

## Abstract

Research has begun to explore the potential benefits of video games as intervention methods for a variety of issues. This study explores the role of video games in assisting the recovery from ostracism. Undergraduate volunteers ( $n = 117$ ) were either included or excluded during a game of cyberball, after which their relational needs (self-esteem and belonging), as well as positive and negative affect were assessed. They were then randomly allocated to a video game condition (self-esteem enhancing, pro-social, or control) and following 5 minutes of play, needs and affect were reassessed. Participants' anti/pro – social responses were also recorded after administering the video game intervention. Results showed that all game conditions were successful in restoring psychological needs and affect scores following ostracism. Additionally, the pro-social game was the most successful in increasing positive affect following ostracism. There were no differences in pro-social behaviour scores between groups, with participants demonstrating neutral to social behaviour scores. This study is the first of its kind to demonstrate that games have the potential to restore needs and affect following ostracism. Exploring such low-cost and easily accessible intervention methods is crucial, given that ostracism is a prevalent issue with serious negative effects on wellbeing. This study adds to the growing research demonstrating the therapeutic benefits of video games, suggesting it is a valuable method of intervention for ostracism that needs to be further explored.

**Keywords:** Video games, gaming, intervention, self-esteem, belonging, ostracism

## **1. Introduction**

Recently researchers have begun to adopt an intervention-focused approach towards the psychological research into video games, exploring their potential to improve wellbeing (Przybylski, Ryan, & Rigby, 2010; Baronowski, Buday, Thompson, & Baronowski, 2008). Indeed, research has shown that video games have the ability to satisfy basic human needs, such as autonomy, competence and relatedness (Sailer, Hense, Mayr, & Mandl, 2017; see also Ryan, Rigby, & Przybylski, 2006). Importantly, whether video games may be used as interventions for such negative experiences as ostracism, social exclusion and rejection has not yet been fully investigated. The present study therefore explores whether different video games are able to restore psychological relational needs (i.e., self-esteem and belonging) and mood (i.e., positive and negative affect) in ostracised participants, while also comparing their behavioural pro/anti social behavioural responses to non-ostracised individuals.

### **1.1 Ostracism**

Ostracism, defined as the act of being ignored or excluded, is a painful and damaging experience. Previously, Williams (2007) has argued that ostracism affects four basic human needs; self-esteem, belonging, control and meaningful existence, whilst also reducing positive affect and increasing negative affect (Williams, 2005). To experimentally test the effects of ostracism, Williams, Cheung, and Choi (2000) created the *CyberBall* manipulation, a virtual game of ball-toss where participants are either passed the ball or ignored. Results from numerous Cyberball studies have

shown that players in the ignored condition demonstrate lower scores on the four basic needs compared to players in the included condition, thereby demonstrating that ostracism can be experienced in a virtual setting as well as in ‘real world’ interactions (see Hartgerink, van Beest, Wicherts, & Williams, 2015 for a review). The recovery from an experience of ostracism is signified by fundamental needs scores and mood returning to levels similar to included individuals, and research has shown that individuals apply various cognitive and behavioural strategies in order to restore their needs and mood following ostracism (see Wesselmann, Ren, & Williams, 2015). Importantly, individuals appear to engage with various forms of media, including video games, in order to regulate dysphoric moods and satisfy their psychological needs (Sherry, Greenberg, Lucas, & Lachlan, 2006; Ryan *et al.*, 2006). Therefore, it is possible that video games may possess specific attributes that can help alleviate the negative consequences of ostracism experience.

## **1.2 Video Game Interventions**

Research suggests that video games possess great therapeutic benefits in mental health settings (e.g. Horne-Moyer, Moyer, Messer, & Messer, 2014). The ways in which games benefit those who play have been categorised into different domains (e.g., social, cognitive, emotional, etc.; for a review see Granic, Engles & Lobel, 2014). For instance, game designers have begun to explore some psychological concepts, such as the benefits of in-game flow (e.g. Sherry, 2004) in order to promote feelings of wellbeing in those who play. With a growing interest in the development of *serious games* (i.e. designed for purposes other than entertainment; Starks, 2014), it remains to be seen whether they have the ability to assist in the recovery of

psychological needs following an experience of ostracism.

