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New Social Horizons: Anxiety, Isolation, and Animal Crossing During the COVID-19 Pandemic

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Increased participation in activities has been associated with improved positive mental health outcomes. However, there is much debate regarding the net effects of video games on individuals. Typified as a socially isolating activity, many games inherently contain socialization within the environment with game-generated characters or other players. Coinciding with the time of the initial pandemic/quarantine period was the release of a popular socializing and life simulation game, Animal Crossing: New Horizons. We investigated whether participation in this game was related to emotional outcomes associated with pandemics (e.g., loneliness and anxiety). The relationship between deleterious mental health and social gaming, amid a time of enforced reduction in socializing, would allow us to isolate the impact of the introduction of a social video game on improving the quality of life for players of this game. Participants (n = 1053) were asked about their time spent playing video games via an online survey, their socialization in game play, loneliness, and anxiety. We predicted that participants with higher levels of social interaction within the game would report less loneliness and anxiety. Utilizing multiple linear regression analyses, the research found that increased gaming and related activities were predictive of higher anxiety and somewhat related to increased loneliness. However, increased visits to another island were associated with lower levels of loneliness. As such, players may be utilizing gaming as a coping mechanism for anxiety. This research may inform generalized research regarding the influence that social games may have on feelings of loneliness and anxiety.

Keywords: anxiety, loneliness, COVID-19, isolation, video games

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INTRODUCTION

Humans are inherently social beings and as such prolonged periods devoid of social interaction can be detrimental to mental and physical health. Social isolation regularly occurs due to large-scale traumatic, natural, or environmental disasters; these disasters are almost always accompanied by decreases in people's psychological well-being (Neria et al., 2008). Isolation, particularly over which one has little or no control, can increase feelings of anxiety and loneliness (Cacioppo and Patrick, 2008; Hawthorne, 2008; Robb et al., 2020). Loneliness has been observed as a risk factor for sadness, depression, anxiety, chronic stress, insomnia, sensory loss, autoimmune and cardiovascular disorders, obesity, and morbidity (Cacioppo and Cacioppo, 2014; Leigh-Hunt et al., 2017; Banerjee and Rai, 2020).

Social isolation has been practiced as a precaution in response to infectious diseases, such as tuberculosis, varicella, and SARS. During times of social isolation due to infectious disease, increased

posttraumatic stress disorder (PTSD) symptomology is observed particularly in relation to longer time in quarantine, health care worker status, and increased compliance (Reynolds et al., 2008). The SARS-CoV-2 (COVID-19) pandemic has led to isolation on a global level in an effort to slow the spread of the virus, and this isolation is expected to increase loneliness and associated negative mental health outcomes (Ammar et al., 2020a; Galea et al., 2020). World-wide changes have been demonstrated in decreased reported mental health and social interaction (Ammar et al., 2020a; Ammar et al., 2020b). Consequences of isolation related to COVID-19 are already evident in Wuhan, China (Banerjee and Rai, 2020), and London, United Kingdom (Robb et al., 2020), where an increase in depression, anxiety, PTSD, and insomnia has been observed in the quarantined population. Saltzman et al., 2020 suggest that the development of and access to technology may provide solutions to the historically reported negative outcomes of social isolation during societal trauma, such as what is occurring during COVID-19.

Negative outcomes resulting from social isolation have been shown to be improved with technology use. Merchant and Lurie (2020) explain that technology can bridge social and physical isolation. Much of the research on technology's impact on social isolation has explored this in older adults and consistently found that technology use during periods of social isolation has positive effects on loneliness, anxiety, and depression (e.g., Czaja et al., 2018; Jun and Kim, 2017). However, we aim to evaluate specifically on technology regarding video games with social elements, as opposed to technology with the specific goal of social interaction (e.g., internet use or software designed to connect individuals). Additionally, these types of evaluations primarily focus on older adults, and the COVID-19 isolation measures have extended to populations of all age groups.

