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How perceived toxicity of gaming communities is associated with social capital, satisfaction of relatedness, and loneliness

Julian Frommel [a,*], Daniel Johnson [b], Regan L. Mandryk [c]

[a] Department Of Information and Computing Sciences, Utrecht University, Princetonplein 5, Utrecht, 3584 CC, Utrecht, the Netherlands
[b] School of Computer Science, Queensland University of Technology, George Street, Brisbane, 4000, QLD, Australia
[c] Department Of Computer Science, University of Saskatchewan, 110 Science Place, Saskatoon, S7N 5C9, Saskatchewan, Canada

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ABSTRACT

There are various benefits of playing multiplayer games, such as enjoyment, satisfaction of basic psychological needs, facilitation of social relationships, and coping and recovery. However, these benefits to online game players are often undermined by the presence of in-game toxicity. Toxicity can be detrimental for game developers when players leave their games. For the players, toxicity can be harmful, by causing distress; however, effects of toxicity on the wellbeing of players are not yet fully understood nor substantiated with empirical evidence. To close this gap, we conducted a study partially replicating and extending findings from prior work. We conducted two online surveys, using validated scales, to explore relationships between the perceived toxicity of gaming communities and social connectedness outcomes. We found that toxicity was associated with lower in-game social capital, need satisfaction of relatedness, and higher loneliness. Our findings provide further evidence that toxicity poses a problem for multiplayer game communities.

1. Introduction

Playing games is a popular leisure activity. Games can provide various desirable outcomes, including enjoyment (Boyle et al., 2012), immersion (Jennett et al., 2008), escapism (De Grove et al., 2016), challenge (Denisova et al., 2020), feelings of success (Frommel et al., 2021), satisfaction of basic psychological needs (Deci & Ryan, 2000, Ryan et al., 2006, Tyack et al., 2020), coping and recovery (Iacovides & Mekler, 2019), and catharsis and mood repair (Russoniello et al., 2009). Multiplayer games are particularly popular, with many players regularly playing online games together (Entertainment Software Association, 2021). For these players, games may have additional benefits, such as bringing together different types of people, helping them stay connected with friends and family, and introducing them to new relationships or friendships (Entertainment Software Association, 2021), a sentiment that is in line with earlier research that showed how games can create, nurture, and develop relationships (Williams et al., 2006). Researchers have shown that social games may benefit social connectedness outcomes, such as providing need satisfaction of relatedness, building social capital, combating loneliness (Depping et al., 2018, Mandryk et al., 2020), and increasing wellbeing (Mandryk et al., 2020). On the other hand, players can have negative experiences in multiplayer games because of negative and harmful behaviours, including abusive communications (e.g., harassment, verbal abuse, and flaming) and disruptive gameplay (e.g., griefing, spamming, and cheating), which is often summarized under the umbrella term *toxicity* (e.g., Adinolf & Turkay, 2018, Beres et al., 2021, Foo & Koivisto, 2004, Kowert, 2020, Kwak et al., 2015, Lapidot-Lefler & Barak, 2012, Neto et al., 2017, Shen et al., 2020, Türkay et al., 2020).

There is evidence that players experience both positive and negative social outcomes through gaming; however, researchers and designers do not yet know how—and how much—toxicity may undermine the benefits of play. Prior work suggested that toxicity is normalized in gaming communities, with players varying in their perceptions about the severity of toxic behaviour (Beres et al., 2021). As such, it can be expected that the perception of a gaming community's toxicity may be a factor for whether a player benefits or experiences harm in those games. In earlier research (2018), Depping et al. (2018) showed that players' perceived toxicity of their gaming communities was negatively associated with in-game social capital derived from these games. In turn, social capital was related to higher need satisfaction of relatedness and lower loneliness. These findings provide evidence that toxicity may be associated with negative wellbeing outcomes in games.

* Corresponding author.
E-mail addresses: j.frommel@uu.nl (J. Frommel), dm.johnson@qut.edu.au (D. Johnson), regan@cs.usask.ca (R.L. Mandryk).

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However, Depping's (Depping et al., 2018) preliminary findings should be further investigated for several reasons. First, toxicity has been considered as increasingly problematic in recent years (Anti-Defamation League, 2021, Emmerich et al., 2020), suggesting potential changes about perceptions of toxicity in gaming communities and thus relationships between toxicity and negative outcomes compared to data published in 2018. When toxicity and hate get increasingly widespread (Anti-Defamation League, 2020, 2021, 2022), it is possible that perceptions and effects may also change. Second, and related to changes in perceptions about toxicity, gaming communities and preferences may change over time. It is possible that current multiplayer games (for example, games that simply were not available in 2018) use different features, which could lead to changes in relationships between toxicity and negative outcomes, warranting replication in a contemporary sample. Third, replication of these effects, in general, is beneficial because it may shed further light on the strength, consistency, and generalizability of these effects. Fourth, Depping et al. (2018) reported direct effects of toxicity on social capital but did not focus on the relationship between toxicity and broader negative outcomes to players. Thus, additional research about these associations may be beneficial, including exploring the direct effects of toxicity on need satisfaction of relatedness and loneliness, and the mediating role of social capital. Thus, we argue that further investigation is warranted into how the toxicity of a game community is associated with social capital built through games and the resulting social wellbeing of players.

