The Effects of Social Exclusion on Play Experience and Hostile Cognitions in Digital Games

Max V. Birk[1], Benjamin Buttlar[2], Jason T. Bowey[1], Susanne Poeller[2], Shelby C. Thomson[1], Nicola Baumann[2] and Regan L. Mandryk[1]

[1]Department of Computer Science,
University of Saskatchewan
Saskatoon, Saskatchewan, Canada
{firstname.lastname}@usask.ca

[2]Department of Psychology,
University of Trier
Trier, RLP, Germany
{buttlar, s1supoel, nicola.baumann}@uni-trier.de

ABSTRACT

The social nature of multiplayer games provides compelling play experiences that are dynamic, unpredictable, and satisfying; however, playing digital games with others can result in feeling socially excluded. There are several known harmful effects of ostracism, including on cognition and the interpretation of social information. To investigate the effects of social exclusion in the context of a multiplayer game, we developed and validated a social exclusion paradigm that we embedded in an online game. Called Operator Challenge, our paradigm influenced feelings of social exclusion and access to hostile cognitions (measured through a word-completion task). In addition, the degree of experienced belonging predicted player enjoyment, effort, and the number of hostile words completed; however, the experience measures did not mediate the relationship between belonging and access to hostile cognitions. Our work facilitates understanding the causes and effects of exclusion, which is important for the study of player experience in multiplayer games.

Author Keywords

Video Games; Social Exclusion; Ostracism; Aggression; Player Experience; Motivation; Toxicity

ACM Classification Keywords

K.8.0 [Personal Computing]: General - Games

INTRODUCTION

People are choosing to spend more of their leisure time and money playing digital games than on movies and music combined [19]. Multiplayer games are particularly popular (e.g., League of Legends has 67 million active players [47]); the majority of gamers play multiplayer games, and do so at least weekly [22]. Although the social nature of multiplayer games provides compelling play, there is also the risk of social exclusion as a result of playing with others. Being excluded can happen explicitly, for example, not being picked for the raiding team in Destiny, or getting kicked out of a clan in World of Warcraft. But being excluded can also happen less explicitly during fluid play – for example, if your teammates do not wait before starting a fight in League of Legends. And the subtlest forms of social exclusion in online play may not even be intentional, for example, if a player in Call of Duty always asks a different player to cover him when he engages the enemy. Whether or not social exclusion is explicit or even intentional does not change that it can make an excluded player feel as if they do not belong.

Although not studied in the context of social play, research has identified several harmful implications of experiencing social exclusion, including decrements in intelligent thoughts [3], impairments of executive functioning [4], an increased tendency to interpret ambiguous situations in a threatening way, and increases in the inclination to perceive neutral information in a hostile manner [17], facilitating access to hostile cognitions. In the context of social play, these observed cognitive effects could translate into impaired in-game performance (affecting a player's feelings of their own competence), whereas the observed effects on interpretation could cause players to assume that their teammates are treating them with hostility (affecting a player's feelings of being connected to others). Previous research has shown that feeling competent and connected to other players are fundamental components of positive play experiences [7,42,49], thus it is likely that feeling excluded during social play will negatively affect play experience.

However, it is also possible that the known effects of social exclusion do not translate into the context of online multiplayer games. For example, players may not be as susceptible to feeling excluded in the first place because the game context changes how the social self is threatened. Or perhaps ostracism experienced in games does not translate into hostile cognitions because of the different expectations players have in the game world (i.e., the magic circle in which there are special rules and boundaries) or because the enjoyment of games buffers players from the effects of social exclusion. Even if players experience feelings of social exclusion, these may not result in increased access to

CHI'16, May 07-12, 2016, San Jose, CA, USA
 ISBN 978-1-4503-3362-7/16/05…$15.00
DOI: http://dx.doi.org/10.1145/2858036.2858061

hostile cognitions, as we do not know the role that game experience plays in facilitating or hindering this translation.

In this paper, our goals are: to induce feelings of social exclusion in an experimental paradigm that simulates an online game, to understand how the experienced feelings of exclusion affect play experience, and to model how feelings of exclusion translate into behaviour – specifically how exclusion facilitates access to hostile cognitions. To investigate these relationships, we first created a multiplayer game-based social exclusion paradigm – called Operator Challenge – that allowed us to induce either social exclusion or inclusion in the context of an online social game. We evaluated the efficacy of our paradigm by asking three research questions:

RQ1: Does Operator Challenge induce social exclusion?
RQ2: Does being excluded change affective state?
RQ3: Does being excluded translate into hostile cognitions?

Our results show that being excluded in Operator Challenge increased feelings of social exclusion and access to hostile cognitions (as measured by a word completion task), but did not change experienced affect.

To then test the effects of social exclusion on players and their play experience in an online context, we conducted a second study in which we excluded all participants. We evaluated how feelings of belonging influence player motivation (i.e., enjoyment, effort, and tension), and hostile cognition by answering three additional research questions using mediated regressions:

RQ4: Do feelings of belonging predict the availability of hostile cognitions?
RQ5: Do feelings of belonging affect player motivation?
RQ6: Does player motivation mediate the relationship between feelings of belonging and hostile cognitions?

Our results show that lower feelings of belonging are associated with increased access to hostile cognitions and reduced player motivation in terms of enjoyment and effort; however, we also show that the relationship between feelings of belonging and hostile cognitions is not mediated by enjoyment, effort, or tension.

Operator Challenge allowed us to systematically explore the effects of social exclusion in the context of an online multiplayer game, which can contribute to understanding how positive and negative social play experiences are formed by the complex relationships between players and the game and between the players themselves. We discuss how manipulating social exclusion in an online game environment can help us answer the questions of what makes people resilient to the effects of social exclusion in games, how we can mitigate hostile behaviour through game design, or what interface solutions in multiplayer games reduce contempt, toxicity, and exclusion, and instead foster support and inclusion – ultimately resulting in compelling and enjoyable online social play.

RELATED WORK

In this section, we explain theories of player experience, we present the roots and effects of social exclusion, and we describe the role of player aggression in online play environments.

Understanding Player Experience

Understanding player experience is a challenging endeavor. People are complex, and so are our experiences – what we bring into a game as traits (e.g., our personality) and states (e.g., do we feel stressed out or relaxed) affects how we experience gameplay [7]. In addition, games are complex systems – the mechanics, dynamics, and aesthetics work together to create multifaceted experiences [29]. Most importantly, how games are experienced is an interaction between the complexities of both the games and the people who play them [43, 45, 8].

Several theories have explained aspects of the play experience. For example, Flow theory asks how the balance between skill and difficulty affects experience [53]; whereas theories of immersion ask under which conditions we feel engrossed in the experience [13]. Other theories situate our understanding of play behaviour in the context of general human behaviour. Mood management theory, for example, is concerned with the question of how we use media in general [64], and games specifically, to self-regulate our arousal and affective states [46]. Another overarching theory is self-determination theory [48], which helps explain why people play, using a well-grounded theoretical framework. Used to explain player experience, self-determination theory suggests that when our need for perceived competence (i.e., demonstrating mastery over challenges), autonomy (i.e., doing so under their own volition), and relatedness (i.e., doing so while feeling connected to others) are satisfied, we will be intrinsically motivated to perform an activity – that is, we will experience enjoyment and invest effort in the activity [49].

Player experience is affected by myriad factors, including who we are (e.g., [8]), how we feel at the time of play (e.g., [45]), and whether or not our basic psychological needs [25] are being satisfied in life (e.g., [43]). In this study, we explore whether social exclusion during play has negative effects on player experience.