One type of technology that has the potential to positively impact well-being during isolation is video games. Much of the research on video games has focused on negative associations with gaming, particularly regarding aggression (Prescott et al., 2018), and there are still stereotypes of the video game playing "loner" (Lenhart et al., 2008; Granic et al., 2014), but the truth is more complicated. The impacts of video game playing on well-being are moderated by other factors including the opportunity for social interaction (Greitemeyer and Mügge, 2014; Halbrook et al., 2019). Whether playing cooperatively or competitively, a majority of video game players engage with friends during play (Cole and Griffiths, 2007; Granic et al., 2014) and thus gaming provides a social experience. Cooperative games especially have been shown to promote psychological well-being through positive interactions and associated higher levels of enjoyment (Carras et al., 2017; Halbrook et al.). Players need not only interact with other live players to gain positive effects; the positive effects on psychological well-being from playing video games occur in games that involve characters controlled by either a real person or a programmed virtual character in the game (Jin and Li, 2017). Furthermore, video games facilitate prosocial behavior outside of the game, including sharing and maintaining positive relationships (Martoncik and Loksa, 2016), suggesting that video games can improve social functioning. Video game play may particularly benefit those who are socially isolated as video games may serve as a proxy for in-person contact (Odrowska and Massar, 2014). Despite the tendency for women to be less represented in gaming or partake in gaming (with particular game genres being the exception), previous research has found that increased gaming was associated with reduced reported depression and anxiety (Desai et al., 2010; Fish, Russoniello, and O'Brien, 2018).

Animal Crossing: New Horizons (ACNH), launched in March 2020, is a life simulation game that enables players to build their own unique, deserted island community, complete with character customization, interact with nonplayable island residents, and cooperatively play with up to eight real-life players (Nintendo, 2020). For many, the simulation aspect of the game became a genuine substitute for daily activities, due largely to the game's release coinciding with COVID-19 which resulted in lockdowns and social isolation in numerous countries (Fasce, 2020). The online, cooperative aspect of the game had immense potential to enable players all over the world to connect with friends and simulate interactions they engaged in prior to the physical distancing necessitated by the virus.

In the current study, we aimed to evaluate whether engaging in real and simulated social interactions was associated with decreased negative outcomes during the COVID-19 pandemic. We evaluated if elements of game play (e.g., hours played, in-game characters, and visiting other players) were related to lower reported levels of loneliness and anxiety. We predicted that participants who engaged more in social interactions associated with ACNH would report less anxiety and loneliness potentially due to an alternative method of making connections with either human or nonhuman players during quarantine and isolating times.

METHODS

A survey model was utilized in order to determine the nature of a possible relationship between gaming and feelings of loneliness and anxiety. The measures utilized were a combination of empirically validated questionnaires and survey measures created for the purpose of this study.

Participants

Participants (n = 1053) were primarily recruited from *Animal Crossing*-focused Reddit and Facebook subgroups. The average birth year for respondents was 1993 (SD = 6.48, range 1956–2001), and only respondents over the age of 18 were included in the data analysis. The majority of respondents were identified as female (89.96%; 5.32% nonbinary or genderfluid; 3.54% male), heterosexual (50.79%; 24.51% bisexual, 8.17% pansexual, 5.32% asexual, 3.54% queer, and 3.05% lesbian), and White (79.92%; 7.08% mixed ethnicity, 5.02% Latinx, and 4.72% Asian). The high number of female participants was expected given that female gamers tend to lean towards casual games, where ACNH falls under this category broadly (Entertainment Software Association, 2020).

Measures

Video Game Habits Questions. These four questions were created by the authors to assess the quality of video game engagement before and during the quarantine. The first two questions were related to the number of hours spent on gaming before and during the quarantine. The final two questions were designed to determine the type of video games participants engaged in during their gaming experience before and during the quarantine.