### **1.2.1 Video games in recovery from ostracism: relational needs**

Leary and Downs (1995) suggest that in order to manage experiences of social exclusion humans have developed a *Sociometer* that serves as a gauge for an individual's inclusionary status and is primarily reflected in an individual's self-esteem. Pickett and Gardner (2005) proposed a complimentary model to the Sociometer known as *Social Monitoring Theory*, whereby individuals naturally monitor their environment for social cues (e.g., eye-contact, facial expression) through the Social Monitoring System, with the purpose of guiding the individual towards remedying and recovering from an experience of exclusion (see also Bernstein, Young, Brown, Sacco, & Claypool, 2008; Böckler, Hömke, & Sebanz, 2014; Wesselmann *et al.*, 2015). Accordingly, an event of ostracism alerts the Sociometer that inclusionary status has been threatened, which in turn activates the Social Monitoring System and prompts the individual to begin scanning their environment for social inclusion cues.

Self-esteem thus has been shown to be predominantly affected by events of ostracism. Importantly, the needs of self-esteem and belonging have been linked within the ostracism literature (e.g., Gerber, Chang, & Reimel, 2017; Knowles, Lucas, Molden, Gardner, & Dean, 2009), and are often referred to as a composite factor called *relational needs* (Wesselmann *et al.*, 2015). Gardner, Pickett, Jefferis, and Knowles (2005) have suggested that, as with self-esteem, the social monitoring system regulates optimal levels of belonging, and when the need for belonging is threatened, the individual will become more sensitive to social information. These

relational needs appear to attenuate mood, or affect, as well (e.g., Heatherton & Polivy, 1991; Peterson, Park & Seligman, 2005; Shteynberg, Hirsh, Galinsky & Knight, 2013). Indeed, feelings of self-esteem and belonging are theoretically and experimentally linked to emotions of happiness, joy and pride, as well as general feelings of psychological wellbeing (Tracy, Cheng, Robbins, & Trzesniewski, 2009; Paradise & Kernis, 2002).

To the authors' knowledge there has only been one attempt to design a serious game that focuses on ostracism coping. *Grow Your Own Chi* is a game that involves identifying smiling faces (as opposed to angry faces or faces not making eye contact) and the player's own name. The game was designed by Dandeneau and Baldwin (2004) to raise feelings of self-esteem, to inhibit rejection information, and to boost an individuals' sense of social connectedness by incorporating social psychological theories of social monitoring (Leary & Downs, 1995; Pickett & Gardner, 2005). Accordingly, the results showed that participants with low self-esteem could be trained through the game to focus less on negative social information. Furthermore, the participants' feelings of self-esteem were increased by presenting self-relevant information (participants' name), paired with positive and accepting feedback in the form of inclusionary social cues (e.g. eye contact). Therefore, *Grow Your Own Chi* is an example of a serious game that could have promising therapeutic properties to assist in recovery of relational needs and affect depleted through ostracism.

### **1.2.2 Video games in recovery from ostracism: behavioural responses**

Recovery from ostracism can also be measured in behavioural choices following an experience of social exclusion (Wesselmann *et al.*, 2015). Research into

behavioural strategies of recovery focuses mainly on pro and anti-social behaviours and how they might assist in restoring psychological needs (Williams, 2009).

Ostracised individuals respond more *anti-socially* than included individuals and have shown to act more aggressively toward another person regardless of whether this person ostracised them or not (Buckley, Winkel, & Leary, 2004; Twenge, Baumeister, Tice, & Stucke, 2001; Warburton, Williams, & Cairns 2006). However, experimental research has also demonstrated that ostracised individuals can respond more *pro-socially* than included individuals in order to restore the needs that have been threatened or lost through ostracism. For instance, ostracised individuals work harder on group tasks (Williams & Sommer, 1997), focus more on re-inclusion (Maner, DeWall, Baumeister, & Schaller, 2007; Molden, Lucas, Gardner, Dean, & Knowles, 2009) and generally engage in behaviours that may encourage favourable responses from other people, such as acting in a pro-social way (Baumeister & Leary, 1995; Leary, Twenge, & Quinlivan, 2006; Williams & Nida, 2011). Indeed, existing research suggests that acting in pro-social ways may be psychologically beneficial beyond the benefits of being re-included. For example, helping others has shown to increase the helper's feelings of self-esteem (Buchanan & Bardi, 2010; Klien, 2017; Schwartz, Meisenhelder, Ma, & Reed, 2003) and positive mood (Snippe, Jeronimus, Rot, Bos, Jonge, & Wichers, 2017).

