Article

Playing Through the Pandemic: Gaming Usage as a Buffer During COVID-19

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Abstract
Amidst the disruptions of the COVID-19 pandemic, video games were used heavily, presumably to help cope with negative moods and social isolation. This study sought to understand the implications of such play on well-being within a particular sample. Drawing on uses and gratifications and self-determination theories, the study adopted a longitudinal perspective incorporating data from one game, both before and during the pandemic. Data included both repeated cross-sectional surveys as well as unobtrusive, within-game measures. Among players of a marginally social, large-scale, team-based vehicle combat game (World of Tanks), play time increased slightly while well-being was generally steady. Increases in play were associated with increases in competence, which in turn lead to higher well-being. The theoretical implications and generalizability of the findings are discussed.

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The year 2020 will long be remembered as the start of the COVID-19 era, a time when many of our daily norms were disrupted, lives were lost, and the global economy was upended. It was (and for many still is) a time of great stress, which compounded challenges that existed before the pandemic. Prior to the outbreak, Americans were suffering from historically low well-being measures (Witters & Harter, 2020), and the isolation and loss of the pandemic exacerbated them. One year into the pandemic, a fifth of Americans continued to experience high levels of psychological distress due to concerns about personal health and financial threats (Keeter, 2021).

In 2020, video games surpassed all other media combined in terms of revenue (Witkowski, 2021). Was this shift to gaming and its challenges and social opportunities in reaction to the isolation of the pandemic, and more importantly did it help? Did patterns among players change well-being outcomes for players, and was this a case of improving well-being, or simply holding losses at bay? Drawing on a combination of self-determination theory (SDT) (Ryan & Deci, 2000) and uses and gratifications (U&G; Katz et al., 1973) theories, we investigate the ways in which a sample of players used a particular video game to cope with this unique historical stressor.

The research here took advantage of an opportunistic data collection to address these questions. Our team was in possession of well-being survey data for a large online game prior to the outbreak, and was able to conduct a second wave at the peak of the pandemic, although not directly of the same players. The game, *World of Tanks* (*WoT*), is a team-based online vehicle combat game allowing for individual and team play. We were able to do a before-and-during the pandemic comparison of *WoT* players on the specific measures of well-being. Additionally, we were able to gain unobtrusive server-side data to measure exactly how much these players played during this unusual time, allowing us to examine issues of play consistency and intensity. Together, this allowed for a natural quasi-experiment of the relationships between play and well-being in a time of crisis.

Literature Review

Theories of media selection broadly describe implicit and explicit motivations for media use (Bowman, 2018). Implicit perspectives such as mood management theory (Zillmann & Bryant, 1985) explain a mostly hedonic motivation to optimize positive moods and terminate negative mood, whereas explicit perspectives such as uses and gratifications theory (Katz et al., 1973) provide a more comprehensive list of social psychological needs underlying media selection that are not necessarily hedonic. Also, U&G describes media selection as a more conscious and deliberate process than MMT (Reinecke, 2017), stemming from "the combined product of psychological dispositions, sociological factors, and environmental conditions that determine the specific uses of the media" (pp. 516–517). Of particular relevance to the current study, Blumler (1979) proposed a typology which consists of three social origins—normative influences, *socially distributed life changes (e.g. COVID-19 pandemic)*, and the subjective reaction or adjustment of the individual to the social situation.

U&G serves as a useful theoretical lens in understanding a wide range of motivations underlying new media use. Scholars have applied U&G to the study of new media ranging from social media (e.g. Papacharissi & Mendelson, 2010; Smock et al., 2011) to games (e.g. Li et al., 2015). The majority of recent work has focused on identifying motivations, yet little attempt has been made to link these motivations to its social origins emphasized in the original tenet of U&G. That being said, a study conducted by Wang et al. (2012) stands out, which tested dynamics among media use, needs, gratification, and social environments using an experience sampling method across 4 weeks. They found that two social environmental factors (i.e. solitude and interpersonal support) serve as key moderators between various needs and media use. For example, the results showed that the positive effects of emotional and habitual needs on social media use weakened as solitude increased. Solitude also moderated the effects of cognitive and social needs on other media use. In the context of gameplay, a handful of studies have extended the U&G framework by adding the notion of network externalities to understand why people continue playing (Ghazali et al., 2019; Wei & Lu, 2014). Here, network externalities refer to a perceived number of other users and peers who play the same game (Wei & Lu, 2014). Moreover, and as demonstrated in Sherry et al. (2006), Yee (2007) and Vahlo and Karhulahti (2020), social motivations for play are a prominent and salient reason for gameplay—we play games to connect with others, as game serve as potentially rich arenas for social interaction (Steinkuehler & Williams, 2006).

The Research Context: The COVID Crisis, Collective Trauma, and *World of Tanks*

This study is focused on the societal-level stressor of COVID-19 rather than individual-level perceived stress, through the lens of collective trauma. Collective trauma is defined as an event that affects a group of people or an entire society (Hirschberger, 2018). COVID-19 has been one of the largest collective traumas since World War II (Venuleo et al., 2020). For most affected countries, COVID-19 brought complex interconnected challenges, including health and racial inequity, economic insecurity, and housing problems (Watson et al., 2020). Due to the high infection and mortality rate of COVID-19, many nations engaged in mandatory and voluntary quarantines, which were effective at slowing infection rates, but also served as a stressor with a negative impact on mental health and well-being (Viana & de Lira, 2020). For example, individuals experienced fears of getting infected, infecting others, losing important others, being alone, as well as financial insecurity (Venuleo et al., 2020).