Social Exclusion

Social exclusion is a behaviour pattern common to animals and people. On one hand, it is highly functional from an evolutionary perspective; for example, it enhances group cohesion to ostracize those who disobey social norms. On the other hand, being rejected might have fatal consequences, being a death penalty for many social animals [27]. Since the early 1990s, a large body of literature arose answering questions regarding reactions and coping of individuals towards the severe threat of social rejection. A widely accepted model was posited by Williams in 2007 [60]. In this temporal need-threat model, Williams states that directly following an encounter with

social exclusion, people feel threatened in four fundamental needs: self-esteem, belonging, control, and meaningful existence. This process is triggered by social pain [20], and is executed on a reflexive level. After the detection of the threat, people direct their attention toward the threat in order to fortify those needs. As outlined in next section, the effects of exclusion and the defensive strategies employed by people can vary greatly [3,4,17] depending on the needs that are threatened and differences in how people appraise the situation. Williams also suggests that if these attempts to cope fail, and social exclusion persists, people eventually resign and drift towards alienation and depression.

Effects of Social Exclusion on Cognition

Research in the laboratory has identified several harmful implications of experiencing social exclusion, including decrements in intelligent thoughts as assessed by general intelligence tests and analytical problem solving [3]. In addition, social exclusion has been shown to result in impairments of executive functioning, assessed using dichotic listening tasks [4]. This same study also showed impairments in self-regulation, measured through behavioural methods (e.g., counting the number of cookies eaten or the time spent before giving up on an unsolvable task). In the context of multiplayer games, cognitive impairments could result in reduced in-game performance, whereas reduced self-regulation has implications on how players interact with the game and with other players.

Effects of Social Exclusion on Social Behaviour

Social exclusion can also be viewed as the cause of a broad range of behavioural effects. For example, if the needs for belonging or self-esteem are threatened, social memory improves [24] and attention for socially relevant cues increases [41]. On the other hand, in order to regain control, the excluded individuals might interpret ambiguous and neutral stimuli in a more threatening way [17], act more aggressively [36] and less pro-socially [55]. Furthermore, Williams [61] describes long-term effects like alienation, depression, helplessness, and worthlessness.

Paradigms of Inducing Social Exclusion

To investigate the consequences of social ostracism, several manipulations have been conducted in face-to-face (e.g., life alone-paradigm [4]) or electronically-mediated (e.g. Cyberball [59]) contexts; for a review see [61]. Effects induced by those paradigms have been replicated reliably. However, Kassner et al. [30] note that virtual procedures offer less realism than modern computer-mediated communication environments. Ostracism paradigms do not take advantage of recent developments in computer-mediated communication [62]. Addressing those issues by adding contemporary design elements to older social exclusion paradigms [30] or by creating an ostracism manipulation with the appearance of a social network with personalized profiles [62] has improved the performance of online social exclusion paradigms.

Prior work has shown that social exclusion (manipulated, for example by asking participants a series of questions and then predicting that they would have a lonely future [17]) facilitates access to hostile cognitions. In addition, this hostile cognitive bias that results from social exclusion has been shown to facilitate aggressive behaviour [17]. The feelings of exclusion prime access to hostile thoughts, which are then exhibited in behaviours. In the context of online play, this implies that social exclusion could result in players misinterpreting neutral comments as threatening or hostile, and could potentially lead to people acting aggressively towards others in the game.

Aggression in Play

Hostile behaviour in games can be exhibited verbally (e.g., insults) or behaviourally (e.g., stealing a teammate's kill in League of Legends). Hostile behaviour can also be exhibited by ostracising teammates when they make a mistake [23], causing them to also feel excluded, and feeding the cycle of rejection, hostility, and aggression. These types of hostile actions in games can contribute to a culture of toxicity [9], which is bad for the social quality of multiplayer games and for the companies who develop and host multiplayers games. Toxicity drives away new players and makes players more likely to quit, which together translates into fewer players, less market share, and lower revenues [50]. As such, companies are actively trying to reduce or eliminate toxicity in their games [34].

Player Experience and Aggression

Few studies have focused on the role that player experience plays in anti-social behaviour. A series of seven studies by Przybylski et al. [42], led the authors to conclude that competence-impeding play is a cause of higher levels of aggressive feelings as well as easier access to aggressive thoughts and a greater likelihood to show aggressive behaviour in players. Chen, Duh, and Ng [14] showed that griefers – i.e., players who aim to decrease other players' enjoyment in a game – are not affected by immersion when the game itself enables grief play, for example, by supporting anonymity. Together, the results suggest that interface options and player experience can facilitate aggressive behaviour.

The recent interest around violence in video games and how it translates into behaviour has received attention from scientists, the media, and the public, and has sparked a lively debate between researchers. For example, Bastian et al. [6] showed that playing violent games, such as Mortal Kombat (Midway Games, 1992), leads to a reduced perception of one's humanity as well as the humanity of one's opponent. This suggests that players might not think of the targets of their aggressive behaviour as people, but more as targets. On the other hand, findings by Cole and Griffiths [15] indicate the importance of online social interactions for the enjoyment of playing games, showing that these interactions are quite meaningful for the players. Previous studies have shown that online environments can

lead to more self-disclosure in individuals [52]. In particular, the lack of eye contact in online contexts can lead to negative effects of online disinhibition [33], which could contribute to aggressive behaviours.

While some of these findings might explain why the prevalence of aggressive behaviour is higher in online contexts, little is known about the reasons why some players show aggressive behaviour and others don't, in which contexts aggression is most likely to occur, and what can be done to minimize it. Some risk factors that have been identified are low character attachment, suspending a disbelief of the game environment, denying responsibility for actions in the virtual space, and demographic factors such as being a young male gamer [11].

The literature on how social exclusion can facilitate hostile thoughts and behaviours (e.g., [17],) suggests that in multiplayer games, social exclusion may contribute to player aggression; however, this relationship is just speculative – the harmful effects of exclusion have not been systematically explored in the context of social play experiences. Our goal in this paper is to understand the effects of social exclusion on experience and behaviour in the context of multiplayer games.

METHODS

Two separate studies were conducted; Study One was designed to test the validity of Operator Challenge, using measures that are known to be affected by social exclusion. Study Two was designed to investigate the effects of social exclusion on experience and behaviour. Both studies were conducted using the online crowdsourcing platform Amazon Mechanical Turk (MTurk). MTurk has been used in online experiments before [31], and has been shown to provide reliable data quality [35].

Instruments

We used standardized scales to assess social exclusion, need satisfaction, intrinsic motivation and the interpretation of ambiguous words. Participant responses were measured using a 5-pt Likert-scale.

Social Exclusion

Social exclusion was measured using the social exclusion questionnaire (SXQ) as used by [57], including the four scales: *self-esteem*, e.g., *"*I feel good about myself*"*; *meaningful existence*, e.g., "I feel meaningless"; *control*, e.g., "I feel powerful"; *feeling of belonging*, e.g., "I feel rejected"; and *positive and negative affect.* SXQ has been used to measure the effects of social exclusion before [58, 60, 61].

Player Experience

Intrinsic Motivation was measured using the Intrinsic Motivation Inventory (IMI, [37]). The IMI measures the constructs *interest-enjoyment,* e.g. "I enjoyed this game very much."*, effort-importance,* e.g., "I put a lot of effort into this game."*,* and *tension-pressure,* e.g., "I felt tense while playing this game. The IMI has been used in games research before (e.g., [7,49]).

Positive and Negative Affect was measured using the Positive Affect Negative Affect Scale (PANAS, [56]). Participants are instructed to indicate how they feel by rating agreement with a list of adjectives, e.g., "hostile" or "excited". PANAS has been used to evaluate games before (e.g., [8,12,49]).

Hostility

Interpretation of Ambiguous Words was measured using the hostile word completion task for aggression (WCT, [1]). The WCT presents words with missing letters to participants, and asks them to fill in the blank; e.g., sl_p, interpretable as slip (neutral) or slap (aggressive). To evaluate the prevalence of aggressive thoughts in a player, the sum of aggressive words was calculated. The WCT has been used before to evaluate aggressive thoughts after exposure to video games [2], or other media [1].

