The transfer of social exclusion and inclusion functions through derived stimulus relations.

Anita Munnelly[1], Georgina Martin,[1] Charlotte Dack[2], Ann Zedginidze[1], Louise McHugh[1]

1. University College Dublin
2. University College London

Correspondence address: Dr. Louise McHugh
School of Psychology
University College Dublin
Belfield
Dublin 4
Ireland

Email: louise.mchugh@ucd.ie

Phone number: +353879545330

Short title: Derived Transformation of Exclusion Functions

Submitted for publication in: *Learning and Behavior*, November (2013).

Abstract

Previous studies have found that social exclusion can cause distress to those excluded. One method used to study social exclusion is through a virtual ball-toss game known as Cyberball. In this game, participants may be excluded from or included in the ball-toss game and typically report lower feelings of self-esteem, control, belonging and meaningful existence following exclusion. Experiments 1 and 2 sought to explore the transfer of feelings of exclusion and inclusion through stimulus equivalence classes. In both experiments, participants were trained to form two three-member equivalence classes (e.g., A1-B1, B1-C1; A2-B2, B2-C2) and tested with novel stimulus combinations (A1-C1, C1-A1, A2-C2, C2-A2). Thereafter, participants were exposed to the Cyberball exclusion and inclusion games. In this game, one stimulus (C1) from one equivalence class was assigned as the Cyberball inclusion game name, while one stimulus (C2) from the other equivalence class was assigned as the Cyberball exclusion game name. In Experiment 2, participants were only exposed to the Cyberball exclusion game. During a subsequent transfer test, participants were asked to rate how included or excluded they thought they would be in other online games, corresponding to members of both equivalence classes. Participants reported that they felt they would be excluded from online games if they were members of the same equivalence class as C2. In contrast, participants reported that they felt they would be included in online games if they were members of the same equivalence class as C1. Results indicated the transfer of feelings of inclusion (Experiment 1) and feelings of exclusion (Experiments 1 and 2) through equivalence classes.

A growing body of research now shows that being ostracised or excluded can have a strong aversive influence on an individual's behavior and emotions (e.g., MacDonald & Leary, 2005; Warburton, Williams, & Cairns, 2006; Williams, Cheung, & Choi, 2000; Williams, Govan, Croker, Tynan, Cruickshank & Lam, 2002; Zadro, Boland, & Richardson, 2006; Zadro, Williams, & Richardson, 2004). For example, following an episode of exclusion, an individual typically reports lower feelings of self-esteem, control, and a lowered sense of meaningful existence (e.g., Williams et al., 2000, 2002; Zadro et al., 2004, 2006). Instances of exclusion can involve nonverbal cues such as avoiding eye contact, ignoring someone's presence or excluding someone from activities (Williams et al. 2002). In addition, it has been reported that exclusion via the internet (i.e., cyberostracism) has the same adverse effect on an individual as face-to-face instances of exclusion (e.g., Williams et al., 2000, 2002). Thus, given the increase in the number of people communicating online via social media sites and the potential for exclusion on these sites, it is important that researchers understand the effects that cyberostracism can have on an individual's personal and social life.

One of the first studies to examine the effects of cyberostracism was conducted by Williams et al. (2000). In this study, participants were exposed to an online virtual ball toss game called "Cyberball" which involved a number of other players. Unknown to participants however, the other players were computer-generated and controlled. That is, the researchers manipulated the program so that they could vary how included or excluded the participant was from the game (e.g., whether the participant received the ball the same number of times as the other players or less times). Findings revealed that the more excluded, or ostracised participants were, the more they reported feeling bad, having a lower sense of belonging, and less control (e.g., Williams et al., 2000; see also Williams et al., 2002). This led Williams et al. (2000) to propose that exclusion threatens at least four

fundamental needs: belonging, self-esteem, control, and meaningful existence (Williams, 2009; Williams et al., 2000). For example, an individual may lose his or her sense of belonging if he or she, is excluded by others (Jamieson, Karkins, & Williams, 2010; Williams, 2009). In addition, an individual may suffer lower self-esteem following an episode of exclusion as self-esteem is based, in part, on one's social inclusionary status (Jamieson et al., 2010; Leary, Haupt, Strausser, & Chokel, 1998; Leary, Tambor, Terdal, & Downs, 1995). The significance of cyberostracism on participants' experience of exclusion and its impact on how the participants feel about themselves is critical with the increase in online communication. Thus, it is important to understand the mechanisms behind the impact of ostracism and how this experience can generalise to other contexts, or areas, in an individual's life. One method in which such an analysis may be undertaken is through an examination of derived stimulus relations.