Prior research on other traumatic periods has leveraged U&G to highlight the role of media and communication in staving off loneliness and killing time (Dotan & Cohen, 1976; Kozman & Melki, 2018). Human separation is perhaps the greatest stressor of all (Cacioppo & Patrick, 2008), and the pandemic has isolated everyone who complied with laws and health regulations. This has led to a great online migration, as

humans suddenly have had to replace in-person socializing with an online equivalent (Pandi-Perumal et al., 2021). As a result, many media have flourished, but none as much as gaming. Compared to 2019, the video game industry in 2020 saw a dramatic increase in the number of players, how much they were playing, and how many devices they were playing on (Lennett et al., 2020). This might be because individuals tend to use video games as a way to cope with and mitigate stress when they do not have sufficient local resources (Pahayahay & Khalili-Mahani, 2020). Lewis et al. (2021) reported that when playing *Animal Crossing: New Horizons*, players who visited each other's island properties had overall lower levels of generalized loneliness, suggesting that they were using the game as a compensation for a general lack of physical interaction with friends and colleagues. Similar effects were reported by Barr and Copeland-Stewart (2021), who found that among the many different self-reported therapeutic uses of video games during the pandemic, a prominent one noted across a variety of games was that they provided rich opportunities to socialize with others—both close friends as well as distant acquaintances (some known only through a common gaming interest).

As previous research has repeatedly indicated, media have various affordances that help users satisfy their hedonic and non-hedonic needs (e.g. Bowman & Tamborini, 2015; Reinecke et al., 2012; Tamborini et al., 2011). Video games, with features such as in-game progression, competition, and chat, are especially good for satisfying the need for challenge and socialization, which are directly tied to psychological well-being (Klimmt et al., 2009; Rieger et al., 2014). For players who are well-versed with video games, otherwise frustrating experiences such as learning new content are mitigated and instead, those players can directly enjoy feelings of competence—the cognitive demands of the video game would be moderate so as to allow for engagement with other demands, such as social engagement (Bowman et al., 2021). Taken together, this line of research suggests that regular video game players are more likely to be better at regulating their well-being via video gaming because they've learned to use video games as a medium capable of addressing need deficiencies (prior exposures as key to learned expectations of media; see Atkin, 1985). From these arguments, we would broadly expect that video game players would turn to gaming as a readily available option for sustaining or potentially improving their psychological well-being, and thus our first prediction (Figure 1):

H1: Players will play more games during COVID-19 than pre- COVID-19.

Because games are not monolithic, the features, mechanics and affordances matter when setting up hypotheses. *WoT* is a team-based PC[1] game, in which 15 players are match-made against an opposing team and sent on to a battlefield for a game that lasts no more than 15 min. Players can queue with friends, with longer term clan mates, or by themselves, making the social element highly variable. The game itself is a routine shooter, with the notable exception of there being no human avatar. The player *is* a tank, playing from a first-person perspective. Like shooters, the tanks have various

Figure 1. A screenshot from a typical match of veterans, with the player's tank in the center. Players deal with a vast amount of information in real time, as well as the small text field at the bottom left for team communication. Text chat is also available outside of a match, and voice chat is common inside and out.

classes that vary from up-close brawlers to long-distance support and snipers. Players win when their team has captured the enemy base, or in most cases, when all of the other team's tanks are destroyed. The game is free-to-play with upcharges for more tank selection, cosmetics, and a small boost to power through slightly better ammo.

Following up on *H1*, as we presume that this gameplay is driven by a desire to satisfy thwarted needs, then we can expect that increased gameplay will be positively associated with self-reported psychological well-being. Yet, prior research on the effects of video game engagement has repeatedly found that the intensity of play and the duration of play differ in terms of their predictive power (e.g. Altintas et al., 2019; Przybylski & Weinstein, 2019). Therefore, this study measured both the intensity and consistency of play, with each representing a distinct dimension of game engagement. In other words, in a time of isolation, we draw a distinction between simply playing a lot and playing regularly. Presuming *H1* is supported, we would also predict that increased gaming during the pandemic will boost well-being disordinally, such that the association would have been greater during the pandemic (presumable when well-being was much lower, due to COVID-19 stressors) than pre-pandemic:

> *H2*: Increased *World of Tanks* play will have a stronger association with well-being during the pandemic than prior to it.

Focusing more directly on need satisfaction, the past decade has seen growth in a focus on video games as an intrinsically motivating activity that satisfies basic

psychological needs defined via SDT (Ryan & Deci, 2000) to predict media use, user experience, and well-being. According to SDT, humans have three universal basic psychological needs: competence (feeling effective), relatedness (connecting with others), and autonomy (having a freedom of choice). SDT has been widely used to examine how engagement with video games satisfies the basic psychological needs of players and impacts enjoyment (Przybylski et al., 2010; Tamborini et al., 2010). For example, Peng et al. (2012) manipulated game features and found that autonomy-supportive features and competence-supportive features boost perceived satisfaction of autonomy and competence. Similarly, Rieger et al. (2014) showed that in-game success was a prerequisite for satisfying competence and autonomy, which in turn contributed to game enjoyment and eventual mood repair.