Serious games are argued to support pro-social attitudes and make a positive change in society. For instance, Free Rice is an ad supported free-to-play game that allows players to donate to charities by playing multiple-choice quiz games. For every question the player answers correctly, 10 grains of rice are donated via the World Food Programme. Research into the benefits of pro-social video game play have found that participants who played a pro-social video game behaved more pro-

socially towards others compared to those who played a control game (Gentile *et al.*, 2009). Indeed, video games offer excellent conditions for learning as they simultaneously expose gamers to modelling and rehearsal, whilst reinforcing the behaviour of the games' theme (Buckley & Anderson, 2006; Hartgerink, van Beest, Wicherts, & Williams, 2015). Accordingly research has shown that playing pro-social video games decreased both aggressive cognitions and aggressive behaviours, and increased positive affect (Greitemeyer, Traut-Mattausch, & Osswald, 2012; Whitaker & Bushman, 2012). Similarly, Liu, Tend, Lan, Zhang, and Yao (2015) showed that short-term exposure to a pro-social video game resulted in inhibiting aggressive thoughts and a reduced aggressive behaviours. Thus, there are reasons to suggest that playing video games with pro-social content, such as Free Rice, might foster pro-social behaviours following an experience of ostracism, while positively attenuating self-esteem and affect.

### **1.3 The present study**

With the discussed literature in mind, the present study was set out to examine whether different video games have the potential to assist in recovery of relational needs and affect depleted through ostracism. Included and excluded participants' relational needs and affect were tested before and after playing one of the three video games, while also measuring their behavioural responses.

First, it was hypothesised that Grow Your Own Chi game will significantly increase relational needs (self-esteem and belonging) compared to the control game (Snake) due to its incorporation of Social Monitoring mechanisms. Second, given that pro-social video games appear to increase pro-social attitudes, increase self-esteem

and reduce aggressive responses, it was predicted that excluded participants who played the pro-social game Free Rice would demonstrate an increase in relational needs and generate higher pro-social responses compared to excluded participants playing the control game (Snake). Finally, given that relational needs and pro-social behaviour attenuate affect, it was hypothesised that both Grow Your Own Chi and Free Rice would also significantly increase positive affect and reduce negative affect compared to the control game (Snake).

## **2. Methods**

### **2.1 Design**

A 2 (included, excluded) x 2 (intervention time: pre, post) x 3 (intervention type: Grow Your Own Chi, Free Rice, Snake) mixed factor design was employed, in which included and excluded participants generated psychological need and affect scores before and after playing one of the three video games. A single post intervention measure of pro/anti- social response was included as an independent measure and was compared across included and excluded participants and three video game conditions.

### **2.2 Participants**

The participants were undergraduate students ( $n = 117$ , male = 29<sup>1</sup>, female = 85; mean age = 21.35,  $SD = 5.94$ ) who were recruited through the university SONA

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<sup>1</sup> Note: gender was not recorded for 3 participants



system that rewards university students with points for participating in research (student annual requirement). Cyberball was used to divide participants into excluded ( $n = 54$ , female = 41, male = 13; *mean* age = 20.62, *SD* = 4.58) and included ( $n = 63$ , female = 44, male = 16; *mean* age = 21.98, *SD* = 6.90) groups.

### **2.3 Materials**

*Cyberball*: The Cyberball game was used to induce the feeling of being included or excluded (Williams *et al.*, 2000). Participants were randomly assigned to a virtual game of ball toss in which they were either included or excluded (i.e., ostracised) by other players. They were told they were playing against two students when in fact they were playing against the computer. When the participants were passed the ball, they were required to click on one of the two players with the mouse in order to pass them the ball. There was also a dialogue box where the participant could talk to other players.