Operator Challenge

To manipulate social exclusion in the context of an online game, we created Operator Challenge, a math based social exclusion paradigm. Operator Challenge was built using HTML5 and JavaScript.

Players begin the game by creating a player profile. Inspired by the questions asked on the dating site Ok Cupid [39], participants answered both standard demographic questions (including sex, name, nickname, age) as well as personal queries (including favourite colour, sexual orientation, whether they were a smoker and drinker, religion, diet, body type, whether they liked dogs, whether they liked cats, and the first thing people notice about them). They were also asked to choose their avatar from a selection of 16 animal icons[1] (see Figure 1). The profile creation was included to induce a sense in players of being invested in and represented in the digital game; profile creation has been used before in online social exclusion paradigms based on interaction over social media [62].

The player was then directed to a tutorial in which their abbreviated profile was displayed along with the game board. The profile included their avatar on a background of their favourite colour, and their name, nickname, age, gender, diet, religion, sexual orientation, and smoking status. Instructions about the mechanics of playing the game were provided in a series of short statements that the player could read and click a "next" button when ready.

Following the tutorial, the player was informed that they would be placed on a team with two other players. Although players were led to believe that these were two other human players, they were in fact computer-controlled characters. The other two players had innocuous profiles that were standardized across all participants (see Figure 3).

[1] http://www.how-to-draw-funny-cartoons.com/royalty-free-animals.html

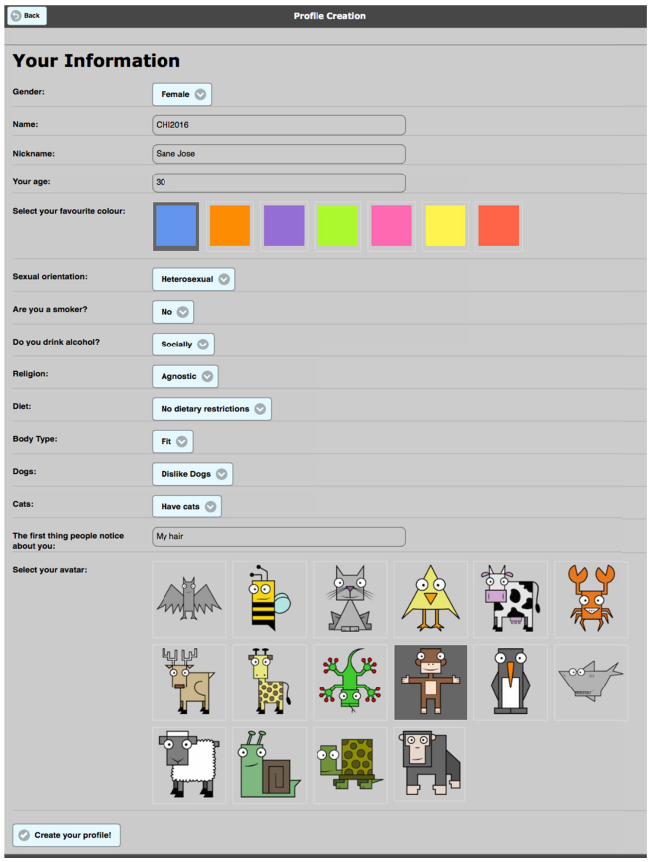

Figure 1. Operator Challenge: Profile Creator

Players were instructed that their goal was to maximize their team's performance so that the team of three could move on and compete against other teams in the next round. After waiting in the lobby to simulate the wait to connect to the other players, they were directed to the practice round.

In the practice round, the player was presented with the layout of the game. This layout consisted of three separate players' profiles, (see Figure 3). To the right of each player's profile description was that player's game board. The game board presented the player with a simple arithmetic statement missing the operation sign with four possible operation signs (addition, subtraction, multiplication and division) available for selection. Players solved these problems by clicking on the corresponding operation sign that made the statement shown true. Each statement only had one correct answer (e.g., 14 _ 3 = 17); ambiguous equations were not included (e.g., 2 _ 2 = 4). Feedback on answer correctness was provided both visually (with green and red coloured feedback) and using a distinct audio cue for correct and incorrect answers (a ding sound for correct answers and a buzz sound for incorrect answers).

In the practice round, as well as the game, the players were asked to answer three math problems in a row and then choose a player to pass control to by clicking on their profile. That player would answer the next three problems before passing control. Within the practice round, control

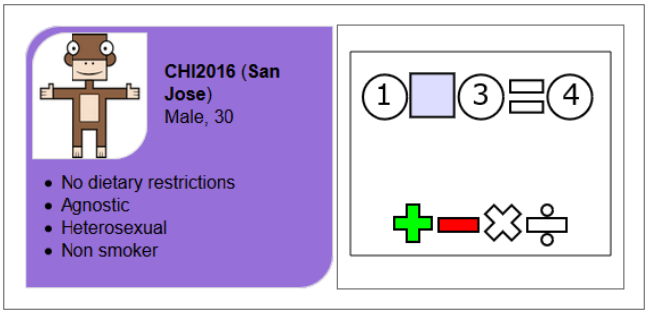

Figure 2. Player Profile, including name, sex, age, diet, religion, sexuality, and smoking behaviour. The arithmetic statement form the tutorial is displayed on the right side of the profile. To train the participant, the operator at the bottom indicates the correct (+) and one wrong answer (-).

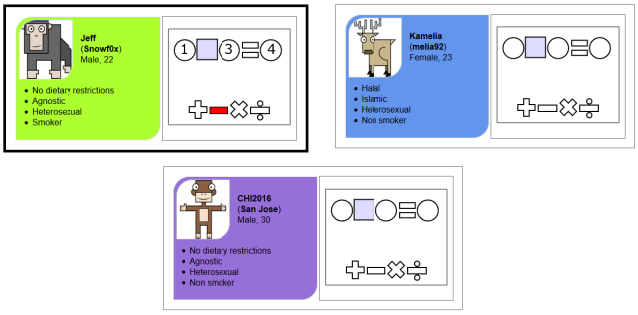

Figure 3. Operator Challenge: The game screen shows two computer-controlled players at the top and the player at the bottom. The black boarder around the green player indicates that it is his turn. The red minus indicates a response error.

was passed five times and was scripted so that each player had two chances to solve the three consecutive problems and pick which player would have their turn next. The game passed control 21 times before ending. Computer-controlled characters took a random time between 1 and 2 seconds to answer a question and made a maximum of 10 errors across the game. The order of questions was scripted.

After control had passed 21 times, the game notified the players that their performance scores would be sent away for analysis and compared with the scores of other players. Players pressed a 'continue' button and were redirected to the questionnaires.

Manipulation

To manipulate social exclusion, we used the same approach as in the Cyberball paradigm of social exclusion [59] and manipulated whether or not control was passed to the player. In the *included* version, the participant was included for the entirety of the game by being passed control by the computer-controlled players 33% of the time. In the *excluded* version, the player was passed control for two turns and then no longer passed control so that they felt socially excluded.

The profile creation process was included to foster involvement among participants and reinforce the manipulation. First, threat to the social self is one of the

biggest predictors of stress [16], and second, both included and excluded players could attribute the cause of the ostracism (or lack thereof) to aspects of how they represented themselves. We also chose the math-based game mechanic to reinforce the manipulation. People often have insecurities around their mathematical ability [36], and it has been used in other paradigms to assist in triggering social stress [32].

STUDY 1: MANIPULATION OF SOCIAL EXCLUSION

Our main goal was to test the effects of social exclusion on emotional well-being, experience, and access to hostile cognitions. After creating the online exclusion paradigm, we needed to validate that the paradigm produced feelings of social exclusion and determine whether these excluded feelings had an impact on affective state and hostile cognitions. As such, our first study addressed three research questions:

RQ1: Does Operator Challenge induce social exclusion?
RQ2: Does being excluded change affective state?
RQ3: Does being excluded translate into hostile cognitions?