Leveraging access to players' behavior variability pre- and during the pandemic, this study examines players' in-game behavior change and subsequent need satisfaction derived from gameplay during the pandemic. It is important to contextualize the current study in COVID-19, as the motivational pull of video games is "at least partially determined by their situational usage and meaning" (Deterding, 2011, p. 3). This is especially true for the need of relatedness, and although the *Tanks* community at large is not especially welcoming, there is a vibrant chat function alongside in-client and many third-party voice systems. Considering that individuals may resort to video games to establish virtual connections with others during the pandemic, they may engage in more co-playing during the pandemic compared to before, resulting in an increased perceived relatedness derived from gameplay. Through these mechanisms, players could increase their sense of relatedness if they engage in more in-game social interactions. In terms of the perceived competence derived from game play, it is likely that players who progress more will report greater perceived competence. This is because players who play more during the pandemic are more likely to improve their skills and unlock more in-game achievement than players who play less, thus reporting higher perceived competence. By definition, needs for autonomy are derived from internal desires free of outside influence. As individuals' behavioral options are largely constrained during the pandemic, we do not expect players' in-game behaviors to be significantly associated with their perceived autonomy. Thus, the association between in-game behaviors and perceived autonomy is not examined in the following hypothesis testing. Comparing gaming behaviors and need satisfaction pre- and during-COVID-19, it is proposed that:

> *H3*: Players who engage in more social interactions during COVID-19 than pre-COVID-19 will report greater perceived relatedness.

> *H4*: Players who perform better during COVID-19 than pre-COVID-19 will report greater perceived competence.

Finally, if it is the case that individuals are playing *WoT* more during COVID-19 and they are doing so as a way to positively impact their well-being, we would expect that those playing more often would benefit more from that gameplay with

respect to need satisfaction. Previous research on the relationship between gameplay and well-being has yielded mixed results. A significant body of research focuses on problematic video game use and excessive gaming, often revealing a positive correlation between excessive gameplay and social and emotional disorders (e.g. Gagliardi et al., 2014; Von der Heiden et al., 2019). Given that well-being is a relatively stable construct, it is challenging to observe causal effects through experiments. Consequently, most studies lean towards non-experimental designs, relying on subjective, self-reported estimates of video game play time and frequency. However, increasing research indicates that self-reported technology use is a poor proxy for actual behavior, leading to a biased understanding of the relationship between video game use and well-being (Parry et al., 2021).

A recent breakthrough is the study by Johannes et al. (2021), where researchers collaborated with two game companies to obtain data on players' actual behavior and surveyed them about their need satisfaction and well-being. Contrary to prior studies and anecdotal fears that excessive playtime leads to addiction and poor mental health, this study found a positive relationship between gameplay and well-being. Similarly, a systematic review by Villani et al. (2018) noted that frequent gaming with commercial games provides more opportunities for emotion regulation improvement than limited experiences, such as those offered by serious games. Another review by Raith et al. (2021) found a positive relationship between massively multiplayer online gaming and social well-being.

Moreover, as a significant portion of this line of research has been conducted with children and young adults (e.g. Lobel et al., 2017; Przybylski and Mishkin, 2016), few studies have investigated the association between gameplay and well-being on a larger scale during times of limited social interaction, such as the pandemic. An exception is the survey by Barr & Copeland-Stewart (2021) conducted during the COVID-19 pandemic. Their findings revealed that 71% of respondents reported an increase in gameplay time, with 58% indicating that gameplay had a positive impact on their well-being. In addition, based on the results of a prior *Tanks* study investigating player needs satisfaction and well-being (Liu et al., 2021), it is predicted that this increased need satisfaction will result in greater well-being. Both of these expectations are formalized below (and visualized in Figure 2).

H5a-c: Increased *World of Tanks* play will have a stronger association with non-hedonic need satisfaction (a. perceived relatedness, b. perceived competence, c. perceived autonomy) during the pandemic than prior to it.

H6a-d: Players' (a) hedonic and (b-d) non-hedonic needs (perceived relatedness, perceived competence, perceived autonomy) satisfaction will be positively associated with well-being.

Method

Working with the data support of Wargaming, Inc., the developer of *WoT*, our research team was given access to the games' North American game server, which largely
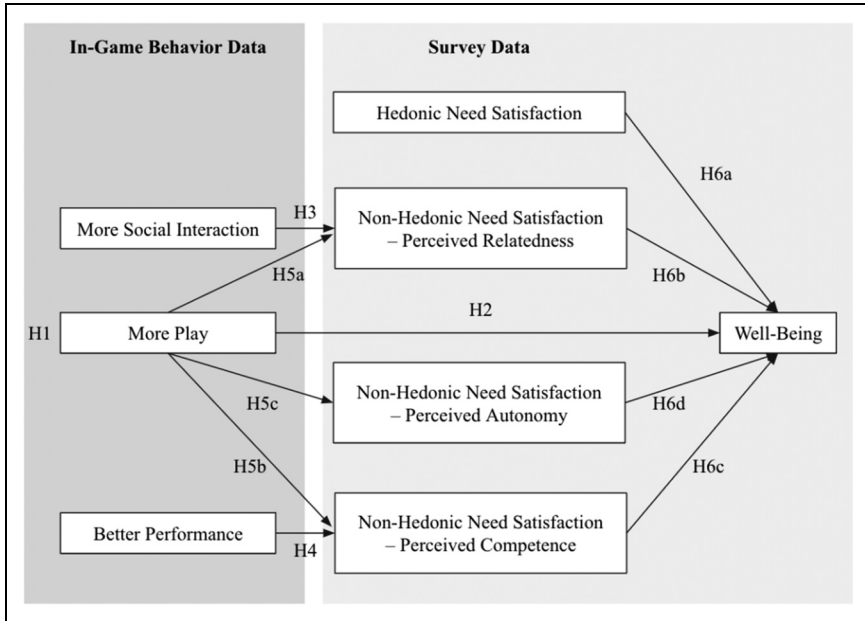
Figure 2. A summary of hypotheses and theoretical model.