*Assessment of Need Satisfaction Following Ostracism Scale*: To assess psychological needs after the game of Cyberball, participants completed the *Assessment of Need Satisfaction Following Ostracism Scale* (20 items,  $\alpha = .95$ ) (Jamieson, Harkins, & Williams, 2010) The participants were asked to indicate on a 5-point Likert scale (1 = *not at all*, 5 = *extremely*) how they currently felt in regards to a series of feelings and emotional adjectives that were categorised into four domains: belonging, self-esteem, meaningful existence, and control. The four needs were analysed as a single factor. However, because of the theoretical framework of the study concerns only needs for belonging and self-esteem needs, these were analysed as a separate sub-factor (10 items,  $\alpha = .93$ ). Examples of the self-esteem subscale

questions include: “I felt good about myself” and “My self-esteem was high.”

Examples of the belonging subscale include: “I felt disconnected” or “I felt rejected.”

*The Positive and Negative Affect Schedule:* To assess mood the *Positive and Negative Affect Schedule* (Watson, Clark, & Tellegan, 1988) was employed. The scale contains 20 emotional adjectives that are categorised into two domains; positive affect (10 items,  $\alpha = .90$ ) and negative affect (10 items,  $\alpha = .77$ ). Examples of the positive items include, “*Interested*” and “*Enthusiastic*”. Examples of the negative items include “*Upset*” and “*Afraid*”. Participants were asked to rate their current emotions on a 5-point Likert scale (1 = *not at all*, 5 = *extremely*).

### ***Video Games***

*Grow Your Own Chi:* This game is modelled to target self-esteem and sense of social acceptance, drawing on the Sociometer (Leary & Downs, 1995) and Social monitoring (Pickett & Gardener, 2005) theories (see also Dandeneau & Baldwin, 2004). The aim of the game is to click on SMILING FACES and YOUR NAME when you see them fly past, and to ignore NEGATIVE FACES. The player is rewarded with positive feedback each time they click on a positive cue by their ‘chi’ being powered up.

*FreeRice:* This game is modelled to target pro-social behaviour. The aim of the game is to match words to their correct meaning. For every correct response, a real portion of rice is donated, thereby inducing in participants a feeling of being pro-social. Before playing, the gamer is presented with the text:

*“Whether you are CEO of a large corporation or a street child in a poor country, improving your education can improve your life. It is a great investment in yourself. Perhaps even greater is the investment your donated rice makes in hungry human beings, enabling them to function and be productive. Somewhere in the world, a person is eating rice that you helped provide.”*

*Snake*: In line with previous research (Gentile *et al.*, 2009; Hartgerink, van Beest, Wicherts, & Williams, 2015), the Snake game was chosen as a control game due to its neutral theme. The game involves a snake moving within a rectangle area. The participants are required to navigate the snake’s movement to collect food without letting it touch the rectangle walls. Participants are required to use the keyboard keys (i.e., left, right, up, down) to navigate the snake. If the snake touches the wall, the participant loses and the screen displays: GAME OVER.

### ***Pro/Anti-Social Responses***

In order to measure pro/anti-social responses following ostracism the participants, upon finishing playing one of the three intervention games, were told that as they were the first to finish their tasks, they are able to select the difficulty level of the game that the other CyberBall players are about to play. Participants are informed that the harder they make the game, the longer the other participants will have to sit in their room until they finish their game, and that their scores may be affected by how much harder the game is. Participants are also told that their decision will remain anonymous. The participants are presented with the prompt *“Please select difficulty level for player 1”* and the same option for player 2. They can choose

between 1 – 3 on a Likert scale (*1 = easy, 2 = medium and 3 = hard*). In accordance with Warburton *et al.*'s (2006) measurement of anti-social responses following ostracism, and Greitemeyer and Osswald's (2010) measure of pro-social responses, lower scores suggest a more pro-social response to other participants and a higher score - a more anti-social response.

## **2.4 Procedure**

Participants completed the present study via the online Qualtrics questionnaire in digital form accessed through the university SONA system for participant recruitment. Upon signing the consent form, participants were prompted to play a short game of Cyberball. Participants were then asked to complete the Assessment of Need Satisfaction Following Ostracism Scale and The Positive and Negative Affect Schedule. Participants were then prompted to play one of three intervention video games (FreeRice, Grow Your Own Chi, or Snake). Participants were then prompted to complete the Assessment of Need Satisfaction Following Ostracism Scale and The Positive and Negative Affect Schedule again, followed by the pro/anti-social response measure. Upon completion, participants completed the additional/demographic information forms. Participants were fully debriefed at the end of the study.