Participants

To answer these questions we recruited 99 participants (40% female, mean age: 32.38, SD=9.5). Participants received a compensation of $6. 10 participants were excluded from further analysis, using the following criteria: if participants filled in more than five surveys in less than -1SD of average completion time, showed ratings of -+3SD in more than two questionnaires, or produced zero variance across items in more than two questionnaires. Ethical approval was obtained from the University of Saskatchewan behavioural research ethics board, and participants were asked to give informed consent at the beginning of the task. To comply with ethical guidelines, the task was only made available to workers in the USA who were older than 18. Additionally, only workers with an approval rate above 90% were offered the task as a means of quality control.

Procedure

After consenting to the experiment, participants completed the initial demographics surveys and a baseline PANAS. They were then exposed to either the inclusion or exclusion condition of Operator Challenge. After playing Operator Challenge, participants were asked to fill out the PANAS, and the SXQ, to measure subjective differences in response to the paradigm, including feelings of exclusion. Afterwards, all participants performed the word completion task and then completed the final demographic surveys. The order of post-exclusion questionnaires and hostile word completion task was intentional. Our main interest was in validating the exclusion paradigm, thus we assessed feelings of exclusion and changes in affect directly after the experience, followed by assessment of access to hostile cognitions. At the end of the experiment, we included a debriefing page to inform participants of the social exclusion manipulation and the simulation that they were playing with other people. To ensure that they understood the manipulation, they were required to answer a few debriefing questions about the experimental manipulation.

Data Analyses and Results

We present the results by answering our three research questions.

RQ1. Does Operator Challenge induce social exclusion?

To answer this question, we tested if Operator Challenge induced feelings of social exclusion on a subjective level. An independent-samples one-tailed t-test comparing the included vs. excluded groups showed a significant difference in *feelings of belonging*, indicating that participants' feelings of belonging in a social group was affected (t_{87}=8.23; p<.001) by our paradigm. In addition, feelings of *meaningful existence* were lower for the excluded group (t_{87}=7.45; p<.001), showing that participants felt less important, meaningless, and invisible when excluded. Finally, feelings of control were higher for the included group (t_{87}=7.57; p<.001), showing that included participants felt more control over the course of the game. Taken together, these results suggest that Operator Challenge successfully induced feelings of social exclusion (see Figure 4).

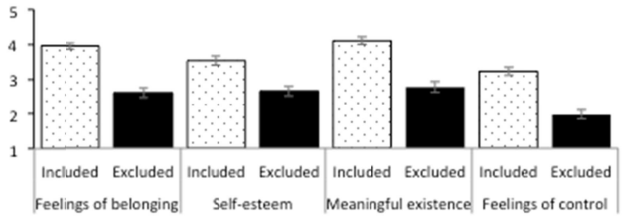

Figure 4. Mean and standard error for the subscales feelings of belonging, self-esteem, meaningful existence, and feelings of control, for the social exclusion questionnaire (SXQ), presented for included and excluded participants.

RQ2. Does being excluded change affective state?

Second, we tested if being excluded facilitated differences in affective state, as measured by PANAS. An independent-samples two-tailed t-test comparing the included vs. excluded groups showed that there was no significant group difference on positive affect change (t_{87}=0.93; p=.355) or negative affect change (t_{87}=0.47; p=.639). See Figure 5.

RQ3. Does being excluded translate into hostile cognitions?

As a final step to evaluate our exclusion paradigm, we wanted to determine whether being excluded translates into action as indicated in our sample by access to hostile cognitions. A one-tailed independent-samples t-test on the sum of hostile words in the ambiguous word completion test shows that participants in the excluded group wrote significantly more hostile words than included participants (t_{87} =1.80; p=.038), indicating that being socially excluded translates into the availability of hostile cognitions (Included: mean=9.57, SD=2.18; Excluded: mean=10.62, SD=3.25).

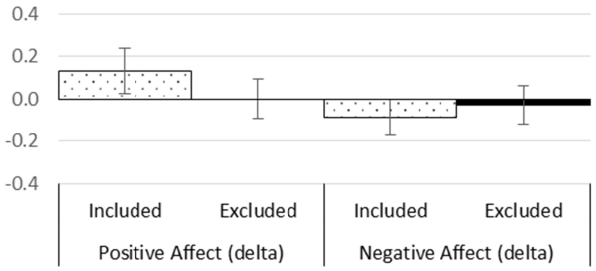

Figure 5. Increase in Positive and Negative Affect calculated as Positive/Negative Affect post – Positive/Negative Affect pre.

Summary of Results

Our first experiment showed that being excluded through Operator Challenge induces social exclusion; participants experienced decreased feeling of meaningful existence, loss of control, and less feeling of belonging. Neither positive nor negative affect was influenced by social exclusion; however, excluded participants had increased availability of hostile cognitions. Our results replicate findings from the laboratory by [17] and show that hostile cognitions can be induced through a social exclusion game in an online context with little experimental control.

STUDY 2: THE EFFECTS OF SOCIAL EXCLUSION

The first study was focused on establishing that Operator Challenge induces social exclusion; the second study was designed to investigate how differences in experienced exclusion increase the availability of hostile cognitions and how this relates to the player's experience during play.

As such, we asked another three questions:

RQ4: Do feelings of belonging predict the availability of hostile cognitions?
RQ5: Do feelings of belonging affect player experience?
RQ6: Does play experience mediate the relationship between feelings of belonging and hostile cognitions?

We evaluated the degree of social exclusion using the feelings of belonging scale – as opposed to meaningful existence or control – as it is most indicative of the effects of social exclusion in online multiplayer games – i.e., a player feels rejected.

Participants

We recruited 202 participants (45% female, mean age: 32.83, SD=10.13). We excluded a total of 6 participants using the same process as for Study One.

Procedure

The procedure for the second study was similar to the first, with two main differences: 1) participants were only exposed to the exclusion condition of Operator Challenge, because we were only interested in the experience of people who feel socially excluded; 2) the player experience measures were included after the social exclusion questionnaire, which measured feelings of exclusion directly after playing Operator Challenge and before the word completion task. We chose to include the experience measures before the ambiguous word completion task to ensure that the measures were reflective of the experience of playing Operator Challenge and not of the experience completing the word completion task. Doing so could have reduced the strength of the effects our exclusion paradigm had on the word completion task; however, we felt from Study One that the manipulation was strong enough to last throughout the time taken to complete the experience questionnaires (which is less than the time that the effects of social exclusion have been shown to last [63]).

Data Analyses

Because we socially excluded all participants, our questions are answered using mediated regression analyses in which *feelings of belonging* is a continuous independent variable. To answer our questions, we performed mediation analyses as suggested by Hayes [28]. A mediation model assumes that the relation between two variables, i.e. X and Y, is influenced by a latent mediation variable, i.e., M. We tested the prediction of *feelings of belonging* (X) on the outcome variable *hostile word completion* (Y), potentially mediated by intrinsic motivation, i.e., enjoyment, effort, and tension (see Figure 6). The results investigate: 1) the path between X→Y to answer question one, 2) the path X→M to answer question two, and 3) the path X→M→Y to answer question three. Age and gender were entered as control variables into the model. Analyses were performed using SPSS 23, using the process toolbox [28]. Prior to modeling, all data was z-standardized and mean centered.

Results

To ensure that participants were socially excluded (i.e., that Operator Challenge reliably induced feelings of exclusion), we tested if *feelings of belonging* from Study Two is comparable with the Study One dataset. Independent-samples t-tests (with equal variances not assumed) show that there is no difference between feelings of belonging from participants in Study Two (*mean*=1.44, *SD*=0.85) compared to the socially excluded group from Study One (*mean*=1.56, *SD*=0.92, t_{68}=.88, p=.406), whereas we do see the expected differences with the included group from Study One (*mean*=2.91, *SD*=0.62, t_{104}=13.8, p<.001). These results suggest that participants in Study Two are responding to Operator Challenge in a similar manner as participants did in Study One.