features American players, with small minorities of Canadians, Mexicans, and some South American countries, to gather unobtrusive player data. Working with Wargaming, we fielded two surveys to two different random samples of players who had passed a threshold for new players (playing more than 200 battles), and who had not been given a survey in the past 2 years. The first survey was deployed in April of 2019 and serves as the pre-COVID baseline ($N = 1,141$, males $= 98.32\%$, $M_{age} = 44.48$; Completes response rate $= 17.7\%$). The second survey was deployed between January 28 and February 10 of 2021 ($N = 1,570$, males $= 97.47\%$, $M_{age} = 44.80$, Completes response rate $= 17.4\%$), near the peak of the infections and deaths in the United States as reported by the *New York Times* (Mazzei, 2021). Players' corresponding behavioral data, including their social play and winrate, 10-month prior to the survey completion date (from July 2018 to April 2019, and from April 2020 to January 2021, respectively) were retrieved and matched with survey measures. Taken together, the two cross-sectional data points represent "before" and "during" the pandemic, and comprise the two comparison points for our trend analysis (see Valenzuela et al., 2014, for a similar approach). To have a direct comparison on players' time spent in playing before and during the pandemic, we compared players' number of battles played and active days 10-months before (from May 2019 to February 2020) and 10-months during the COVID-19 outbreak (from April 2020 to January 2021) in North America. All data were anonymized with a one-way

hash before reaching the research team, and the hashed ID from the surveys were merged with data from the back-end servers. Prior to conducting statistical analyses, all data on players under the age of 18 and over the age of 90 were removed. The study was reviewed and approved by the host university's Institutional Review Board.

Measures

Time Spent Playing the Game

To assess the player's consistency of play, we examined the total number of active days each player had during the 10 months prior to the first survey (i.e. July 2018 to April 2019), 10 months prior to the pandemic outbreak in North America (i.e. May 2019 to February 2020), and over 10 months during the pandemic (i.e. April 2020 to January 2021). To assess the player's intensity of play, we examined the total number of battle counts prior and during the pandemic for each player.

Non-Hedonic Needs Satisfaction

Non-hedonic needs (autonomy [$\alpha = .62$], competence [$\alpha = .73$], and relatedness [$\alpha = .87$]) were adapted from the Basic Psychological Needs Scale (La Guardia et al., 2000) modified to reflect the game context. Participants responded to nine Likert-type items (rated on a scale from 1 to 5, with 1 = I disagree completely, 5 = I agree completely, and *hard to say*, which was dropped from analysis) which included statements such as "When I am playing *WoT*, I feel free to be who I am" (autonomy), "When I am playing *WoT*, I feel like a competent person" (competence), and "When I am playing *WoT*, I feel a lot of closeness in the gaming community" (relatedness). To enhance scale reliability and follow prior research recommendations (e.g. Józsa & Morgan, 2017), three reverse coded items were excluded from the nine-item scale during data analysis.

Hedonic Need Satisfaction

The satisfaction of hedonic arousal needs and absorption needs were each measured by three-item Likert-type scales (Tamborini et al., 2011) rated on a scale from 1 to 5, with 1 = I disagree completely, 5 = I agree completely, and *hard to say*, which was dropped from analysis. Items for arousal included "Playing *WoT* is arousing," "exciting," and "stimulating." The first item, "Playing *WoT* is arousing" was removed from the final survey during the internal review process with *Wargaming* due to its ambiguous implications to players. Items for absorption included "Playing *WoT* is interesting," "absorbing," and "engaging." Hedonic arousal and absorption were highly correlated ($r = .85$, $p < .001$) and, thus, were averaged to form one variable representing hedonic needs satisfaction.

Social Interactions

Social game play was measured via player co-play (i.e. actively choosing to play with another human player rather than join a random battle). For *H3*, the change in each player's social interaction was calculated by taking the difference between the total number of co-plays over 10 months prior to the second batch of survey and the total number of co-plays during the 10 months prior to the first batch of survey.

Performance

Performance was measured via player winrate (their proportion of battles won to all battles fought). For hypothesis *H4*, the change in each player's winrate was calculated by taking the difference between a player's average pre-pandemic (covering 10-month prior to the first batch of survey) and post-pandemic winrates (covering 10-month prior to the second batch of survey).

Well-Being

Player well-being was measured via eight Likert-type items (1 = Strongly Disagree, 5 = Strongly Agree) from the Flourishing Scale (Diener et al., 2010) to analyze *H2* and *H6a-d*. Exemplar items included: "I lead a purposeful and meaningful life," "I am engaged and interested in daily activities." The scale reliability was measured using Cronbach's alpha ($\alpha = .91$).