1.1. Related work

Toxicity is a widely prevalent problem within online multiplayer games. In a recent survey, the Anti-Defamation League found that 83% of adult gamers experienced harassment in online multiplayer games in the six months preceding the survey, a number that has grown in recent years (Anti-Defamation League, 2021). This harassment is perceived as problematic by both players (Emmerich et al., 2020) and game developers (Prescott, 2017). An increasing body of work investigates different contexts and potential causes for toxicity. Kordyaka, Jahn, and Niehaves (Kordyaka et al., 2020) proposed a unified theory for toxic behaviours, proposing that an individual's attitude towards toxicity, behavioural control, toxic behaviour victimization, and toxic disinhibition are important factors that predict toxic behaviours of players. On the other hand, research about how toxicity is perceived also highlights toxic online disinhibition but further identifies moral disengagement as a factor that affects toxic perceptions (Beres et al., 2021). Similarly, perceived toxicity has been shown to be associated with game expertise (Beres et al., 2021), age (Mattinen & Macey, 2018), and higher in-game ranks (Reid et al., 2022). Aligning with the importance of toxic behaviour victimization (Kordyaka et al., 2020), being targeted by toxicity can trigger more toxicity (Shen et al., 2020, Kordyaka et al., 2020, Kou, 2020, Cook et al., 2018), an effect described as a downward spiral (Kordyaka et al., 2020) and ultimately a normalization of toxicity in gaming communities (Beres et al., 2021, Fox et al., 2018). Further, toxicity is generally more prevalent among teammates (McLean et al., 2020, Neto et al., 2017, Shen et al., 2020), men (Nitschinsk et al., 2022), and in competitive game modes (Grandprey-Shores et al., 2014, Lee et al., 2022). Finally, it is likely that there are also cultural differences, as suggested by prior work that found that Indian players had higher self-reported toxic behaviour than players from the US (Kordyaka et al., 2022).

Toxicity can be detrimental for many reasons. It can be bad for the game developers because it can harm the health of gaming communities (Prescott, 2017), and may lead to churn (Kordyaka et al., 2020) and decreased player retention (Grandprey-Shores et al., 2014), which affects revenues. Toxicity is detrimental to team performance (Kwak et al., 2015, Neto et al., 2017, Monge & O'Brien, 2022), which is problematic for a growing esports scene, in which players train and compete, often in team-based play. It may be harmful to player experience (Türkay et al., 2020, Barnett et al., 2010, Ross & Weaver, 2012), e.g., by leading to frustration (Fox et al., 2018, Ross & Weaver, 2012) and decreased mood or enjoyment (Türkay et al., 2020, Ross & Weaver, 2012, Saarinen, 2017). Players who are targets of toxic behaviours can experience psychological distress, rumination, and social withdrawal (Fox et al., 2018, Fox & Tang, 2017, Pew Research Center, 2014, Runions, 2013). Many adult players report severe influences of disruptive behaviours on day-to-day life, including feeling uncomfortable, upset, isolated, or alone, being less social, treating other people more poorly than usual, or having depressive or suicidal thoughts (Anti-Defamation League, 2021). Comparable effects were reported by players aged 13 to 17 (Anti-Defamation League, 2021). Concerningly, some recent research suggests that the experience of toxic behaviour in games may not result in reduced time spent playing, meaning that players continue to be exposed to toxic behaviour and experience the associated negative influences (Lee et al., 2022). Toxic behaviours often devolve into gendered or racial harassment (Chess & Shaw, 2015, Fox & Tang, 2014, Salter & Blodgett, 2012, Kuznekoff & Rose, 2013) with players from marginalized groups being disproportionally targeted, such as women (Fox & Tang, 2017), 2SLGBTQ+ players (Ballard & Welch, 2017), and players of colour (Gray, 2012, 2014). Further, the cyclical nature (Shen et al., 2020, Kordyaka et al., 2020, Kou, 2020, Cook et al., 2018) and normalization of toxicity (Beres et al., 2021, Fox et al., 2018) changes and potentially distorts what is and is not acceptable. Thus, there is mounting empirical evidence that toxicity is harmful to players, developers, and gaming communities alike.