RQ4. Do feelings of belonging predict the availability of hostile cognitions?

To answer this question, we investigated the relationship between *feelings of belonging* and *hostile word completion* (X→Y). The total effect shows that *feelings of belonging* are negatively associated with hostile word completion (β=-.95, p<.05, R^2=.05), i.e., that participants who felt more excluded as a result of playing Operator Challenge tend to produce more hostile words. The model (shown in Figure 6) confirms that feelings of belonging are associated with the availability of hostile cognitions.

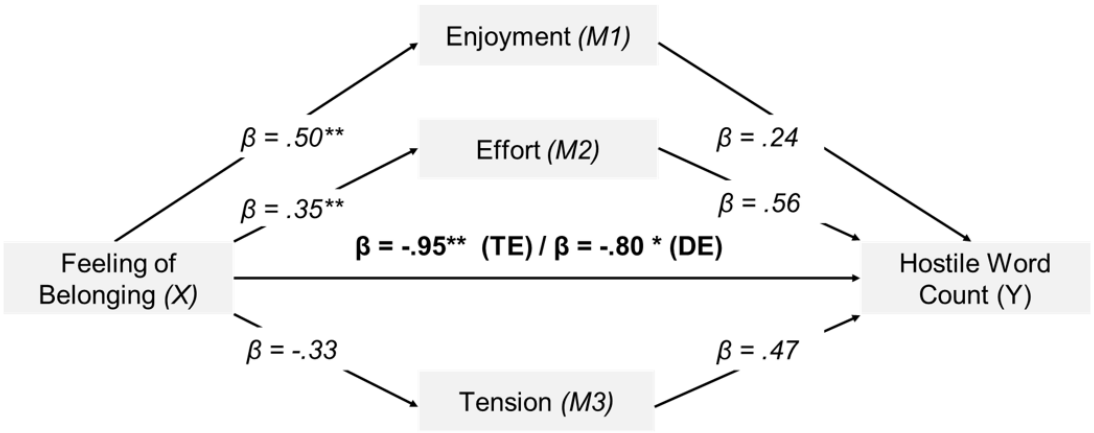

Figure 6. Beta-values for the relationship between Feeling of Belonging (X) and Hostile Word Count (Y) mediated by intrinsic motivation: enjoyment (M1), effort (M2), and tension (M3). *p<.05; **p<.01.

RQ5. Do feelings of belonging predict play experience?

To answer this question, we investigated the relationship between *feelings of belonging* and *intrinsic motivation* factors, i.e., enjoyment, effort, and tension *(*X→M). The individual effects show that *feelings of belonging* are associated with increased enjoyment (β=.50, p<.00, R^2=.11), and increased effort (β=.35, p<.01, R^2=.07), but not tension (β=-.33, p=.07, R^2=.03). These results show that player enjoyment and invested effort are both positively associated with feelings of belonging

RQ6. Is play experience mediating the relationship between feelings of belonging and hostile cognitions?

To answer this question, we investigated the full mediation model (X→M→Y) of *feelings of belonging* on *hostile word completion* mediated by the *intrinsic motivation* variables of enjoyment, effort, and tension. The results show that although the association of feeling of belonging on hostile word completion is improved by including experience measures in the model *(*β=-.80, p<.05, R^2=.07), neither enjoyment (β=-.29, p>.05), nor effort (β=-.16, p>.05), nor tension (β=-.14, p>.05) are associated with hostile word completion or mediate the relationship between feelings of belonging and hostile word completion, i.e., the direct effect between feelings of belonging and hostile word completion stays significant (β=-.80, p<.05). This suggests that feeling excluded is directly associated with access to hostile cognitions, and that this relationship is not mediated by the observed differences in intrinsic motivation factors as a result of social exclusion.

Summary of Results

First, our results indicate that *feelings of belonging* are associated with hostile cognition directly. Second, increased *feelings of belonging* are associated with increased enjoyment and invested effort. Third, we show that although increased *feelings of belonging* are associated with both increased hostile word completion and increased intrinsic motivation, intrinsic motivation is not significantly associated with hostile word completion. Even more importantly, intrinsic motivation does not mediate the relationship between *feelings of belonging* and hostile word completion. Feeling excluded is directly associated with the availability of hostile cognitions and influences play experience and access to hostile cognitions independently.

DISCUSSION

The social aspect of multiplayer games creates compelling play experiences; however, players are also at risk of being socially excluded from the actions of their teammates and opponents. Previous research has shown that social exclusion decreases our feeling of belonging and increases hostile cognitions, which translated into aggressive behaviour [17]. We created a social exclusion paradigm that successfully induced ostracism in the context of multiplayer games, which facilitated access to hostile cognitions. Our results showed that the degree of feeling excluded was associated with increased hostile cognitions and impaired play experience. Our results also showed that as a result of social exclusion, hostile cognitions increased regardless of whether or not players enjoyed the game.

Our results are relevant to current research on social exclusion in video games; specifically, these results contribute to the discussion around social exclusion as a trigger of aggression in multiplayer gaming. In a context where multiplayer games have become ubiquitous, social exclusion not only has emotional consequences, but also an economic impact. Our results show how when players are ostracized, their experience is negatively impacted, and they experienced less game enjoyment and were not as willing to invest effort into play. This reduced motivation to play may translate into fewer players returning to the game, affecting revenues for the company. Our results also suggest that the social exclusion seen in multiplayer online games can lead to hostility (which can lead to aggression), resulting in further ostracism of another player. This positive feedback loop of exclusion-hostility-aggression can escalate in multiplayer games, creating negative environments that are not fun for anyone.

In this section, we discuss the implications of our results, present the importance of an effective paradigm that works well in the online context, and discuss future directions to mitigate the negative effects of social exclusion.

Application to Online Multiplayer Games

The effects of social exclusion go beyond the hostile interpretation of ambiguous words. Previous work has shown that after being excluded, people have reduced executive functioning [4] and decrements in intelligent thoughts [3]. The lack of inhibition control, self-regulation, or poor decision-making could lead to poor performance and mistakes made in the game. Although perhaps not a problem in and of itself, mistakes and poor decision making in a team-based game can also lead to aggression. For example, nearly half (48%) of the reported toxic behaviour in a study of League of Legends (LoL, Riot Games, 2009) [23] started with a team member making a mistake that resulted in another player dying in the game. Mistakes and aggression can facilitate toxic play environments, which are a big issue in the context of modern multiplayer interaction.

Toxicity in Games

Toxicity has become a common occurrence in online contexts. A study by Ballard and Welch showed that 52% of massively multiplayer online role playing game (MMORPG) players reported that they had been cyber-victimized before and 35% admitted to perpetrating cyberbullying themselves [5]. When playing an online video game, it is likely that toxic behaviour will be encountered. There are many ways for a player to negatively influence the gaming experience of others in multiplayer online games, including, for example, griefing and trolling, as well as insulting or harassing enemies or allies. The question of why people behave in toxic ways toward others online has garnered recent interest. Players of League of Legends stated that in around 26% of the games, where toxic behaviour occurred, the identified reason was a lack of teamwork [23]. Most cases of toxicity in this study (48%), however, started with a teammate making a mistake that resulted in in-game death.

As such, many companies are actively trying to reduce or eliminate toxicity and negative behaviour in their games [34]. As the Lead Game Designer of Social Systems in League of Legends, Jeffrey Lin argues that in competitive multiplayer games, social interaction determines if a player continues to play or quits. [34]. The Riot Games research team found that players who experience in-game toxicity are up to 320% more likely to quit playing the game [34]. This is consistent with a study by Shores et al. [50] stating that toxic players in League of Legends drive away new players. Toxic behaviour in online games has implications not only for user experience, but for the financial bottom line of the companies who produce and host online play.