Demographics

As previous research showed that demographic information, including age (Liu et al., 2021), gender (Matud et al., 2019), education (Desjardins, 2008), and income (Fischer & Boer, 2011), can influence well-being, age ($M = 44.69$, $SD = 15.54$), gender (97.84% male, 1.49% female, 0.67% other), education (Mdn = Associates degree), and income (Mdn = $50,000 to $74,999 annually) were measured and included in the analyses for more robust results. We also compared demographic information between both samples to ensure confidence in our trend analyses (i.e. that our samples would be comparable to each other). Independent samples t-tests of demographic variables between the two batches showed no significant differences in participants' age ($p = .525$). Chi-square tests did not reveal any differences in self-reported gender, income, and education. Thus, we can conclude that our two samples of *WoT* players are similar to each other in their demographic profiles.

Results

A summary of all the hypotheses and the data sources can be found in Figure 2.

H1 predicted that more time would be spent in games during the pandemic. Our dataset provided two distinct measures of time spent paying: days played per month (a measure of consistency) and battle counts (a measure of intensity). Tests for *H1* only utilized players' in-game behavior log data, thus making repeated observations of the same participants over time viable. Shapiro–Wilk normality tests were conducted on players' time spent in games, and results indicated that the assumption of normality was violated (all $p < .001$). Wilcoxon signed-rank tests were conducted to compare players' time spent playing before and during the pandemic. For play consistency, results showed that players were more active in terms of days played per month during the pandemic than prior to it, $Mdn_{pre-COVID-19} = 106$, $SD_{pre-COVID-19} = 94.13$; $Mdn_{during-COVID-19} = 121$, $SD_{during-COVID-19} = 95.66$, $V = 1,368,322$, $p < .001$. A non-parametric measurement of effect size, Cliff's $\Delta = -0.104$. For intensity, results showed that players played more battles during the pandemic than prior to it, $Mdn_{pre-COVID-19} = 1,287$, $SD_{pre-COVID-19} = 2194.17$; $Mdn_{during-COVID-19} = 1,560$, $SD_{during-COVID-19} = 2201.93$, $V = 1,368,322$, $p < .001$. Cliff's $\Delta = -0.097$. Therefore, *H1* was supported for both consistency (active days) and intensity (battle counts). We note that the observed effect are small, but relevant in the context of the current study (see Discussion section).

H2 predicted that players who play more during COVID-19 will report better well-being than those who play less, and this will be a larger relationship than the same test prior to the pandemic. Since players' time spent in games were not normally distributed, we ran a Spearman's rank correlation between active days during the COVID-19 and well-being, $r(1554) = 0.036$, $p = .157$, and between battle counts and well-being, $r(1554) = 0.005$, $p = 0.852$—neither were significant effects. To see if there would be a difference in the magnitude of these relationships prior to the pandemic, the same tests were run on data gathered before the pandemic. The results showed a positive correlation between active days and well-being, $r(1126) = .070$, $p = .019$, but not battle counts and well-being, $r(1126) = .022$, $p = .469$. Therefore, *H2* was not supported.

To test for hypotheses 3–6, we conducted separate regression analyses for each hypothesis. Multicollinearity was assessed via variance inflation factor which was found to be lower than two across all four models. Additionally, we checked for heteroskedasticity in the data via the Brush-Pagan test and from these results ($p > .05$), determined that our data was reliable for further analysis.

H3 predicted that players who engaged in more social interactions during the pandemic would report greater perceived relatedness. There was a significant effect for the hypothesized relationship ($\beta = .06$, $p = .024$; adjusted $R^2 = .012$, $F(5, 1240) = 4.10$, $p = .001$).

H4 predicted that better performance during COVID-19 than pre-pandemic would yield greater perceived competence. We did not find support for this hypothesis ($\beta = -.03$, $p = .289$; adjusted $R^2 = .016$, $F(5, 1221) = 5.05$, $p < .001$).

To test *H5*, we examined the relationship between non-hedonic needs satisfaction and time spent in game during- and pre-COVID-19 (see Tables 1 and 2). We found a significant and positive relationship between *active days* during the pandemic and

Table 1. Results of Multiple Regressions of Active Days on Autonomy, Competence, and Relatedness.

		Pre-Pandemic		During Pandemic	
		β	SE	β	SE
Competence	Active days	0.119***	0.000	0.065*	0.000
	Age	−0.084*	0.002	−0.121***	0.002
	Gender (Male)	0.015	0.221	0.010	0.207
	Income	0.098**	0.018	−0.006	0.021
	Education	−0.062†	0.020	−0.071*	0.023
Total R²			0.016		0.019
Relatedness	Active days	0.074*	0.000	0.030	0.010
	Age	−0.032	0.002	−0.071*	0.002
	Gender (Male)	−0.056†	0.270	0.001	0.212
	Income	−0.035	0.022	−0.044	0.022
	Education	−0.113**	0.025	−0.041	0.024
Total R²			0.021		0.009
Autonomy	Active days	0.045	0.000	0.020	0.000
	Age	0.059	0.002	−0.045	0.002
	Gender (Male)	−0.035	0.247	0.029	0.218
	Income	0.055	0.021	−0.037	0.022
	Education	−0.107**	0.023	−0.015	0.025
Total R²			0.011		0.002

Note. ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$, †$p < .10$.

perceived competence ($\beta = .07$, $p = .028$; adjusted $R^2 = .019$, $F(5, 1221) = 5.81$, $p < .001$), but not autonomy ($\beta = .01$, $p = .674$; adjusted $R^2 = .001$, $F(5, 1205) = 1.43$, $p = .211$) or relatedness ($\beta = .03$, $p = .318$; adjusted $R^2 = .009$, $F(5, 1240) = 3.27$, $p = .006$). When conceptualize time spent in games as the number of *battle count*, results showed a significant and positive relationship between *battle count* and competence ($\beta = .08$, $p = .005$; adjusted $R^2 = .022$, $F(5, 1221) = 6.42$, $p < .001$) and relatedness ($\beta = .07$, $p = .012$; adjusted $R^2 = .013$, $F(5, 1240) = 4.36$, $p < .001$), but not autonomy ($\beta = .02$, $p = .494$; adjusted $R^2 = .002$, $F(5, 1205) = 1.49$, $p = .191$).