Numerous studies have shown that two stimuli can become associated with one another merely on the basis of their shared associative history (i.e., despite sharing no physical properties and despite never having been directly paired; Sidman, 2000). The derivation of stimulus relations is an empirically demonstrable phenomenon in which, by training a series of unidirectional relations between arbitrary stimuli, a number of untrained or derived relations emerge in an overall pattern according to which the stimuli seem subsequently to be treated as mutually substitutable or equivalent. Using the simplest possible example, imagine participants are trained, using arbitrary stimuli A, B and C to choose B in the presence of A, and C in the presence of B. Stimulus equivalence is subsequently demonstrated if they show a number of further 'derived' relations including reversing the trained relations by choosing A in presence of B, and B in presence of C; and combining the trained relations by choosing C with A and vice versa. If all emergent relations proposed here control responding, then A, B and C are effectively being treated

by the participant as equivalent or mutually substitutable and are said to function as a derived equivalence relation or equivalence class. Furthermore, stimulus functions are found to transfer through equivalence classes (e.g., Augustson & Dougher, 1997; Dack, McHugh & Reed, 2009; Dack, McHugh & Reed, 2010; Dougher, Augustson, Markham, Greenway, & Wulfert, 1994). That is, a function attached to one member of an equivalence class is often found to transfer to other stimuli in that class. For example, ratings of self-efficacy and causal-effectiveness have been demonstrated to transfer across equivalence classes (Dack et al., 2009, 2010; Valdivia-Salas, Dougher, & Luciano, 2013). In one such study, Dack et al. (2009) found that an evaluation made towards one stimulus transferred to another stimulus through a relation between the latter stimulus with the former. That is, stimuli that were associated with schedules of reinforcement that produced either good or bad causal evaluations were later categorized with stimuli that had previously been established as having the same function ('good' or 'bad') through stimulus equivalence classes. The authors proposed that these findings have the potential to account for the processes involved in disorders such as depression in which the negative evaluations spread to many areas (e.g., people and events) of an individual's life. Just as causal evaluations can transfer through equivalence classes, it is possible that so too can feelings of exclusion. Such findings would have important implications for our understanding of how exclusion from one activity (e.g., badminton) may generalize to other contexts or activities in an individual's life without the person having experienced direct exclusion from these activities (e.g., to similar sports or activities such as basketball or tennis).

Experiments 1 and 2 aimed to determine whether the functions of ostracism (feelings of exclusion and inclusion) would transfer across equivalence classes. That is, would participants expect to feel excluded from (or included in) a new game based on the

fact that this game was in an equivalence class with a game from which they were directly excluded from?

Experiment 1

Method

Participants and Design

Twelve students, 5 male and 7 female, ranging in age from 20 to 39 (M = 25.67, SD= 6.21) were recruited through campus wide advertisements at University College Dublin. In return for participation, individuals received €5 in cash. All participants were naive to the purpose of the experiment (e.g., participants were told that the current study sought to examine online gaming), and were fully debriefed on completion.

Ethical approval was obtained from the departmental ethics committee before research commenced. The experiment involved a 2 x 2 repeated measures factorial design with Game type (inclusion vs. exclusion) and Equivalence Class (Class 1 vs. Class 2) as the repeated measures.

Apparatus and Setting

The experiment was conducted in a quiet room containing a computer with a 15-inch color monitor and a standard keyboard. The presentation of the derived stimulus training and testing and all responses were recorded by a program written in Visual Basic 6. All responses were made using the computer mouse or on the keyboard. The Cyberball game V 4.0 was downloaded from https://cyberball.wikispaces.com and adapted to include the relevant 'game name' on the screen.