Animal Crossing: New Horizons-Specific Questions. This measure, created by the authors, featured 12 items specifically related to engagement with *Animal Crossing: New Horizons*. The first question asked about the total number of hours of ACNH played, which can be determined by looking at Nintendo Switch data. Subsequent questions asked about the frequency and duration of game play, in terms of both the amount played on a weekly basis and the amount played in a single session. Questions later in the survey were used to determine the social interaction participants engage in related to the game, including frequency and type of interaction with game-generated characters, with strangers, with friends, and with ACNH-specific social media. These data were used as individual variables, as well as a composite score of overall social interaction for both friends and strangers. This score was calculated utilizing the frequency of engaging in social activities (e.g., exchanging resources and simulating social events).

Beck Anxiety Inventory. The *Beck Anxiety Inventory (BAI;* Beck et al., 1988) consists of 21 items representative of anxiety symptoms and asks respondents to rate how bothersome *(not at all* to *severely*) the symptoms have been in the last month. Examples of included symptoms are "fear of worst happening," "difficulty in breathing," and "nervous." Scores range from 21 to 84, with higher scores representing higher anxiety experiences. The *BAI* is considered a reliable and valid measure of anxiety (Beck et al., 1988) and had internal consistency reliability of 0.93 in the current study.

UCLA Loneliness Scale. The *UCLA Loneliness Scale* (Russel et al., 1980) asks respondents to identify how frequently (*never* to *often*) they feel loneliness via 20 statements detailing various experiences of social relationships (e.g., "There is no one I can turn to" and "I am an outgoing person"). Scores range from 20 to 80, with higher scores indicating higher levels of loneliness. This scale is considered a reliable and valid measure of loneliness (Knight et al., 1988) and had internal consistency reliability of 0.94 in the current study.

Procedure

The researchers posted an Institutional Review Board-approved recruitment statement on ACNH Reddit and Facebook pages; the statement included the link to the measures in Qualtrics. All data collection was anonymous, and survey completion took on average 9.86 min based on data available from Qualtrics.

Analysis

We conducted two regression analyses for our primary variables of reported levels of anxiety and loneliness. We utilized a bootstrapping, enter method, and all coefficients were evaluated based on this analysis. No violations of assumptions were found, with no multicollinearity or bias evident in the data. We included the following variables as predictors for both models: frequency of social interaction with friends, frequency of social interaction with strangers, total hours of gaming during quarantine (prequarantine gaming hours was not included in regression models as this would represent behavior outside of pandemic behaviors), total hours of gaming in ACNH, average time played per session in ACNH, frequency of interacting with islanders, number of island neighbors in ACNH, frequency of visiting other islands, frequency of having a visitor to the island, and frequency of interacting in online communities related to ACNH. Based on these results, we then ran a multivariate analysis comparing mean differences for high and low anxiety participants.

TABLE 1 | Descriptive statistics.

Variable	*M*	*SD*
1. Loneliness	2.20	0.62
2. Anxiety	2.05	0.62
3. friendSocial	1.60	0.51
4. strangerSocial	1.44	0.51
5. quarGamingHours	29.81	49.46
6. hoursPlayed	398.03	230.90
7. frequencyPlayed	3.91	0.87
8. timePerSession	3.01	1.22
9. islanderInteract	3.82	0.75
10. Islanders	6.63	1.17
11. vistingFrequency	2.31	0.79
12. visitorFrequency	2.10	0.80
13. communityInteract	3.39	0.98

RESULTS

In processing our data, we removed participants whose reported gaming hours exceed two or more standard deviations from the mean. This data cleaning was implemented to reduce any potential influence of outliers who engage in gaming beyond 95.45% of the normal distribution; several participants reported game times that were impossible given the length of time since the game was released. Descriptive statistics and correlations for measures used in this study are listed in **Tables 1** and **2**.

Characteristics

Gaming Habits. Initial assessment for changes in gaming habits prior to and during the pandemic was assessed. We found that participants were reporting an increased amount of time gaming during the pandemic compared to before, t (1, 1014) = −14.87, $p < 0.001$.

Outcome Variables. Our key variables of interest were the reported levels of anxiety and loneliness. We found a moderate, positive correlation between these variables, r (1, 1015) = 0.41, $p <$ 0.001. This suggests that there was a moderate association between these two negative emotional experiences in our sample.