We conducted the same tests on pre-pandemic data and found significant and positive relationships between *active days* before the pandemic and perceived competence ($\beta = .12$, $p < .001$; adjusted $R^2 = .016$, $F(5, 1013) = 2.24$, $p < .001$) and relatedness ($\beta = .07$, $p = .034$; adjusted $R^2 = .021$, $F(5, 940) = 5.00$, $p < .001$), but not autonomy ($\beta = .05$, $p = .190$; adjusted $R^2 = .011$, $F(5, 964) = 3.12$, $p = .008$). When we conceptualize time spent in games as the number of battles, the results showed a significant and positive relationship between *battle count* and relatedness ($\beta = .08$, $p = .017$; adjusted $R^2 = .022$, $F(5, 940) = 5.26$, $p < .001$), and a marginally significant relationship with competence ($\beta = .05$, $p = .095$; adjusted $R^2 = .006$, $F(5, 1013) = 2.26$, $p = .046$), but not autonomy ($\beta = .04$, $p = .256$; adjusted $R^2 = .010$, $F(5, 964) = 3.03$, $p = .010$). Taken together, *H5a-c* were not supported.

Table 2. Results of Multiple Regressions of Battle Counts on Autonomy, Competence, and Relatedness.

		Pre-Pandemic		During Pandemic	
		β	SE	β	SE
Competence	Battle counts	0.054†	0.000	0.080***	0.000
	Age	−0.056	0.002	−0.116***	0.002
	Gender (Male)	0.013	0.222	0.010	0.207
	Income	0.103**	0.018	−0.002	0.021
	Education	−0.061†	0.021	−0.073*	0.023
Total R²			0.006		0.022
Relatedness	Battle counts	0.080*	0.000	0.072*	0.000
	Age	−0.026	0.002	−0.074*	0.002
	Gender (Male)	−0.059†	0.269	0.000	0.211
	Income	−0.032	0.022	−0.041	0.022
	Education	−0.115**	0.025	−0.043	0.024
Total R²			0.022		0.013
Autonomy	Battle counts	0.038	0.000	0.020	0.000
	Age	0.066†	0.002	−0.044	0.002
	Gender (Male)	−0.036	0.247	0.029	0.218
	Income	0.057	0.021	−0.036	0.022
	Education	−0.108**	0.023	−0.016	0.025
Total R²			0.010		0.002

Note. ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$, †$p < .10$.

H6 predicted that players' hedonic and non-hedonic needs satisfaction would be positively associated with their well-being during the pandemic. Via multiple linear regression analysis, competence ($\beta = .22$, $p < .001$), and hedonic needs satisfaction ($\beta = .22$, $p < .001$) significantly predicted well-being, whereas autonomy ($\beta = .05$, $p = .134$) and relatedness ($\beta = .02$, $p = .518$) were not significant indicators, adjusted $R^2 = .287$, $F(8, 1046) = 53.97$, $p < .001$. Therefore, *H6a* and *H6c* were supported, *H6b* and *H6d* were not supported.

Discussion

Bridging U&G and SDT, this study investigated media users' selective exposure to *WoT* under the context of COVID-19 and how that related to their satisfaction for hedonic and non-hedonic needs and well-being. In a sample of already heavy players of *WoT*, we saw both (a) a significant (10%) increase in the number of active days playing and (b) more intense gameplay during the pandemic as compared to pre-pandemic gaming levels. The observed effect sizes associated with these effects were small, but we note two critical caveats for interpreting these effects. The first is that given ours was a sample of already-engaged *WoT* players, there was likely a "ceiling effect" in our playtime estimates restriction of range in our data and thus,

covariance patterns would be suppressed. Put another way, gameplay rates were already overall high and time is a finite resource (i.e. we can only devote so much time to any given task)—in the face of this limitation, our sample was still more likely to play *WoT* during compared to pre-pandemic. The second is that there are a great many variables that likely explain one's media usage that are unaccounted for in the current study (or at least, treated as sources of between-subjects random variance), and likewise observed effects in media and communication research are often quite small for myriad reasons (see Valkenburg & Peter, 2013 for a parallel discussion regarding media effects; LaRose, 2010 for discussion specific to U&G). Again here, and given the indirect nature of our data (using behavior data guided by *a priori* theorizing about those behavioral patterns), the findings here are still highly relevant. The observed increases of players' gaming consistency pre- and during the pandemic were consistent with the prediction of U&G in that media users selectively consume media content based on their prior learned experiences with that content, potentially to fulfill need deficiencies produced in the broader social environmental context of the COVID-19 pandemic.