The Importance of Experimentally Inducing Exclusion in an Online Multiplayer Game Context

To avoid the negative experience that results from social exclusion in online games, we need to ask how social exclusion unfolds in online play and what effects it has on players. The available toolsets to answer these questions are mostly analytic (mining the logged data, e.g., skill-based spatio-temporal differences, [18]) or ethnographic (engaging as a researcher in the online game, e.g., investigating collaboration in *World of Warcraft* [38]). These methods have the benefit of providing access to the in situ experience of players, which gives ecological validity to the work; however, they also have several drawbacks. Analytic approaches are only available to those with access to the dataset, and although many companies release access to their game data (e.g., Riot Games API [https://developer.riotgames.com/]), they generally remove access to metrics that relate to toxicity in order to protect their brand. Ethnographic approaches are time and labour intensive and limit exposure to a very small subset of the game activity. Finally, when modeling player experience and behaviour, it is important that we elicit genuine responses from our participants, which can be difficult to achieve in a laboratory; however, using in situ methods alone can hinder the accuracy of the resulting models due to a lack of experimental control.

Current methods of inducing social exclusion experimentally are not situated in the context of multiplayer games. The life alone paradigm [4] suggests to participants that they will spend their life alone, based on their answers to a series of personality questions; the get acquainted paradigm has participants meet a confederate, who then refuses to work with them on future tasks [41]. The closest paradigm to the context of online multiplayer games is the Cyberball paradigm. In Cyberball, players are told that they are doing an experiment on mental visualization and are asked to visualize the context, the appearance, and personality of other participants while they pass a virtual ball to each other; excluded participants are not passed the ball. Cyberball has been very successfully used in many studies on the effects of social exclusion (see [61]); however, equating Cyberball to a multiplayer online game is not reasonable.

Studying human behaviour requires a balance between the experimental control needed to manipulate, measure, and model behaviour, and the realism needed to replicate the situations that the experiment is trying to investigate. This experimental control-mundane realism tradeoff requires researchers to decide how to tradeoff the precise manipulation of independent variables with the ecological validity of working in situ [10]. Researchers studying social exclusion have the difficult task of making experiment participants actually feel social ostracism through manipulation and deception. In our case, we have the added layer of difficulty of working in the context of digital games. One of the defining characteristics of digital game play is that players are engaging under their own volition [49], which is very much at odds with the idea that the situation can be experimentally controlled (i.e., participants are required to be there). Researchers have struggled with how to promote realistic game play in the context of experimental control

[12]. In our case, studying social exclusion in the context of games requires consideration of the validity of excluding participants and also doing so in the context of playing a game.

Because of its success to induce social exclusion, we based aspects of Operator Challenge on Cyberball, but built up a more game-like environment, mechanic, and context to establish a better link into the effects of social exclusion in online multiplayer games and to create a paradigm that better balances realism with experimental control. Although we provide a paradigm that works towards this balance, equating Operator Challenge with a complex and immersive online multiplayer game, such as League of Legends, or Destiny is also not reasonable. Future research needs to translate the findings from using Operator Challenge into these ecologically-valid contexts. Although we can only speculate, we assume that our findings will translate. In a commercial game (e.g., League of Legends, Destiny), players are intrinsically motivated to play. Players wish to invest effort and they care about how they are perceived by the other players on and off their team. In Operator Challenge, the participants were MTurk workers who were there to complete a task and get paid. Their motivation was different and their concern about how they were perceived by the other players in this ephemeral situation was also likely different. The effects of social exclusion on players should be even stronger when the participants are more intrinsically invested in the experience, and we plan to investigate this in future work.

Limitations and Future Work

Although our work demonstrates a number of important contributions, there are several limitations that we will address through future work.

First, as previously discussed, we performed our study on Amazon's Mechanical Turk platform, with people engaged in completing a task for money, not with players interested in gaming under their own volition. In future work, we will extend our approach to determine whether the results transfer to more realistic gameplay environments.

Second, the link between access to hostile cognitions as a result of social exclusion and aggressive behaviour has already been made outside of the context of online social game play [17]. We assume that this link will stay intact in the context of online game play; however, future work will consider demonstrating this explicitly.

Third, we discussed that the effects of social exclusion go beyond access to hostile cognitions. There are several harmful cognitive effects that result from being excluded that could be relevant to research in the context of online game play. We will investigate whether or not these results also transfer into the Operator Challenge paradigm.

Finally, although the effects of social exclusion are often negative, there are several positive outcomes that result from the type of social ostracism that we manipulated in our study. For example, social exclusion has been shown to improve social memory [24] and attention to socially-relevant cues [41]. Leveraging the social benefits of ostracism in multiplayer game design presents an interesting challenge that we will explore in future work.

CONCLUSIONS

Multiplayer games draw a large number of players, who are motivated by the compelling gameplay and interesting dynamics that emerge from the uncertainty of playing with other people. Playing as part of a team against another team brings in aspects of both cooperation and competition, which can be very motivating for players. However, playing with other people also has the drawback of potentially being subject to negative or hurtful behaviour. In particular, the social exclusion that occurs both explicitly and subtly in multiplayer online games can increase hostile cognitions, resulting in in-game aggression, and ultimately a toxic play environment.

To experimentally investigate the effects of ostracism in online multiplayer games, we first created a game-based social exclusion paradigm called Operator Challenge that produces feelings of exclusion in an online environment. In an online study, we showed that social exclusion reduces feelings of belonging and that excluded players exhibit more hostility than included players as measured by the hostile interpretation of ambiguous stimuli. In a second study, we show that the degree of feeling excluded predicts drops in game enjoyment and invested effort, and increases in tension. In addition, the degree of feeling excluded predicts the degree of access to hostile cognitions and this relationship is not mediated by the measures of experience.

Research into the causes and effects of social exclusion in online games can contribute to solving the problem of toxicity in multiplayer games. Operator Challenge allowed us to systematically explore the effects of social exclusion in the context of an online multiplayer game. Manipulating social exclusion in an online game environment will help us answer the important questions of what makes people resilient to the effects of social exclusion in games, how we can mitigate hostile behaviour through game design, or what interface solutions in multiplayer games reduce contempt and exclusion, and instead foster support and inclusion – ultimately resulting in compelling and enjoyable online multiplayer games.

ACKNOWLEDGMENTS

We thank Jared Pritchard for his work on the Operator Challenge paradigm. Thanks also to NSERC and GRAND for funding, to Colby Johanson for his work on BOF, and to the Interaction Lab at the University of Saskatchewan.

REFERENCES

1. Craig A. Anderson, Nicholas L. Carnagey, and Janie Eubanks. 2003. Exposure to violent media: The effects of songs with violent lyrics on aggressive thoughts and feelings. *Journal of Personality and Social Psychology*