TABLE 2 | Correlations.

	Correlations											
Variable	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***
1. Loneliness												
2. Anxiety	0.41*											
3. friendSocial	−0.06	0.14*										
4. strangerSocial	0.04	0.07*	0.41*									
5. quarGamingHours	0.03	0.10*	0.08*	0.09*								
6. hoursPlayed	0.05	0.02	0.22*	0.23*	0.23*							
7. frequencyPlayed	0.08*	0.02	0.20*	0.21*	0.07*	0.30*						
8. timePerSession	0.05	0.15*	0.16*	0.19*	0.20*	0.29*	0.09*					
9. islanderInteract	0.05	0.09*	0.18*	0.19*	0.06	0.20*	0.52*	0.15*				
10. Islanders	0.06	0.01	0.04	0.58	0.30*	0.18*	0.04	0.06	0.05			
11. vistingFrequency	−0.02	0.03	0.54*	0.07*	0.27*	0.30*	0.29*	0.21*	0.22*	0.10*		
12. visitorFrequency	−0.08*	0.00	0.56*	0.08*	0.28*	0.28*	0.27*	0.18*	0.23*	0.10*	0.78*	
13. communityInteract	0.05	0.10*	0.23*	0.07*	0.20*	0.20*	0.20*	0.13*	0.18*	0.07*	0.33*	0.29*

*p < *0.05.*

TABLE 3 | Regression coefficients.

Predictor	***Loneliness***	***Anxiety***
	Standardized coefficients	
1. friendSocial	−0.08 (p = 0.096; −0.17–0.02)	0.18 (p < 0.001; 0.11–0.34)*
2. strangerSocial	0.06 (p = 0.120; −0.24–0.15)	0.00 (p = 0.915; −0.09–0.11)
3. quarGamingHours	0.00 (p = 0.455; 0.00–0.00)	0.08 (p < 0.05; 0.00–0.00)*
4. hoursPlayed	0.00 (p = 0.465; 0.00–0.00)	−0.06 (p = 0.076; 0.00–0.00)
5. frequencyPlayed	0.06 (p < 0.05; 0.01–0.12)*	−0.03 (p = 0.432; −0.08–0.04)
6. timePerSession	0.02 (p = 0.203; −0.10–0.05)	0.13 (p < 0.001; 0.03–0.10)*
7. islanderInteract	0.01 (p = 0.805; −0.06–0.07)	0.09 (p < 0.05; 0.02–0.14)*
8. islanders	0.03 (p = 0.082; −0.01–0.07)	0.00 (p = 0.830; −0.03–0.04)
9. vistingFrequency	0.05 (p = 0.220; −0.04–0.13)	−0.02 (p = 0.709; −0.9–0.06)
10. visitorFrequency	−0.14 (p < 0.001; −0.21–−0.06)*	−0.13 (p < 0.05; −0.18–−0.02)*
11. communityInteract	0.02 (p = 0.299; −0.02–0.06)	0.07 (p < 0.05; 0.00–0.08)*

*p < *0.05 (*p *value, confidence interval).*

Regression Models

Loneliness. In our analysis, the model including all predictors found a significant model relationship for loneliness, adj R^2 = 0.02, F (11, 991) = 3.20, p < 0.001. While the relationship is small given our sample size, we found that frequency of playing ACNH (β = 0.06) and having a visitor to the island was significantly related to reported loneliness (β = −0.14) (see **Table 3** for full model statistics). The regression model reanalyzed with these significant predictors was nearly identical, adj R^2 = 0.02, F (6, 1002) = 9.61, p < 0.001.