Although we did see slightly more daily gaming among *WoT* players, there was no substantive relationship between this and psychological well-being. However, we did find evidence that during the pandemic, increases in gameplay intensity (playing more battles) were correlated with increased feelings of competence. This latter relationship is notable, given that increases in felt competence were associated with increased psychological well-being and broadly, our sample of *WoT* players did report overall higher levels of present and future subjective well-being as compared to a national sample. Finally, consistent with the prediction derived from SDT, we did find that those players who felt higher levels of competence and hedonic need satisfaction during the pandemic were more likely to report higher overall psychological well-being scores.

The data do not offer conclusive evidence that *WoT* players used gaming to improve their mental health during COVID-19, though they do suggest some mechanisms relevant to how players might have sustained (or even slightly increased) their well-being through deeper engagement with their already-passionate gaming hobby. Taken together, our overall conclusion is that game play provided a buffer against declines in well-being—as a type of psychological maintenance. These results are discussed in more detail, below (Table 3).

Gaming as Psychological Maintenance

As noted above, *WoT* players in the current study did play more during the pandemic, as their active days gaming increased by about 10% as compared to pre-pandemic gameplay levels. However, contrary to our expectations this increased playtime did not directly improve psychological well-being in a broad sense—even though *WoT* players reported overall higher subjective well-being than national averages. As suggested in the literature review, one reason for this relative lack of well-being impact is that veteran *WoT* players already play quite often and their gameplay already

Table 3. Intercorrelation Among Key Variables.

Variables	1	2	3	4	5	6
Age	-					
Income	0.385***	-				
Education	0.225***	0.468***	-			
Competence	−0.075***	−0.026	−0.062**	-		
Relatedness	−0.082***	−0.090***	−0.093***	0.478***	-	
Autonomy	0.000	−0.020	−0.040†	0.546***	0.495***	-
Well-being	0.210***	0.295***	0.177***	0.357***	0.207***	0.290***

Note. ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$, †$p < .10$.

serves as a well-being maintenance behavior. Although we presumed *a priori* that the implicit presence of a global stressor in the COVID-19 pandemic would result in a much greater need for mood management and need satisfaction, already heavy gamers likely already play video games in part for their psychologically restorative properties (overviewed in Bowman, 2018; Reinecke, 2017). In this way, heavy gamers might have developed buffers from the negative influence of the pandemic through gaming as an enduring maintenance behavior, with further buffering may have been irrelevant in the presence of a ceiling effect. Put another way, there could be a diminishing return such that if the correlation between gaming and well-being is already small (see Vuorre et al., 2022), the baseline effect could be even smaller for a population of heavy gamers already reporting higher-than-average well-being. Here, it is especially notable that players' well-being remained steady and higher than the declining national average during a time of great stress. It could be possible that the *implicit* mood regulation as predicted by mood management theory is more relevant, as gamers already buffering through their gameplay were unknowingly (at least, at a conscious level) sustaining an optimal mood state through gaming rather than repairing a noxious mood state—an aspect of mood management theory and other theories of media regulation that is often not studied.

As noted above, even more relevant here is that media habits are often triggered by a constellation of environmental and psychological factors (LaRose, 2010), as those factors serve as cues that can trigger behavioral scripts associated with somewhat automated media consumption. In the case of COVID-19, at least one near-ubiquitous global safety measure was mandatory home quarantine or at least, extreme social distancing measures that made it difficult to navigate any space outside the home. To the extent that the combination of being homebound and thus already in the natural environment for *WoT* gameplay and the presence of a major stressor served as cues, it is plausible that players were more active during the pandemic not so much as an explicit decision to stave of the stressors of the pandemic, but more as an implicit and automated behavior resulting from having ready access to gameplay. That players saw an increase in active days spent playing but not the duration or intensity of those gaming sessions adds credence to this claim—as they were home more often, they

turned to gaming more often. This is somewhat supported when we consider the overall means for well-being both pre-pandemic ($M = 4.15$, $SD = 0.72$) and during the pandemic ($M = 4.19$, $SD = 0.81$), both of which are significantly higher than the scale neutral point of 3.00, $t(1148) = 54.04$, $p < .001$, and $t(1550) = 58.39$, $p < .001$, respectively.

That said, we did see some more specific influences of *WoT* play on well-being that confirm suggestions that aspects of gaming can be a useful (albeit not very strong) way for coping with pandemic-related stress. For example, *post-hoc* analyses revealed that those who played more intensely during the pandemic itself—players who had more tank battles during any given gameplay session—reported increased competence, with later analysis showing that boosted feelings of competence during the pandemic were related with overall feelings of psychological well-being. Another possible pathway is a general sense of control during a time when many real-life events and choices were out of players' control. A mixed-method study by Ballou et al. (2022) demonstrated that people use games to compensate for and cope with thwarted basic psychological needs during adverse life events, such as the COVID-19 pandemic. Specifically, they found that having greater control over in-game features and possessing their own in-game space with minimal pressure helped balance the lack of autonomy they experienced outside the game. Furthermore, a qualitative interview study by Boldi and Rapp (2023) revealed that during the COVID-19 pandemic, individuals experienced a disruption of their previous and current life routines. Many attempted to reestablish their daily routines, using games as a way to create a sense of normality and to replace other routines that were lost. However, we did not have direct measures of these pathways.

