
GT Sport	0.72	0.22	0.05
Outriders	0.56	0.41	0.03
The Crew 2	0.67	0.27	0.06

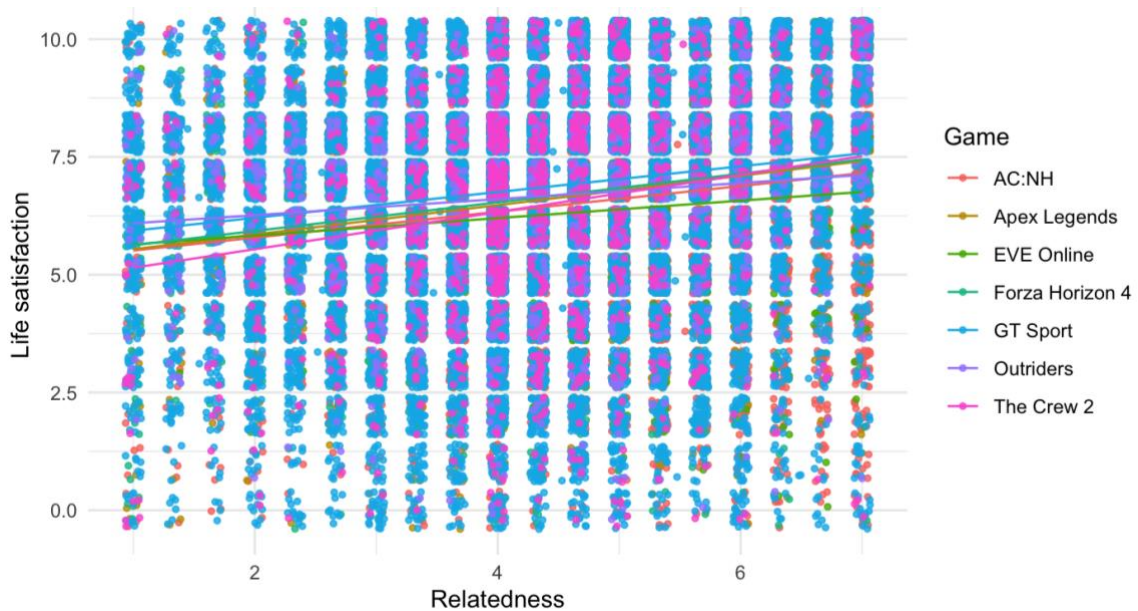
*Table A.2. Descriptive analysis relatedness satisfactions scores for each game*

<b>Game</b>	<b>Mean</b>	<b>Median</b>	<b>Min</b>	<b>Max</b>	<b>S.D.</b>
AC:NH	4.92	5.00	1	7	1.25
Apex Legends	4.29	4.33	1	7	1.37
EVE Online	5.00	5.00	1	7	1.27
Forza Horizon 4	4.12	4.00	1	7	1.33
GT Sport	4.26	4.33	1	7	1.32
Outriders	4.19	4.33	1	7	1.39
The Crew 2	4.27	4.33	1	7	1.27

## Appendix B



**Figure B.1.** Comparison of the effects (slopes) of relatedness on affective well-being for seven games. We can see the differences are marginal.



**Figure B.2.** Comparison of the effects (slopes) of relatedness on life satisfaction for seven games. We can see the differences are marginal.