1.2. The present study

Our paper reports data from two studies partially replicating and extending prior findings (Depping et al., 2018). With our study, we wanted to answer two overarching research questions.

RQ1. What is the association between perceived toxicity and bonding and bridging social capital, loneliness, and relatedness? To replicate effects from prior work, and to consider these previous findings in a contemporary context, we were interested in evaluating the strength and direction of these relationships.

RQ2. What are the associations of toxicity with relatedness and loneliness through direct, indirect, and total effects? To further disentangle the relationship between toxicity and the negative outcomes, we evaluated these new relationships.

We conducted a survey with two samples six months apart investigating relationships between perceived toxicity, in-game social capital, need satisfaction of relatedness, and loneliness. These two surveys were administered to assess the participants' experiences with games and broader outcomes, such as social connectedness, across an extended period of time. Relevant to this paper, we report on a subset of the survey and report only those measures related to our two research questions; other constructs (e.g., PHQ-9 (Kroenke et al., 2001)) are not reported in this paper.

To align with the replication, we chose to analyze the surveys separately as cross-sectional data, using path modeling. Fig. 1 shows the hypothesized path model and the predicted direction of relationships, as described in Section 2.4.

2. Material and methods

Data for this paper originates from respondents to two online surveys six months apart. The participants of the second data collection represent a subsample of those from the first sample. Data was collected on Amazon Mechanical Turk, an online platform for Human Intelligence Tasks, which can be used for HCI studies (Kittur et al., 2008, Mason & Suri, 2012).

2.1. Prescreen, data filtering, and procedure

We aimed to recruit players who had experience with multiplayer games and gaming communities. Therefore, we conducted a prescreen

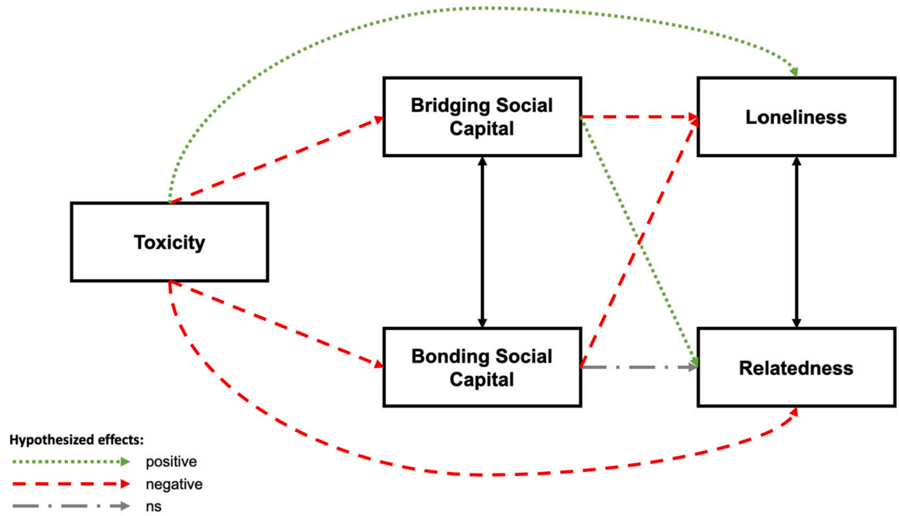

Fig. 1. Hypothesized path model.

on Amazon Mechanical Turk, resulting in 803 responses. We selected participants who reported playing multiplayer games ("yes" in a binary choice), a sufficient identification as a gamer (more than 30 on a scale from 1 = *"not at all"* to 100 = *"gamer"*) and a sufficient proportion of their playing time being spent with multiplayer games (more than 30 on a scale from 1 = *"play alone"* to 100 = *"play with others"*). Further, participants had to indicate that they regularly played games, selecting either *"Every day"* or *"A few times per week"* from a multiple-choice question with five options (*"Every day"*, *"A few times per week"*, *"A few times per month"*, *"A few times per year"*, *"Never"*). This prescreen resulted in 385 participants who were invited to take part in the subsequent surveys. Participants were paid $6.50 USD for each survey, which took 20–30 minutes to complete, in line with minimum wage rates in California.

For this study, we report data from two subsequent samples. Survey 1 was collected in October 2020 and resulted in 160 responses. We conducted a validation of responses following best practices for online data collection (Meade & Craig, 2012, Buchanan & Scofield, 2018), resulting in the removal of 13 participants who responded too quickly (faster than 1.5 seconds per item on more than 2 scales) or showed repeated high response variance on more than 4 constructs, which happens when participants click inconsistently on items that should be relatively consistent. After removal, the final sample for Survey 1 consisted of 147 participants. Data collection for Survey 2 was conducted 6 months after Survey 1. We invited the participants who had completed Survey 1 and used the same survey again, effectively testing whether their experiences had changed; 132 participants responded. The same filtering protocol removed 7 participants, resulting in a final sample of 125 participants for Survey 2.