Although not established in a serial causal chain, the findings are sensical for several reasons. For example, competence is an important aspect of gaming enjoyment (Tamborini et al., 2010) and likewise that games are designed to present gamers with a steady stream of variably intense cognitive demands (Bowman, 2018). Such demands are critical to the expected challenges and difficulties presented in video games (Vorderer et al., 2003), and games such as *WoT* known for their difficulty are likely to attract players who value cognitive effort (Inzlicht et al., 2018). Thus in addition to players engaging their gameplay as part of their broader entertainment routines, those players who took to *WoT* more intensely might have spent more time challenging themselves to refine their skills, resulting in increased feelings of competence. This conclusion is further borne out when we consider that for most players, their overall winrates did not differ substantially between pre-COVID ($M = 48.59$, $SD = 4.27$) and during COVID ($M = 48.47$, $SD = 4.49$), $t(1471) = .0.174$, $p = .0.861$, $d = 0.014$.

Overall, the minor increases in competence and playing time appear to have buffered *Tanks* players from the stressors experienced by others, though the social context of the game may have been a limiting factor as *WoT* is not a socially vibrant game and is relatively low in its social-supportive features. Indeed, our impression of *Tanks* is that it is not a particularly vibrant social space. Its players are largely experienced veterans and there is not the kind of lively space for banter seen in many other games that

have been heavily researched, such as *World of Warcraft* or *League of Legends* (e.g. Scholtes et al., 2016; Steinkuehler & Williams, 2006). Likewise, by design *WoT* has few features that allow for social affordances likely to elicit or encourage social interaction (Fox & McEwan, 2017). Although there are clans who use voice systems to communicate, we could not access those third-party spaces to see the level of social engagement taking place. The default game spaces are generally functional or filled with insults and criticism. Although the game does involve playing with others, those interactions are more challenge-focused than interpersonal, especially among *WoT* veterans mostly playing to win. *WoT* likely is quite low on social presence and even when players play with others, it may be more a function of seeking challenge than anything else. Players may be seeking a mastery experience aligned with the challenge and competition gaming motivations common in the literature (Sherry et al., 2006; Yee, 2007). So, perhaps it should not be surprising that despite being a game played with others, *WoT* did not appear to serve as a social surrogate during COVID-19—there were no associations with the satisfaction of relatedness. Whereas *Tanks* appears to have delivered a psychological buffer for its players broadly, perhaps more social and supportive environments would generate more positive outcomes for those seeking socialization (which does not encompass all online players; Paul et al., 2015). Many games and many players could have similar possible ceiling effects. As we have noted throughout, this study of one game is not intended to generalize to all games, or to the broader population. It is a test of a subset that adds nuance to our base of theories.

Limitations and Future Research Directions

Three limitations of this study should be noted. The first limitation concerns the timing and sample of the survey. According to Gallup surveys, in April 2020, the well-being of U.S. adults dropped to the lowest point since the 2008 Great Recession (Witters & Harter, 2020). With the fast development and distribution of the COVID-19 vaccine, well-being was starting to rebound by the time the survey was conducted in February of 2021, despite a peak in cases and deaths (Witters & Agrawal, 2021). Therefore, it is possible that society-wide well-being was climbing back, which would have attenuated relationships in our analysis. Given the challenge of comparing two very different samples, we did not present a replication and comparison of those Gallup measures in our hypothesized analysis, but we did conduct it. Gallup's national survey found 63.3% of US adults "thriving," while our sample found 65.09%. Similarly, 69.2% of the Gallup sample rated eight out of 10 on their future well-being, compared to 72% here. These numbers suggest that game play had at least a small and positive "buffering" impact worth considering in more systematic future research.

Similarly, we do not have measures of whether players were or had been infected themselves. Presumably, if they had, it would lead to lower well-being and so would make the results here more conservative. Also, we analyzed data from a repeated cross-sections survey that drew different samples before and during the pandemic. Although

the two samples were different, they were drawn from the same population and the sampling procedures were identical—moreover, the samples shared nearly all measured demographic properties. Second, as we examined players from one specific game, and one that is played dominantly by males, the results here may not generalize to players of other video games or players with other demographic characteristics. Nor are they intended to. It is important for any researcher looking at media to understand how its context may impact theorized processes; for games, this is more complex because the affordances and mechanics of the games, and the populations themselves, are so varied. For example, with tanks as the attitude objects of the game rather than humans, it may change the mental models and processes of players, perhaps lower inhibitions or allowing for more safely directed antagonistic behaviors.

Third, although this study had privileged access to examining players' in-game behavior variability pre- and during-COVID-19, the outbreak of COVID-19 and its subsequent reconfiguration of social practices put virtually all human beings in a real-time experiment with no control group. Although we do have time-ordered correlations required for causality, the lack of a non-treatment group and the inability to fully rule out non-spurious factors prevented us from directly assessing the causal effect of video game engagement on players' well-being during COVID-19. And, common to all field settings, we do not know whether players' self-selection into this game made them different in some theoretically meaningful way. As game engagement is nested within a constellation of other activities, the impact of games alone on well-being are hard to elucidate. Future research may consider leveraging experimental designs. Moreover, more qualitative work is warranted to examine players' media habits in the context of their online and offline routines and to understand the psychological mechanisms underlying media selection and need satisfaction. Lastly, we acknowledge that different player motivations might interact with the social architectures of this game, and play a role in socialization and therefore well-being outcomes. This is an intriguing area for future exploration.

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Note

1. There are clients for mobile and consoles, but they do not offer cross-platform play and the vast majority of the player base is on a PC, with a very small Mac audience.

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