## **3. Results**

*Overall and relational needs:* Two 2 (included; excluded) x 2 (intervention time: pre; post) x 3 (intervention type: GYOC; FR; control) ANOVAs were conducted to investigate the overall needs measured by the *Assessment of Need*

*Satisfaction Following Ostracism Scale* and the sub-factor of that scale referred to as relational needs (belonging and self-esteem), pre and post intervention in included and excluded participants. The group average scores are presented in Table 1, while significant results are reported in Table 2.

*Table 1. Mean scores on relational needs and affect for participants in included and excluded conditions for conditions of Grow Your Own Chi, Free Rice and Snake (control)*

		GYOC M (SD)	FR M (SD)	Snake M (SD)
<i>General need scores</i>				
Included	Pre	3.20 (.69)	3.24 (.67)	3.45 (.83)
	Post	3.15 (.79)	3.38 (.78)	3.14 (.73)
Excluded	Pre	1.90 (.51)	1.94 (.50)	1.97 (.55)
	Post	3.48 (.68)	3.61 (.67)	3.28 (.63)
<i>Relational need scores: belonging + self-esteem</i>				
Included	Pre	3.37 (.90)	3.34 (.73)	3.54 (.94)
	Post	3.15 (.83)	3.26 (.75)	2.99 (.87)
Excluded	Pre	1.93 (.64)	1.98 (.61)	2.09 (.62)
	Post	3.39 (.69)	3.42 (.63)	3.21 (.66)
<i>Positive affect</i>				
Included	Pre	2.20 (.84)	2.10 (.76)	2.19 (.88)
	Post	2.30 (1.08)	2.90 (.99)	2.37 (1.06)
Excluded	Pre	1.43 (.49)	1.47 (.55)	1.69 (.76)
	Post	2.42 (1.01)	3.06 (1.05)	2.51 (.96)
<i>Negative affect</i>				
Included	Pre	1.41 (.48)	1.40 (.48)	1.44 (.45)
	Post	1.61 (.70)	1.35 (.52)	1.64 (.60)
Excluded	Pre	1.87 (.60)	1.80 (.42)	1.85 (.63)
	Post	1.47 (.77)	1.39 (.64)	1.42 (.46)

Participants' scores on the overall needs and the relational needs sub-factor generated similar results. The scores were higher after playing video games. Excluded participants had significantly lower scores on all measures compared to the included group. Participants showed significantly different scores pre intervention, with

excluded participants showing lower scores than included participants. Scores post intervention were the same across both groups.

*Table 2. ANOVA summary table of group comparisons of general and relational needs pre and post intervention in excluded and included individuals*

	<i>df</i>	<i>F</i>	$\eta^2$	<i>t</i>	<i>D</i>	<i>P</i>
Mixed ANOVAs 2 (group: GRP) x 3 (Intervention type: INT) x 2 (Pre/Post Intervention: PPI)						
<b>General needs</b>						
PPI	1,111	91.93	.45			<.001
Group	1,111	29.95	.21			<.001
Interaction (PPI, Group)	1,111	112.29	.50			<.001
Follow-up t-tests (Group: GRP)						
Pre intervention	115			11.5	2.13	<.001
Post intervention	115			1.62	.31	.108
<b>Relational needs</b>						
PPI	1,111	41.26	.27			<.001
Group	1,111	28.06	.20			<.001
Interaction (PPI, Group)	1,111	97.76	.47			<.001
Follow-up t-tests (Group: GRP)						
Pre intervention	115			10.1	1.91	<.001
Post intervention	115			1.42	.27	.158

*Positive and Negative affect:* Two 2 (group: included; excluded) x 2 (intervention time: pre; post) x 3 (intervention type: GYOC; FR; control) ANOVAs were conducted to investigate positive and negative affect pre and post intervention in ostracised and excluded participants. The group average scores are presented in Table 1, while significant results are reported in Table 2.

*Positive affect:* Participants' positive affect scores were higher post intervention. Participants showed significantly different scores pre intervention, with excluded participants showing lower positive affect scores than included participants. Scores post intervention were the same across both groups.