84 (5), 960-971. http://dx.doi.org/10.1037/0022-3514.84.5.960

2. Craig A. Anderson and Karen E. Dill. 2000. Video games and aggressive thoughts, feelings, and behavior in the laboratory and in life. *Journal of Personality and Social Psychology* 78(4), 772-790. http://dx.doi.org/10.1037/0022-3514.78.4.772
3. Roy F. Baumeister, Jean M. Twenge, and Christopher K. Nuss. 2002. Effects of social exclusion on cognitive processes: Anticipated aloneness reduces intelligent thought. *Journal of Personality and Social Psychology* 83(4), 817-827. http://dx.doi.org/10.1037/0022-3514.83.4.817
4. Roy F. Baumeister, C. Nathan DeWall, Natalie J. Ciarocco, and Jean M. Twenge. 2005. Social Exclusion Impairs Self-Regulation. *Journal of Personality and Social Psychology* 88(4), 589-604. http://dx.doi.org/10.1037/0022-3514.88.4.589
5. Mary E Ballard and Kelly M Welch. 2015. Virtual Warfare: Cyberbullying and Cyber-Victimization in MMOG Play. *Games and Culture*. http://dx.doi.org/10.1177/1555412015592473
6. Brock Bastian, Jolanda Jetten, and Helena R.M. Radke. 2012. Cyber-dehumanization: Violent video game play diminishes our humanity. *Journal of Experimental Social Psychology* 48(2), 486-491. http://dx.doi.org/10.1016/j.jesp.2011.10.009
7. Max Birk and Regan L. Mandryk. 2013. Control your game-self. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (CHI'13). ACM, New York, NY, USA, 685-694. http://dx.doi.org/10.1145/2470654.2470752
8. Max V Birk, Regan L Mandryk, Matthew K Miller, Kathrin M Gerling. 2015. How Self-Esteem Shapes our Interactions with Play Technologies. In *Proceeding of the Annual Symposium on Computer-Human Interaction in Play* (CHI PLAY'15). ACM, New York, NY, USA, 35-45. http://dx.doi.org/10.1145/2793107.2793111
9. Jeremy Blackburn and Haewoon Kwak. 2014. STFU NOOB!: predicting crowdsourced decisions on toxic behavior in online games. In *Proceedings of the 23rd international conference on World wide web* (WWW'14). ACM, New York, NY, USA, 877-888. http://dx.doi.org/10.1145/2566486.2567987
10. Jim Blascovich, Jack Loomis, Andrew C. Beall, Kimberly R. Swinth, Crystal L. Hoyt, and Jeremy N. Bailenson. 2002. TARGET ARTICLE: Immersive Virtual Environment Technology as a Methodological Tool for Social Psychology. *Psychological Inquiry* 13(2), 103-124. http://dx.doi.org/10.1207/s15327965pli1302_01
11. Nicholas D Bowman, Daniel Schultheiss, and Christina Schumann. 2012. I'm Attached, and I'm a Good Guy/Gal!: How Character Attachment Influences Pro- and Anti-Social Motivations to Play Massively Multiplayer Online Role-Playing Games. *Cyberpsychology, Behavior, and Social Networking* 15(3), 169-174. http://dx.doi.org/10.1089/cyber.2011.0311
12. Jason Bowey, Max V Birk, and Regan L Mandryk. (2015). Manipulating Leaderboards to Induce Player Experience. In *Proceeding of the Annual Symposium on Computer-Human Interaction in Play* (CHI PLAY'15). ACM, New York, NY, 115-120. http://dx.doi.org/10.1145/2793107.2793138
13. Emily Brown, and Paul Cairns. 2004. A grounded investigation of game immersion. In *CHI '04 Extended Abstracts on Human Factors in Computing Systems* (CHI EA '04). ACM, New York, NY, USA, 1297-1300. *http://dx.doi.org/10.1145/985921.986048*
14. Vivian Hsueh-Hua Chen, Henry Been-Lirn Duh, and Chiew Woon Ng. 2009. Players who play to make others cry. In *Proceedings of the International Conference on Advances in Computer Enterntainment Technology (*ACE 09*)*. ACM, New York, NY, 341-344 http://dx.doi.org/10.1145/1690388.1690454
15. Helena Cole and Mark D Griffiths. 2007. Social Interactions in Massively Multiplayer Online Role-Playing Gamers. *CyberPsychology & Behavior* 10(4), 575-583. http://dx.doi.org/10.1089/cpb.2007.9988
16. Sally S Dickerson and Margaret E Kemeny. 2004. Acute Stressors and Cortisol Responses: A Theoretical Integration and Synthesis of Laboratory Research. *Psychological Bulletin* 130(3), 355--391. http://dx.doi.org/10.1037/0033-2909.130.3.355
17. C Nathan DeWall, Jean M Twenge, Seth A Gitter, and Roy F Baumeister. 2009. Its the thought that counts: The role of hostile cognition in shaping aggressive responses to social exclusion. *Journal of Personality and Social Psychology* 96(1), 45-59. http://dx.doi.org/10.1037/a0013196
18. Anders Drachen, Matthew Yancey, John Maguire, Derrek Chu, Iris Yuhui Wang, Tobias Mahlmann, Matthias Schubert, and Diego Klabajan. 2014. Skill-based differences in spatio-temporal team behaviour in Defense of the Ancients 2 (DotA 2). In *Proceedings of IEEE Games Media Entertainment* (GEM'14). IEEE, 1-8. http://dx.doi.org/10.1109/gem.2014.7048109
19. Christopher Dring. 2015. More money is spent on games than movies and music combined, says HIS (Web log post). Retrieved by http://www.mcvuk.com/news/read/more-money-is-spent-on-games-than-movies-and-music-combined-says-ihs/0151059
20. Naomi I Eisenberger and Matthew D. Lieberman. 2004. Why rejection hurts: a common neural alarm system for physical and social pain. *Trends in Cognitive Sciences*

8(7), 294-300. http://dx.doi.org/10.1016/j.tics.2004.05.010

21. Entertainment Software Association. 2014. Essential Facts about the Computer and Video Games Industry (Annual report). Retrieved by http://www.theesa.com/wp-content/uploads/2014/10/ESA_EF_2014.pdf
22. Entertainment Software Association. 2015. Essential Facts about the Computer and Video Games Industry (Annual report). Retrieved by http://www.theesa.com/wp-content/uploads/2015/04/ESA-Essential-Facts-2015.pdf
23. Josefine Fahlström, and Emma Matson. 2014. Preventing Toxic Behaviour through Game Mechanics. (Master's Thesis). Retrieved from http://www.diva-portal.org/smash/get/diva2:731451/FULLTEXT01.pdf
24. Wendi L Gardner, Cynthia L Pickett, and Marilynn B Brewer. 2000. Social exclusion and selective memory: How the need to belong influences memory for social events. *Personality and Social Psychology Bulletin* 26(4), 486-496. http://dx.doi.org/10.1177/0146167200266007
25. Marylène Gagné. 2003. The Role of Autonomy Support and Autonomy Orientation in Prosocial Behavior Engagement. *Motivation and Emotion* 27(3), 199-223. http://dx.doi.org/10.1023/a:1025007614869
26. John Gaudiosi. 2012. Riot Games' League Of Legends Officially Becomes Most Played PC Game In The World (Web log post). Retrieved from http://www.forbes.com/sites/johngaudiosi/2012/07/11/riot-games-league-of-legends-officially-becomes-most-played-pc-game-in-the-world/
27. Margaret Gruter and Roger D Masters. 1986. Ostracism as a social and biological phenomenon: An introduction. *Ethology and Sociobiology* 7(3-4), 149-158. http://dx.doi.org/10.1016/0162-3095(86)90043-9
28. Andrew F Hayes. 2013. Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach. *Journal of Educational Measurement* 51(3), 335-337. http://dx.doi.org/10.1111/jedm.12050
29. Robin Hunicke, Marc LeBlanc, and Robert Zubek. 2004. MDA: A formal approach to game design and game research. In *Proceedings of the AAAI Workshop on Challenges in Game AI*, vol. 4.
30. Matthew P Kassner, Eric D Wesselmann, Alvin Ty Law, and Kipling D Williams. 2012. Virtually Ostracized: Studying Ostracism in Immersive Virtual Environments. *Cyberpsychology, Behavior, and Social Networking* 15(8), 399-403. http://dx.doi.org/10.1089/cyber.2012.0113
31. Aniket Kittur, Ed H. Chi, and Bongwon Suh. 2008. Crowdsourcing user studies with Mechanical Turk In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (CHI '08). ACM, New York, NY, USA, 453-456. http://dx.doi.org/10.1145/1357054.1357127
32. Clemens Kirschbaum, Karl-Martin Pirke and Dirk H. Hellhammer. 1993. The Trier Social Stress Test - A Tool for Investigating Psychobiological Stress Responses in a Laboratory Setting. *Neuropsychobiology* 28, (1-2), 76--81. http://dx.doi.org/10.1159/000119004
33. Noam Lapidot-Lefler and Azy Barak. 2012. Effects of anonymity, invisibility, and lack of eye-contact on toxic online disinhibition. *Computers in Human Behavior* 28(2), 434-443. http://dx.doi.org/10.1016/j.chb.2011.10.014
34. Jeffery Lin. 2015. More Science Behind Shaping Player Behavior in Online Games (Presentation). Retrieved from http://gdcvault.com/play/1022160/More-Science-Behind-Shaping-Player
35. Winter Mason and Siddharth Suri. 2011. Conducting behavioral research on Amazon's Mechanical Turk. *Behavior Research Methods*, 44, (1), 1-23. http://dx.doi.org/10.3758/s13428-011-0124-6
36. Keiichi Miki, Kouki Kawamorita, Yutaka Araga, Toshimitsu Mushu, and Ayako Sudo. 1998. Urinary and Salivary Stress Hormone Levels While Performing Arithmetic Calculation in a Noisy Environment. *Industrial Health* 36(1), 66--69. http://dx.doi.org/10.2486/indhealth.36.66
37. Edward McAuley, Terry Duncan, and Vance V Tammen. 1989. Psychometric Properties of the Intrinsic Motivation Inventory in a Competitive Sport Setting: A Confirmatory Factor Analysis. Research *Quarterly for Exercise and Sport 60*(1), 48-58.
38. Bonnie Nardi, & Justin Harris. 2006. Strangers and friends: Collaborative play in World of Warcraft. In *Proceedings of the 20th anniversary conference on Computer supported cooperative work* (CSCW'06). ACM, New York, NY, 149-158.
39. OkCupid. Web service. http://www.okcupid.com/
40. Erich Prisner. 2009. Game Theory Through Examples. Cambridge University Press (CUP). http://dx.doi.org/10.5948/9781614441151
41. Cynthia L Pickett, Wendi L Gardner, and Megan Knowles. 2004. Getting a cue: The need to belong and enhanced sensitivity to social cues. *Personality and Social Psychology Bulletin* 30(9), 1095-1107. http://dx.doi.org/10.1177/0146167203262085
42. Andrew K Przybylski, Edward . Deci, C Scott Rigby, and Richard M. Ryan. 2014. Competence-impeding electronic games and players' aggressive feelings, thoughts, and behaviors. *Journal of Personality and Social Psychology* 106(3), 441-457. http://dx.doi.org/10.1037/a0034820
43. Andrew K Przybylski, Netta Weinstein, Richard M Ryan, and C Scott Rigby. 2009. Having to versus