Both surveys used the same procedure. First, participants provided informed consent. Then, they answered questionnaires about demographic information and play behaviour and experience, and completed several validated scales. Both studies had ethical approval received from the Behavioral Research Ethics Board at the University of Saskatchewan. For this paper, we omit some scales due to scope and report data from the scales about perceived toxicity of game communities, need satisfaction through games, social capital, and loneliness.

2.2. Participants

We report data from two surveys and thus from two sets of participants. As detailed below, our sample was somewhat biased towards men and included experienced players, the majority of whom played multiplayer games much of the time.

2.2.1. Survey 1

The final sample in Survey 1 consisted of 147 participants (men = 93, non-binary = 1, women = 42, prefer not to disclose = 1), aged 21 to 65 ($M = 37.667$, $SD = 9.135$). They played games regularly (*"Every day"* = 74, *"A few times per week"* = 66, *"A few times per month"* = 6, and *"A few times per year"* = 1). On a scale from 1 (= *"not at all"*) to 100 (= *"gamer"*), they identified as gamers to a substantial degree ($M = 72.626$, $SD = 21.903$). Most reported playing multiplayer games (*"Do you play multiplayer games?"*, *"Yes"* = 138, *"No"* = 7, no response = 2) and that a substantial proportion of their playing time was spent with multiplayer games (*"How much of your time playing games is spent playing with others as compared to playing alone?"*), measured on a scale from 1 (= *"Play Alone"*) to 100 (= *"Play with Others"*) ($M = 47.918$, $SD = 25.851$).

2.2.2. Survey 2

Survey 2 contained responses from a subset of the participants of Survey 1. Accordingly, demographic information was very similar. The sample consisted of 125 participants (men = 79, non-binary = 1, women = 44, prefer to self-describe = 1: *"Masculine non-conforming, technically non-binary but that's not my taxonomical term"*), aged 24 to 66 ($M = 38.856$, $SD = 9.298$). Their gameplay experience and behaviour had not changed substantially. They played games regularly (*"Every day"* = 62, *"A few times per week"* = 59, and *"A few times per month"* = 4). Their identification as gamers ($M = 71.680$, $SD = 19.951$) and reported proportion of their playing time spent with multiplayer games ($M = 73.560$, $SD = 30.868$) were comparable. Again, most participants played multiplayer games (*"Yes"* = 115, *"No"* = 8, no response = 2). We asked participants to state games that they had played with others recently. The most commonly reported games in Survey 2 were Call of Duty (16), World of Warcraft (10), Fortnite (9), Animal Crossing: New Horizons (8), Mario Kart (8), Madden (6), Among Us (6), League of Legends (6), Minecraft (6), Apex Legends (5), Final Fantasy XIV (5), and Fall Guys (5). See Section 4.1 for a discussion about the similarity and differences to the games in the study of Depping et al. (2018).

2.3. Measures

We adapted several validated scales for both surveys to prompt participants to consider the questions in light of their gaming experience. All survey items were included in subsequent analyses, and all scales showed good internal consistencies for the measured constructs (see Table 1).

Table 1
Internal consistency (McDonald's ω) and means and standard deviations for the responses (M_1, SD_1, M_2, SD_2) in Survey 1 and Survey 2.

	ω_1	M_1	SD_1	ω_2	M_2	SD_2
Toxicity	.924	2.483	1.117	.922	2.483	1.045
Bonding Social Capital	.954	3.408	1.639	.949	3.352	1.625
Bridging Social Capital	.954	4.703	1.418	.947	4.662	1.401
Relatedness	.956	4.947	1.535	.956	5.020	1.537
Loneliness	.960	1.858	0.678	.966	1.848	0.699
n	147			125		

2.3.1. Perceived toxicity of game communities

We used an 8-item scale adjusted from earlier work (Depping et al., 2018, Beres et al., 2021) to measure the participants' perceived toxicity of their gaming communities. On 7-point scales from 1 (= *"Disagree strongly"*) to 7 (= *"Agree strongly"*), participants responded how they considered their communities (e.g., *"The people I play with are sometimes..."*) with respect to 8 different characteristics such as "angry" and "toxic". Responses were averaged, resulting in a single score for perceived toxicity.

2.3.2. Need satisfaction of relatedness

We adapted a scale from (Chen et al., 2015) to measure need satisfaction through games. We used the subscale for relatedness and adjusted items to refer to games and gaming communities (e.g., *"I feel that the people I care about in my gaming communities also care about me."*), which uses four items with 7-point Likert scales from 1 (= *"Not true at all"*) to 7 (= *"Completely true"*) and represents how games satisfy the players' need for relatedness.