Table 3. Group Analyses investigating positive and negative affect pre and post intervention in ostracised and included individuals

	<i>df</i>	<i>F</i>	$\eta^2$	<i>T</i>	<i>d</i>	<i>P</i>
Mixed ANOVAs 2 (group: GRP) x 3 (Intervention type: INT) x 2 (PrePost Intervention: PPI)						
<b>Positive Affect</b>						
PPI	1,111	73.06	.40			<.001
Interaction (PPI, Group)	1,111	20.00	.15			<.001
Follow-up t-tests (Group:GRP)						
Pre intervention	115			-4.64	.87	<.001
Post intervention	115			< 1	.10	>.2
Interaction (PPI, INT)	1,111	6.40	.10			.002
Follow-up ANOVAs (Intervention type) by PPI						
Pre intervention	2,111	.48	.01			>.2
Post intervention	2,111	4.02	.07			.021
Post intervention comparisons (Intervention type )						
FR - GYOC	74			2.59	.59	.011
FR – Snake	76			2.32	.53	.023
GYOC - Snake	78			< 1	.07	>.2
<b>Negative affect</b>						
PPI	1,111	7.84	.07			.006
Interaction	1,111	24.87	.18			<.001
Follow-up t-tests (Group:GRP)						
Pre intervention	115			4.49	.91	<.001
Post intervention	115			< 1	.16	>.2

As expected, pre intervention, participants generated similar scores regardless of the game being assigned to them, but showed different scores post intervention. Participants who played the Free Rice game generated higher positive affect scores than participants who played Grow Your Own Chi and control video games, while the latter 2 generated similar scores (Figure 1).

*Negative Affect:* Participants' negative affect scores were lower post intervention. Participants showed significantly different scores pre intervention, with excluded participants showing higher negative affect scores than included participants. Scores post intervention were the same across both groups. Note that while there were no significant interactions, included participants showed marginal

increase in negative affect post game intervention in Grow Your Own Chi and Snake conditions, but not in Free Rice condition (Figure 1), an observation further elaborated on in the Discussion.