wanting to play: Background and consequences of harmonious versus obsessive engagement in video games. *CyberPsychology & Behavior* 12(5), 485-492. http://dx.doi.org/10.1089/cpb.2009.0083

44. Johnmarshall Reeve, Hyungshim Jang, Dan Carrell, Soohyun Jeon, and Jon Barch. 2004. Enhancing Students Engagement by Increasing Teachers Autonomy Support. *Motivation and Emotion* 28(2), 147-169. http://dx.doi.org/10.1023/b:moem.0000032312.95499.6f
45. Leonard Reinecke, Tilo Hartmann, and Allison Eden. 2014. The guilty couch potato: The role of ego depletion in reducing recovery through media use. *Journal of Communication* 64(4). 569-589. http://dx.doi.org/10.1111/jcom.12107
46. Leonard Reinecke, Ron Tamborini, Matthew Grizzard, Robert Lewis, Allison Eden, and Nicholas D Bowman. 2012. Characterizing mood management as need satisfaction: The effects of intrinsic needs on selective exposure and mood repair. *Journal of Communication* 62(3), 437-453. http://dx.doi.org/10.1111/j.1460-2466.2012.01649.x
47. Riot games. 2014. League player reach new heights in 2014 (Web log post). Retrieved by http://www.riotgames.com/articles/20140711/1322/league-players-reach-new-heights-2014
48. Richard M Ryan and Edward L Deci. 2000. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist* 55(1), 68-78. http://dx.doi.org/10.1037/0003-066x.55.1.68
49. Richard M. Ryan, C Scott Rigby, and Andrew Przybylski. 2006. The Motivational Pull of Video Games: A Self-Determination Theory Approach. *Motivation and Emotion* 30(4), 344-360. http://dx.doi.org/10.1007/s11031-006-9051-8
50. Kenneth B Shores, Yilin He, Kristina L Swanenburg, Robert Kraut, and John Riedl. 2014. The identification of deviance and its impact on retention in a multiplayer game. In *Proceedings of the 17th ACM conference on Computer Supported Cooperative Work & Social Computing* (CSCW 14). ACM, New York, NY, USA, 1356-1365. http://dx.doi.org/10.1145/2531602.2531724
51. Statista. 2015. Most played PC games on gaming platform Raptr in November 2015, by share of playing time (Web service). http://www.statista.com/statistics/251222/most-played-pc-games/
52. John Suler. 2004. The Online Disinhibition Effect. *CyberPsychology & Behavior* 7(3), 321-326. http://dx.doi.org/10.1089/1094931041291295
53. Penelope Sweetser, and Peta Wyeth. 2005. GameFlow: a model for evaluating player enjoyment in games. *Computers in Entertainment* (CIE) 3(3), 3-3. http://dx.doi.org/10.1145/1077246.1077253
54. Jean M Twenge, Roy F Baumeister, Dianne M Tice, and Tanja S Stucke. 2001. If you can't join them, beat them: Effects of social exclusion on aggressive behavior. *Journal of Personality and Social Psychology* 81(6), 1058-1069. http://dx.doi.org/10.1037/0022-3514.81.6.1058
55. Jean M Twenge, Roy F Baumeister, C Nathan DeWall, Natalie J Ciarocco, and J Michael Bartels. 2007. Social exclusion decreases prosocial behavior. *Journal of Personality and Social Psychology* 92(1), 56-66. http://dx.doi.org/10.1037/0022-3514.92.1.56
56. David Watson, Lee A Clark, and Auke Tellegen. 1988. Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology* 54(6), 1063-1070. http://dx.doi.org/10.1037/0022-3514.54.6.1063
57. Kipling D Williams, Christopher K T Cheung, and Wilma Choi. 2000. Cyberostracism: Effects of being ignored over the Internet. *Journal of Personality and Social Psychology* 79(5), 748-762. http://dx.doi.org/10.1037/0022-3514.79.5.748
58. Kipling D Williams, Cassandra L Govan, Vanessa Croker, Daniel Tynan, Maggie Cruickshank, and Albert Lam. 2002. Investigations into differences between social- and cyberostracism. *Group Dynamics: Theory, Research, and Practice* 6(1), 65-77. http://dx.doi.org/10.1037/1089-2699.6.1.65
59. Kipling D Williams and Blair Jarvis. 2006. Cyberball: A program for use in research on interpersonal ostracism and acceptance. Behavior Research Methods 38(1), 174-180. http://dx.doi.org/10.3758/bf03192765
60. Kipling D Williams. 2007. Ostracism: The Kiss of Social Death. *Social Personality Psychology Compass* 1(1), 236-247. http://dx.doi.org/10.1111/j.1751-9004.2007.00004.x
61. Kipling D Williams. 2007. Ostracism. *Annual Review of Psychology* 58, 1, 425-452. http://dx.doi.org/10.1146/annurev.psych.58.110405.085641
62. Wouter Wolf, Ana Levordashka, Johanna R. Ruff, Steven Kraaijeveld, Jan-Matthis Lueckmann, and Kipling D. Williams. 2014. Ostracism Online: A social media ostracism paradigm. *Behavior Research Methods* 47(2), 361-373. http://dx.doi.org/10.3758/s13428-014-0475-x
63. Lisa Zadro, Catherine Boland, and Rick Richardson. 2006. How long does it last? The persistence of the effects of ostracism in the socially anxious. *Journal of Experimental Social Psychology* 42(5), 692-697. http://dx.doi.org/10.1016/j.jesp.2005.10.007
64. Dolf Zillmann. 1988. Mood management: Using entertainment to full advantage. *Communication, Social Cognition, and Affect*, 31, 147-171.