Anxiety. The model regarding anxiety including all predictors was significant, adj R^2 = 0.06, F (11, 991) = 6.31, p < 0.001. We found that overall friend interaction (β = 0.18), total gaming hours during quarantine (β = 0.08), average time played per session in ACNH (β = 0.13), frequency of interacting with islanders (β = 0.09), frequency of having a visitor to the island (β = −0.13), and frequency of interacting in online communities related to ACNH were all significant predictors of reported anxiety (β = 0.07) (see **Table 3** for full model statistics). Overall, friend interaction was a moderate effect, while the other variables had a small effect. The regression model reanalyzed with only the significant predictors reproduced similar results, adj R^2 = 0.06, F (6, 1002) = 10.76, p < 0.001. All predictors remained significant except for interacting with communities online (p = 0.052). Additionally, a multivariate Hotelling's trace with high and low anxiety (using a median split for anxiety scores) as the independent variable and the significant predictors for anxiety in the regression as the dependent variables showed a significant difference between high and low anxiety, F (6, 1002) = 6.92, p < 0.001. Highly anxious individuals were engaging in more social interaction through ACNH than people with low levels of anxiety.

DISCUSSION

We predicted that we would find an association between increased social behaviors in ACNH and decreased levels of loneliness, based on findings that suggest that the socially meaningful applications of technology may benefit those experiencing isolation (Jun and Kim, 2017; Czaja et al., 2018; Merchant and Lurie, 2020). Additionally, due to evidence highlighting the positive impact of cooperative game play on psychological well-being (Carras et al., 2017; Halbrook et al.,

2019), we expected that utilizing game-related interactions would be associated with decreased anxiety. While some of these game-related variables were predictive of loneliness and anxiety, others were not associated with loneliness and anxiety as expected.

Regarding feelings of loneliness, we found that increased hours of game play predicted higher self-reported feelings of loneliness. Participants who were engaging in game play may have been attempting to escape their feelings of isolation with ACNH but may have also felt withdrawn from others due to increased gaming. Research in social gaming does support a social displacement effect in which online social gaming is related to decreased quality of offline social interaction (Kowert et al., 2014). While it is unclear how this effect might represent itself during social isolation due to a pandemic, it is possible that playing ACNH during isolation increased feelings of offline loneliness. Similarly, it is also possible that ACNH does not affect loneliness as strongly as it does with anxiety. A key finding related to our question of whether simulated social interaction in ACNH would relate to decreased loneliness, participants who received visitors on their island more frequently reported feeling less lonely. However, variables such as artificial interactions (e.g., interactions with island characters) did not improve feelings of social isolation. Ideally, a game that simulates social engagement would improve loneliness and has been found to do so in other studies (Jin and Li, 2017), but in our current study, we found minimal evidence of in-game socialization assisting in feelings of loneliness.

As for anxiety levels, increased interactions with friends on ACNH predicted higher levels of anxiety. This may be a result of high anxiety individuals attempting to cope with and regulate their anxiety during a high-stress situation by accessing their social support network via gaming; alternatively, individuals who interact with their friends more through ACNH may have increased anxiety about that interaction (though the researchers believe this explanation seems unlikely). As anxiety levels increased, so did the number of hours of overall gaming during the pandemic, the number of interactions with in-game characters/islanders, time playing ACNH per session, and participating in communities online regarding the game increased. These findings may suggest that those experiencing high anxiety during the COVID-19 global pandemic, in which social isolation has been a necessary tool to attempt to mitigate spread of the virus, are turning to gaming, in particular ACNH. Coping with distress by avoiding the anxiety-provoking stimulus is a common mechanism in anxious individuals (Spira et al., 2004), and a casual game with social interaction may provide an escape from the anxiety associated with the pandemic. Social support is important to the quality of life and can help decrease anxiety during stress (Heinrichs et al., 2003), and it has recently been found to be especially important in regulating or decreasing anxiety experienced as a result of COVID-19 (El-Zoghby et al., 2020; Hou et al., 2020; Qi et al., 2020; Yue et al., 2020). It is possible that the escape from stress and anxiety provided by gaming is the primary mechanism through which gaming has positive effects on well-being, but the current research suggests that the social interaction provided through ACNH also plays some role in regulating or avoiding anxiety during social isolation as a result of the global pandemic. The utilization of technology for socialization has demonstrated a reduction in anxiety and feelings of isolation in certain populations (Czaja et al., 2018). Given the nature of data collection and analysis, we cannot infer the causality between increased game play and self-reported outcomes. However, we can infer from our findings that individuals who were feeling increased anxiety and loneliness reported increased gaming engagement and participating in select social activities. While it is possible that increased game play resulted in increased anxiety, it is equally likely that increased anxiety levels resulted in increased game play.