Derived Stimulus Relations Training

The stimuli employed as members of the two equivalence classes were nonsense words. The nonsense words and corresponding letter-number designations are shown in

Table 1. All of the stimuli were composed of Arial Bold characters in black, each of which occupied a certain proportion of the screen (screen width/4 in.). Each stimulus was surrounded by a box (4 in. width and 1 in. height) against a white background. On each trial, participants were presented with two comparison stimuli in the lower portion of the screen and a sample stimulus in the upper portion (horizontal position 1.25 in., and vertical position, 7.75 in.). All feedback choices (CORRECT, WRONG) were in red surrounded by a box (6 in. width and 1.5 in. height), presented in the middle of the screen.

Cyberball Exclusion and Inclusion Conditioning Games

In this task, the C1 (Boceem) stimulus was employed as the Cyberball inclusion game name, while the C2 (Casors) stimulus was employed as the Cyberball exclusion game name.

Measures

Participants were required to complete the University of Wales Institute of Science and Technology (UWIST) Mood Adjective Checklist questionnaire (MACL; Mathews, Jones & Chamberlain, 1990), which was administered in order to assess participants' current mood state. The UWIST MACL was administered at the start of the experiment and also at the end in order to capture any potential changes in participants' moods as a result of exposure to the Cyberball exclusion and inclusion games.

A post-experimental Cyberball questionnaire (e.g., Willams, et al., 2000; Zadro et al., 2006) was administered to measure four types of needs: Belonging (e.g., "I felt I belonged to the group"), Self-esteem (e.g., "I felt good about myself"), Control (e.g., "I felt I had the ability to significantly alter the course of the game"), and Meaningful Existence (e.g., "I felt meaningless"), following both the inclusion and exclusion Cyberball games. Participants rated these needs based on how they felt *during the game* on a scale of 1 (*not at all*) to 5 (*extremely*). Items were reversed scored where necessary. In addition,

participants were asked to rate certain positive (e.g., "I felt happy") and negative (e.g., "I felt sad") emotions that they experienced *during the game*. Three manipulation checks were also included at the end of the post-experimental Cyberball questionnaire to determine whether or not participants felt excluded and ignored during the Cyberball game. Participants were asked to respond to the following statements on a scale of 1 (*not at all*) to 5 (*extremely*): "I was ignored" and "I was excluded". The third manipulation check consisted of participants responding to the following open-ended question: 'Assuming the ball should be thrown to each person equally (33%), what percentage of the throws did you receive?' by recording the percent of overall tosses they recalled received.

A post-experimental Transfer of Function Questionnaire was administered to determine whether participants felt they would be included in or excluded from games that were related to the Cyberball inclusion and exclusion games, respectively (see below for more details on the Transfer of Function Questionnaire).

Procedure

Each participant was taken into a quiet room and given an information sheet to read, and a consent form to sign. Next, the experimental task began and the general procedure was as follows: *Phase 1:* Pre-experimental Questionnaires (UWIST MACL Questionnaire); *Phase 2A:* Derived Stimulus Relations Training and *Phase 2B:* Testing Emergent Relations; *Phase 3:* Cyberball Inclusion and Exclusion Conditioning Games; *Phase 4:* Transfer of Function Questionnaire; *Phase 5:* Post-experimental Questionnaires (Cyberball Questionnaire and the UWIST MACL).

Phase 1

UWIST MACL. Participants were required to complete the pre-experimental UWIST MACL which assessed their current mood to positive and negative adjectives. This involved the presentation of twenty-four mood related words that were both positive and

199 negative (e.g., “anxious” or “happy”). Participants were instructed to rate their mood
200 “Right Now” (i.e., at the time of administration) to a number of adjectives by circling one
201 of four options including “Definitely”, “Slightly”, “Slightly not” to “Definitely not”.
202 *Phase 2A*
203 **Derived Stimulus Relations Training.** All training and testing was conducted
204 using a 2 x 3 matching-to-sample conditional discrimination paradigm using stimuli that
205 consisted of three nonsense words (see Table 1). Two three member equivalence classes
206 were established by training AB and BC relations in a linear series structure. Each relation
207 (A1–B1, A2–B2, B1–C1, and B2–C2) was presented at least three times during training.
208 The criterion to proceed to the testing phase was 12 consecutively correct trials across all
209 stages. There was no time limit for responding to individual trials. Each trial started with
210 the presentation of a sample (Sa) and two comparison stimuli. The positive comparison
211 (Co1) stimulus was chosen from the same equivalence class as Sa, and the negative
212 comparison (Co2) stimulus was chosen from the other class. The stimuli were displayed in
213 an isosceles triangle display on the monitor, with Sa at the vertex of the triangle and Co1
214 and Co2 at the corners of the base. At the start of the equivalence training phase,
215 participants were told that they were going to be exposed to nonsense words that
216 represented online game names, and that their task was to learn these game names.
217 Participants were instructed that these nonsense words represented game names as they
218 were later going to be exposed to online ball-toss games, in which two of these nonsense
219 words would appear as the game names. The following instructions were then presented
220 across the middle of the screen on the first trial only: “Look at the Box Above and then
221 Click on the Box Below that GOES WITH the one at the Top. Try Your Best NOT to Make
222 Any Mistakes.” The participants chose a comparison by clicking on the left- or righthand
223 box. Participants were given feedback for their choices. Choosing the positive comparison