2.3.3. Social capital

We used an adjusted version of the Internet Social Capital Scales (Williams, 2006) to measure bridging and bonding social capital in gaming communities, each with 10 items on 7-point Likert scales from 1 (= *"Strongly disagree"*) to 7 (= *"Strongly agree"*). Participants were instructed to think about the game communities for the videogames that they play and rate their agreement with statements such as *"There are several people from my game communities I trust to help solve my problems"* (bonding social capital) and *"Interacting with people in my game communities gives me new people to talk to"* (bridging social capital).

2.3.4. Loneliness

We employed the revised UCLA Loneliness Scale (Russell et al., 1980) to assess the participants' loneliness. The scale uses 19 items with 4-point scales (1 = *"Never"*, 2 = *"Rarely"*, 3 = *"Sometimes"*, and 4 = *"Often"*), indicating their agreement to statements such as *"I feel isolated from others"*.

2.4. Data analysis

First, raw study data were visually inspected and then filtered for data quality using the validation protocol described earlier. Then, construct measures were calculated. See Table 1 for an overview of descriptive statistics. Before data analysis, scores were z standardized to normalize the scales with a varying number of response options. Then, we calculated path models in JASP 0.16 (JASP Team, 2021) using lavaan syntax. See Fig. 1 for an overview of the hypothesized model. We defined direct paths from toxicity to bridging and bonding social capital, relatedness, and loneliness. Direct paths from bridging and social capital to loneliness and relatedness were also included. The model also provides estimates for total and indirect effects from toxicity on loneliness and relatedness. Further, we allowed covariances between bonding and bridging social capital and between loneliness and relatedness. The model was tested separately for the data from Survey 1 and 2.

3. Results

We report results from our two surveys. As results were consistent across both samples, we provide combined interpretation of both samples for brevity. Table 2 shows an overview of the results.

3.1. RQ1: replication of effects from prior work

As a partial replication, the results from our surveys provide insights into the stability of effects reported earlier. Table 3 shows effects from Depping et al. (2018) and our surveys. First, the results were consistent across both our surveys, with consistent directions, and comparable coefficients, confidence intervals, and *p* values. Compared to Depping et al.'s results (Depping et al., 2018), our results provide confirmation for part of the results. Specifically, our results confirmed negative relationships of toxicity with bonding and bridging capital and a positive relationship between bridging social capital and relatedness. In contrast, the relationships between bonding and bridging social capital with loneliness were negative, similar to prior work, but did not reach significance in our samples. Further, the relationship between bonding social capital and relatedness, which was not significant in prior work, was significant, positive, and moderate to strong in both our samples.

Table 2
Coefficients (*B*) with confidence intervals and *p* values for direct, indirect, and total effects between toxicity (Tox), bonding and bridging social capital (Bonding and Bridging), loneliness (Lon), and relatedness (Rel) in our surveys.

	Survey 1			Survey 2		
	B	95% CI	*p*	*B*	95% CI	*p*
Bridging → Rel	0.303	[0.154, 0.453]	< .001	0.221	[0.047, 0.395]	0.013
Bonding → Rel	0.561	[0.428, 0.695]	< .001	0.479	[0.300, 0.658]	< .001
Tox → Bridging	−0.312	[−0.487, −0.138]	< .001	−0.367	[−0.556, −0.178]	< .001
Tox → Bonding	−0.394	[−0.532, −0.256]	< .001	−0.450	[−0.594, −0.306]	< .001
Bridging → Lon	−0.176	[−0.359, 0.006]	0.058	−0.137	[−0.338, 0.064]	0.181
Bonding → Lon	−0.139	[−0.337, 0.058]	0.167	−0.108	[−0.295, 0.079]	0.258
Total Tox → Rel	−0.435	[−0.600, −0.269]	< .001	−0.496	[−0.657, −0.335]	< .001
.. Direct Tox → Rel	−0.119	[−0.222, −0.016]	0.023	−0.199	[−0.340, −0.058]	0.006
.. Total Indirect Tox → Rel	−0.316	[−0.435, −0.196]	< .001	−0.297	[−0.419, −0.174]	< .001
.... Indirect Tox → Bridging → Rel	−0.095	[−0.172, −0.017]	0.017	−0.081	[−0.161, −0.001]	0.046
.... Indirect Tox → Bonding → Rel	−0.221	[−0.311, −0.131]	< .001	−0.216	[−0.320, −0.111]	< .001
Total Tox → Lon	0.353	[0.182, 0.524]	< .001	0.508	[0.353, 0.663]	< .001
.. Direct Tox → Lon	0.243	[0.064, 0.422]	0.008	0.099	[0.006, 0.192]	0.036
.. Total Indirect Tox → Lon	0.110	[0.026, 0.194]	0.010	0.409	[0.243, 0.575]	< .001
.... Indirect Tox → Bridging → Lon	0.055	[−0.011, 0.121]	0.101	0.050	[−0.027, 0.128]	0.202
.... Indirect Tox → Bonding → Lon	0.055	[−0.024, 0.134]	0.173	0.049	[−0.038, 0.135]	0.272

Table 3
Direct effects from our analysis compared to Depping et al. (2018). ns = non-significant, *$p < .05$, ***$p < .001$.