A key consideration in evaluating our models, specifically, the lack of significant predictors for loneliness compared to anxiety, may be a result of reliance on introspection vs. physical symptoms to self-report levels of each variable. The measure of loneliness relied exclusively on the experiences and emotions of social isolation, whereas the measure of anxiety included items addressing physical symptoms. This may have allowed for a more accurate representation of anxiety compared to loneliness during the COVID-19 pandemic. Further, it is possible that the characteristics of our sample may have influenced their feelings of loneliness; for instance, we did not collect data on participant living arrangements, so we have no knowledge of how that variable may have affected feelings of loneliness in this study.

Regarding the practical application of our research, the development of social technologies should consider the implications of utilizing simulated or real-world social interaction to improve the experience and quality of life of users. In our sample, we did not see a benefit for simulated socialization, but this may be a result of the limitation of the interactions (e.g., minimal decision tree options resulting in the same outcome despite choices offered). Additionally, game developers and technology creators may elect to initially support peer-to-peer interactions directly, as opposed to relying on independently created groups for socialization (e.g., third-party websites, Facebook groups, and subreddits) to foster connection between users. By increasing social interaction quantity and quality, there may be further mitigation of negative emotional outcomes as a result of social gaming engagement.

Future research related to social gaming, specifically related to changes in society and access to human interaction, should aim to consider changes in loneliness and anxiety between gaming populations during periods of social isolation. At the present time, this research aimed to explore the impact of a game that includes human and simulated social interaction after the initial release of a popular game coinciding with the social isolation as the result of a global pandemic, and therefore, we examined a sample from a specific population who engaged in ACNH. To assess whether the relationship between ACNH and negative socioemotional outcomes related to the COVID-19 pandemic is exclusive to this game, ideally, a comparison needs to be made to other active gamers who do not engage in ACNH or to a population who exclusively does not game. Additional research can also explore changes to gaming and well-being pre- and postsocial isolation. While this is a harder goal to achieve and our

data collection occurred after the changes to society occurred regarding social isolation, future studies could explore retroactive designs to examine perceptions of pre- and postpandemic gaming habits, social interactions, loneliness, and anxiety levels. Another explanation would be that underlying traits not measured in our current model would potentially explain the relationship more fully (e.g., trait anxiety, neuroticism, and general isolation). Previous research has shown the relationships between psychological traits (e.g., extroversion/introversion, openness, anxiety, depression, and stress; Peever et al., 2012; Pine et al., 2020) and video gaming so the precedent has been set for these relationships. We encourage future research to explore additional contributing factors to assist in identifying the relationships between negative emotional outcomes and gaming. Finally, continued exploration of the role of social games such as ACNH in psychological well-being should continue with attention to the role of other social factors such as peer, familial, and professional relationships.

Overall, the current research findings demonstrate the potential relationship between simulated social interaction via gaming and negative consequences (i.e., loneliness and anxiety) typically associated with large-scale societal trauma such as the current pandemic. While we predicted that increased game play would be associated with reduced anxiety and feelings of isolation, we found the opposite (the exception being reduced loneliness/anxiety with increased gaming visitors). Given the lack of pre- to postpandemic data available on these participants' loneliness and anxiety, we cannot infer any causal nature of this relationship. However, a possible interpretation of the relationship between increased anxiety levels and more frequent social interactions during game play suggests that ACNH game players might be relying on the escape of the game, particularly the social components, as a coping mechanism for the negative outcomes accompanying social isolation during a pandemic (Spira et al., 2004; Granic et al., 2014).

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the University of Northern Colorado Internal Review Board. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JL and MJ generated the research idea, design, and analysis. All authors completed the literature review and writing.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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