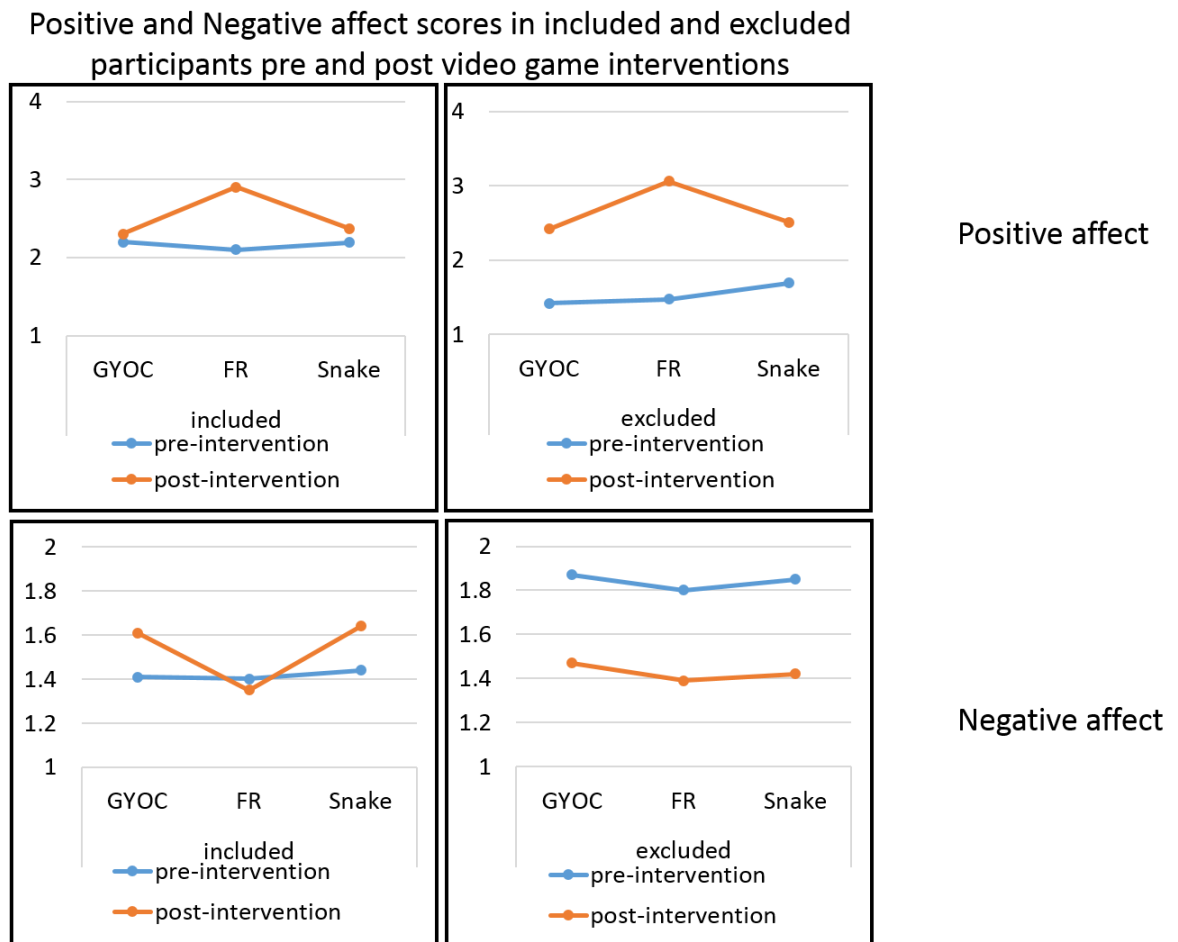


Figure 1. Average scores on Positive and Negative Affect in included and excluded participants pre- and post-intervention.

*Pro/Anti - Social Responses:* The average scores measuring pro/anti- social responses in included and excluded participants are presented in Table 4. A 2 (group: included; excluded) x 3 (game type: GYOC; FR; control) ANOVA examined the potential effect of video game intervention on pro/anti -social responses following



ostracism. The main effect of group was not significant  $F(1, 109) < 1$ . There was no two-way interaction  $F(2,109) = 1.60, p = 2.07, \eta^2 = .03$ .

*Table 4. Frequency and mean of pro/anti- social responses in included and excluded participants*

	Level of difficulty assigned to Player 1			Level of difficulty assigned to Player 2			Mean level of difficulty assigned to 2 players
	Frequency %			Frequency %			M (SD)
	<i>1</i>	<i>2</i>	<i>3</i>	<i>1</i>	<i>2</i>	<i>3</i>	
<i>1 = easy, 2 = medium, 3 = hard</i>							
	<i>Included</i>			<i>Included</i>			<i>Included</i>
GYOC	25.0	45.0	30.0	25.0	55.0	20.0	2.00 (.63)
FR	36.4	40.9	22.7	27.3	54.5	18.2	1.89 (.69)
Snake	47.6	33.3	19.0	28.6	47.6	23.8	1.83 (.64)
	<i>Excluded</i>			<i>Excluded</i>			<i>Excluded</i>
GYOC	47.4	36.8	15.8	42.1	36.8	21.1	1.74 (.75)
FR	26.7	66.7	6.7	20.0	66.7	13.3	1.87 (.55)
Snake	15.0	60.0	25.0	25.0	40.0	35.0	2.10 (.68)

Based on the data presented in Table 4, both included and excluded participants generated medium to pro-social responses, as their responses generally remained within the 1-2 range (i.e. assigning easy – medium game levels for other players). While analyses generated no significant differences, the pattern of responses suggests that when examining the anti-social responses (level 3 = hard), frequency distribution would indicate that participants playing the control game were more likely to assign a difficult level to other players, than participants who played Grow Your Own Chi and Free Rice.

#### 4. Discussion

The present study aimed to explore the use of video games in ostracism recovery. Included and excluded participants' relational needs (self-esteem and belonging; Williams, 2007), positive and negative affect as well as behavioural responses were measured before and after playing one of the video game conditions. Although not in the manner predicted the findings of this study demonstrate that video games possess the ability to assist in the recovery from ostracism.