	D2018	Survey 1	Survey 2	Consistent with Depping 2018?
Toxicity → Bonding Social Capital	−.37**	−.394***	−.450***	yes
Toxicity → Bridging Social Capital	−.29**	−.312***	−367***	yes
Bonding Social Capital → Loneliness	−.17**	−0.139 (ns)	−0.108 (ns)	no
Bridging Social Capital → Loneliness	−.31**	−0.176 (ns)	−0.137 (ns)	no
Bonding Social Capital → Relatedness	.03 (ns)	.561***	.479***	no
Bridging Social Capital → Relatedness	.42**	.303***	.221*	yes

3.2. RQ2: toxicity and negative outcomes

In addition to replicating effects from prior work, we were mainly interested in studying if perceptions of toxicity were associated with negative outcomes in games in general. Thus, we evaluated direct, indirect, and total effects of toxicity on relatedness and loneliness (see Table 2 for an overview). First, we want to highlight that effects were consistent across results from both our surveys, i.e., effects had comparable effect sizes and were either significant or not significant in both samples.

Total effects showed a significant and negative relationship between toxicity and relatedness, which comprised of significant and negative direct and indirect effects, both through bridging and bonding social capital. Thus, players who perceived their gaming communities as toxic also had lower need satisfaction of relatedness with some of the effects attributable to lower bridging and bonding social capital and further effects that cannot be explained with social capital.

The results showed that toxicity was positively and significantly associated with loneliness. Direct effects and total indirect effects were significant while individual indirect effects through bridging and bonding social capital did not reach significance. This suggests that players who perceived their gaming communities as toxic also reported higher loneliness. Some of this relationship can be explained by players having lower social capital with neither type of social capital contributing significant influence alone. The significant direct effects suggested that there were further mechanisms about the relationship between toxicity and loneliness that cannot be explained with social capital.

4. Discussion

We summarize findings, provide explanations, and discuss limitations and implications.

4.1. Replication effects from prior work

As a partial replication, part of our contribution is comparing our results to those from the original study. Table 3 provides an overview of these comparisons. We provide confirmation of three effects that were shown previously. Players' perceived toxicity of their gaming communities was negatively associated with in-game bonding and bridging social capital. Further bridging social capital was positively associated with need satisfaction of relatedness. In contrast, our results were not consistent with prior work regarding the relationships between bonding and bridging social capital with loneliness and bonding social capital and relatedness. Thus, we recommend further study of these outcomes.

Our findings together with the original study from Depping et al. provide some evidence that playing games can have positive outcomes. Consistently, in-game bridging social capital was associated with higher satisfaction of relatedness, one of the basic psychological needs in self-determination theory (Ryan et al., 2006, Ryan & Deci, 2000). These effects are also in line with other prior work that has repeatedly suggested and shown that playing multiplayer games can be beneficial for players by providing relatedness (Ryan et al., 2006, Mandryk et al., 2020, Rigby & Ryan, 2007, 2011). Our results suggest that players who derive bridging social capital also experience need satisfaction of relatedness.

Further, our results are consistent with Depping et al. (2018) considering the associations between perceived toxicity and social capital.

4.2. Toxicity and negative outcomes in games

Our main interest was exploring how perceived toxicity was related to negative outcomes in games. Similar to Depping et al. (2018), we found that perceived toxicity was negatively associated with social capital. Players who perceived their gaming communities as toxic, also derived lower in-game bridging and bonding social capital.

Further, we show that perceived toxicity was also associated with relatedness and loneliness. Total effects between toxicity and relatedness and loneliness were significant and moderate to strong. Players who perceived their gaming communities as toxic also reported higher loneliness and lower need satisfaction of relatedness. These total effects can be divided into direct effects and indirect effects through social capital. This suggests that toxicity may be associated with lower social connectedness outcomes by lower social capital and additional mechanisms.

As this is a cross-sectional survey, we cannot assess causation but offer two possible explanations.