First, in line with previous research (Williams & Sommer, 1997; Williams *et al.*, 2000), the participants ostracised through cyberball showed significantly lower scores of relational needs (self-esteem and belonging). Importantly, results indicate that while participants included in the cyberball game (i.e., non-ostracised participants) showed no difference in relational need scores before and after video game intervention, ostracised participants' reduced need scores were restored post-game intervention. Drawing from existing research on social monitoring theory (e.g. Gardner *et al.*, 2005) and how ostracised individuals become more attentive to social information in order to remedy an experience of ostracism, it was predicted that playing the videogame *Grow Your Own Chi* would significantly increase feelings of self-esteem and belonging in ostracised participants compared to the control game condition. However, there were no differences between game conditions, with all three video games successfully increasing relational needs following ostracism. While previous studies have demonstrated that video games have the ability to satisfy such needs as autonomy, relatedness and competence (Legate, DeHaan, & Ryan, 2015; Przybylski *et al.*, 2010), this is the first study to show that relational needs depleted through an event of ostracism can be restored through video game play.

Additionally, it was predicted that Grow Your Own Chi and Free Rice would significantly increase positive affect and reduce negative affect following ostracism. This study demonstrated that excluded participants, as expected, had lower scores on positive affect and higher scores on negative affect than included participants pre-intervention, which were successfully restored post-intervention. However, contrary to predictions, positive and negative affect were restored in all game conditions.

It is noteworthy that the game Free Rice showed a distinct pattern of results in both excluded and included participants when examining their affect scores (Figure 1). First, excluded participants who played Free Rice restored their positive affect more successfully than those who played the Grow Your Own Chi and the control games. Second, included participants who played the Grow Your Own Chi and the control games, but not Free Rice, showed marginally significant increase in negative affect. Taken together these findings suggest that the game Free Rice was the most effective in regulating participants' positive and negative affect. Thus in line with previous research (e.g. Whitaker & Bushman, 2012), playing a game with pro-social attributes has a positive effect on mood.

While the rise in negative affect in included participants after videogame interventions may seem counterintuitive at first, it falls in line with previous research. Indeed, Bowman, Kowert and Cohen (2015) showed that included participants were less likely to enjoy videogames than excluded participants. The authors proposed that it could be due to the fact that included participants did not enjoy playing the intervention game alone after having played cyberball in a virtual group. For now we can only speculate to the process, and future research would be useful in this area.

It was also predicted that excluded participants who played the game Free Rice would have higher scores on the pro-social response measure following

ostracism. However, contrary to predictions results showed no significant differences in pro-social response scores between intervention groups. In line with predictions, both included and excluded participants' generated medium to pro-social responses post video game intervention (Table 4).

This study has limitations. First, Wesselmann *et al.* (2015) state that recovery can begin within minutes after ostracism occurs, therefore participants excluded in this study have begun their recovery prior intervention and regardless of game condition assigned to them. Future studies will need to address this limitation in order to further test the value of video game interventions, possibly by monitoring the real-time impact of ostracism or using a measure that elicits a longer lasting ostracism effect. Furthermore, it is possible that having experienced an event of ostracism through a video game (cyberball), and then receiving an intervention through another video game, may have resulted in a positive outcome for all game conditions. Experiencing 'real-world' face-to-face ostracism and then playing a video game may yield different results, and future research could explore the differences between contrasting intervention methods. Another limitation is that the present study did not explore such factors as participants' initial mood levels, personality differences and experiences of enjoyment and flow whilst playing. Exploring these factors and their potential influence on ostracism recovery may provide explanations for why all of the games within the present study were successful. Finally, it may be worthwhile exploring the potential therapeutic benefits of AAA games (high budget popular high street games) as opposed to the basic games employed in this study, as they may play a more complex role in ostracism recovery.

In conclusion, this study is the first of its kind to demonstrate that a brief period of video game play can restore relational needs, whilst restoring affect following an

experience of ostracism. These findings add to the current literature that is beginning to explore potential benefits of video games. Exploring such low-cost and accessible intervention methods is important, as ostracism is a prevalent issue with serious side effects on individuals' wellbeing. However, the interplay between psychological needs affected by ostracism and different game themes needs to be further explored in order to fully harness the potential benefits of video games as an intervention for ostracism recovery.

### **Declaration of Conflicting Interests**

The authors declare that they had no conflicts of interest with respect to their authorship or the publication of this article.

### **Funding**

This work is part of a PhD project funded internally by the University (Vice Chancellor's Doctoral Scholarship).

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