4.2.1. Explanations for the harmful effects of toxicity in games

First, it is conceivable that people who derive fewer benefits also perceive communities as more toxic. Thus, those players that feel lonely in general, who have less social capital and relatedness through games may see communities as more toxic than other players who do derive these benefits.

On the other hand, it is possible that toxicity may be detrimental to the players' experiences. Those players who perceive their communities as toxic may also derive less social capital and relatedness, potentially because they perceive their communities as toxic and therefore do not want to interact with such toxic players. One possible explanation would be that players who experience toxicity, withdraw from and spend less time playing games, ultimately having less potential to derive benefits. However, prior research suggested that perceived toxicity was not meaningfully associated with time spent playing *Dota 2* (Lee et al., 2022). Instead, maybe experiences of interacting with toxic players leave a bitter mark. Players who were witnesses to or even targets of toxicity may not be able to or want to directly interact socially with others, precluding the building of social capital. Alternatively, it may be that those players who experience or perceive toxicity continue to interact with others who play but without any social capital being built during those interactions. Regardless of whether they interact with others or not, the lower levels of social capital reduce their ability to access other benefits of play such as decreased loneliness and improved relatedness.

In a different perspective, prior research (Lee et al., 2022) found that time spent playing was not associated with perceived toxicity in *Dota 2*. The authors suggested two possible explanations, including compartmentalization and that players internalized and adopted the toxicity as normative. They raised that it is possible that players are accustomed to the negative experience of toxicity without undermining wellbeing. Our research adds an additional aspect. While we do not have data on time spent playing, our results suggest that players *do* experience negative effects on wellbeing associated with higher toxicity. It may be that players adopt toxicity as normative but experience harm to wellbeing, regardless. Alternatively, it may be specifically those players who do not accept toxicity as normative who experience harm to wellbeing. Whatever the underlying mechanism, our results suggest that players may continue playing games despite toxicity being associated with worse social connectedness, rather than toxicity not affecting them.

More generally, our findings indicate that perceived toxicity in gaming communities is associated with fewer benefits that players usually derive from play. With this, our work is in line with Depping et al. (2018) and an abundance of prior work that suggests that toxicity is detrimental to players by causing harmful effects (Ross & Weaver, 2012, Fox et al., 2018) and undermining the benefits of play (Türkay et al., 2020, Saarinen, 2017, Ross & Weaver, 2012). Even if some players are resistant to the harmful effects, it is possible that they lose some of the social benefits. Thus, our work adds to a growing body of evidence for the harm of toxicity, highlighting the need to combat those behaviours.

4.2.2. Toxicity in a contemporary context

In part, our study was motivated by investigating if the effects found in prior work hold in a contemporary sample, in which other games are popular and in which gaming culture may have changed (e.g., more common and normalized toxicity (Anti-Defamation League, 2021, 2022, Beres et al., 2021)). A comparison of the most commonly named games in our sample (see Section 2.2.2) with those reported in Depping et al. (2018) shows some overlap (e.g., *World of Warcraft, League of Legends* and *Call of Duty*) but also that our sample contains a few games that were released after 2018 (*Apex Legends, Animal Crossing: New Horizons, Fall Guys*) or experienced an immense boost in popularity since then (*Among Us*). Further, our sample arguably contains more games that are not necessarily considered as competitive (*Animal Crossing: New Horizons*) or infamous for their toxicity (*Madden, Fall Guys*). With this, our findings extend to a broader set of games. In line with recent reports about hate and harassment in games (including *Minecraft* and *Roblox*) (Anti-Defamation League, 2022), we find that the harmful effects of toxicity affect online games of all types and not just competitive and infamously toxic games. Thus, it is important to acknowledge that this is not a problem of some games but a challenge that we need to combat at scale (Anti-Defamation League, 2021, 2022).

4.3. Limitations

By analyzing two samples, we show that the relationships between perceived toxicity and outcomes are stable across a period of multiple months. However, both samples investigated responses from the same respondents. As such, findings might be limited to this specific sample and should be replicated with other players. Additionally, though our Time 2 data was drawn from the same group who provided responses at Time 1, our analysis did not allow us to connect the responses from specific participants between timepoints (limiting us to cross-sectional analysis). Future research with prospective analysis is likely to generate additional insights.

Our data was gathered with a survey on Amazon Mechanical Turk, which is subject to challenges regarding the quality of data gathered, such as fraudulent behavior (Dennis et al., 2020) or even social media phenomena (Letzter, 2021). While this platform can generate valuable, high-quality data when precautions are taken, e.g., filtering spurious responses (Meade & Craig, 2012, Buchanan & Scofield, 2018, Mason & Suri, 2012, Paolacci & Chandler, 2014, Shapiro et al., 2013), it is possible that the sample is not representative of all types of players. Similarly, we deliberately recruited regular gamers as participants and cannot claim generalizability to other groups, such as novice players. Thus, replication of these effects with other samples may be beneficial. Relatedly, our sample size did not allow us to explore any game-specific effects. It may be that our findings vary across games and that some of the differences between this and previous research relate to the games being predominantly played by participants.

In this paper, we report on a partial replication because we were mainly interested in the relationship between toxicity with social capital, loneliness, and relatedness. As such, in comparison with Depping et al. (2018), we did not assess cooperation and interdependence in our survey and accordingly did not include them as factors in our model. Thus, we cannot provide information about this part of the model and further cannot make claims about potential interaction between those factors.

In our study, we did not explore traits like moral disengagement (Beres et al., 2021, Boardley & Kavussanu, 2007) or online disinhibition (Beres et al., 2021, Kordyaka et al., 2020) that have been shown to be associated with toxicity. Future work may be beneficial to explore how these traits interact with perceptions on toxicity and positive and negative outcomes.

One limitation is our measure of toxicity. While it has been successfully used in prior work (Depping et al., 2018, Beres et al., 2021), it is not a validated scale. Other validated scales were not a good fit for our study, because they measure different constructs, such as the perpetuation of toxicity (e.g., Kordyaka et al., 2019), rather than perceptions about toxicity. We chose to use the scale from Depping et al. (2018) for comparability with the original study that we wanted to replicate. However, with this, our scale may not fully capture perceived toxicity, highlighting the need for confirmation of these results. Further, this echoes calls from prior work (Frommel et al., 2022) about the potential for the development of a validated scale.

4.4. Implications

Our findings are further evidence that players can experience positive and negative outcomes in games, which we should not consider in isolation. It would be a fallacy to think that all players only experience benefits or just negative outcomes. Although they lie in stark contrast, it is possible that players experience these positive and negative outcomes in the same game. Specific outcomes often depend on several things, including the players themselves, the games and their design characteristics, as well as the context (Johnson et al., 2013). Thus, we argue that future research would be beneficial to investigate different contexts, in which experiences are good or go awry. It can be useful to use online methods to assess a player's current state, i.e., how they experience games to be able to adjust features during runtime to provide a more beneficial experience. For instance, automated methods may be useful to predict whether a player perceives a social interaction as positive or toxic (Frommel et al., 2020).

The results add to the existing research suggesting the harm of toxicity in games. In addition to the many negative effects like experiencing psychological distress, rumination, and social withdrawal (Fox et al., 2018, Fox & Tang, 2017, Pew Research Center, 2014, Runions, 2013), feeling uncomfortable, upset, isolated, or alone, being less social, treating other people worse than usual, or having depressive or suicidal thoughts (Anti-Defamation League, 2021), and harassment of marginalized groups (Chess & Shaw, 2015, Fox & Tang, 2014, Salter & Blodgett, 2012, Kuznekoff & Rose, 2013), our findings confirm that players who perceive their gaming community as toxic also experience lower in-game social capital, lower need satisfaction of relatedness, and higher loneliness. As such, toxicity is an ongoing problem for gaming communities that should be combated in focused efforts by game developers, researchers, and importantly game communities themselves (Anti-Defamation League, 2021). This is essential considering the normalization of toxicity (Beres et al., 2021), which will require a major shift in culture.

In addition to normalization, there are further reasons why toxicity remains a problem. Automated sensing methods can be useful, especially given that reporting methods are often misappropriated (Kou & Gui, 2021). However, what is toxic can be a very subjective question (Frommel et al., 2020), suggesting that the assessment methods should be grounded in how players perceive others' behaviours (Frommel et al., 2020). Further, most tools merely use punishment like bans, which is valuable but does not help players who have already experienced toxicity. Thus, it may be beneficial to support players who have been targeted by toxic players, e.g., with tools that provide recovery and mood improvements. As such, we argue that more useful methods are necessary to solve the problem of toxicity. In general, we can only hope to combat toxicity with concerted efforts by multiple stakeholders, including game developers, governments, researchers, and the players themselves (Anti-Defamation League, 2021).

5. Conclusions

Multiplayer games can be beneficial for players while toxicity can be detrimental. We showed that perceived toxicity of gaming communities was associated with lower in-game social capital, need satisfaction of relatedness, and higher loneliness. These findings partially replicate and extend results from prior work (Depping et al., 2018, Mandryk et al., 2020). Overall, our contribution provides evidence for the harm of toxicity, a widely prevalent and harmful set of behaviours that we must combat to ensure safe and healthy gaming communities.

Declaration of competing interest

The authors have no conflict of interest to declare.

Data availability

The authors do not have permission to share data.

Appendix A. Supplementary material

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.chbr.2023.100302.

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