(Co1) produced a 1-sec display of the word "Correct," whereas choosing the negative comparison (Co2) produced a 1-sec display of the word "Wrong." Feedback was displayed in red across the middle of the computer screen.

Phase 2B

Testing Emergent Relations. Once the criterion for the training session had been met, the test phase commenced. On the first test trial, the following instructions were shown across the middle of the computer screen: "Look at the Box Above and then Click on the Box Below that GOES WITH the one at the Top. Try Your Best NOT to Make Any Mistakes. DURING THESE TRIALS THE COMPUTER WILL NOT GIVE YOU ANY FEEDBACK." All tests for one-node transitivity (A-C) and equivalence (C-A) were presented in a single block. Each type of relation (A1–C1, A2–C2, C1–A1, and C2–A2) was presented nine times, with 32 trials in total. All trials were unreinforced. The mastery criterion for testing was at least 28 correct class-consistent selections across the block of 32 test trials. If participants failed to reach this criterion, then they were re-exposed to equivalence training and testing for three more times. Thus, a total of three and seven participants required additional equivalence training and testing in Experiments 1 and 2, respectively.

Phase 3

Cyberball Exclusion and Inclusion Conditioning Games. Upon reaching criterion during the equivalence testing phase, participants were immediately exposed to the Cyberball inclusion and exclusion games. When exposed to the exclusion game, participants were informed by the computer program that they were going to play the Casors (C2) game, with players (i.e., students) from other universities. For the inclusion game, participants were informed that they were going to play the Boceeem (C1) game.

For example, participants were informed that they were going to play the Casors (C2) game, and were presented with the following instructions onscreen:

The CASORS Game.

In a few moments, you will be playing a ball tossing game, called the CASORS game, with other students over our network. The game is very simple. When the ball is tossed to you, you simply click on the name of the player you want to throw it to. When the game is over, click on the Next button.

Okay, ready to begin?

Please click on the "Next" button below to begin.

The only difference between instructions for the Cyberball inclusion and exclusion games was that for the Cyberball inclusion game (C1), the word "CASORS" was replaced with the word "BOCEEM".

When participants clicked on the Next button, the computer program instructed them to wait while they connected to other players. In total, there were three players involved in the game (the participant and two other students). The player icon for the participant was always positioned at the bottom of the screen, and was labelled "You". Two other player icons were positioned above the participant player icon, on the left and right of the screen respectively (see Figue 1 for a screenshot example). The player on the left-hand side of the screen was named "Paul", while the player on the right-hand side of the screen was named "Catherine". Each player icon consisted of a white figure with a black outline. A line of text reminding participants of the game name (e.g., "The CASORS game") was presented in the top portion of the screen during both the exclusion and inclusion games.

At the beginning of the game, one of the players threw the ball to the participant. In order for the participant to throw the ball to another player, he or she clicked on the appropriate player icon. Reminder instructions on how to throw the ball remained onscreen for the duration of the game. During the Cyberball exclusion game, the participant only caught and threw the ball twice at the start of the game, and was then excluded by the other players for the remainder of the game. That is, the participant did not receive the ball again. The Cyberball exclusion game lasted approximately three minutes, and for a total of 30 trials. In contrast, during the Cyberball inclusion game, participants caught and threw the ball the same number of times as the other players. That is, participants randomly caught and threw the ball 33% of the time (10 times out of the 30 trials). Half of participants played the Cyberball inclusion game first, followed by the Cyberball exclusion game, while the other half played the Cyberball exclusion game first, followed by the Cyberball inclusion game.

Phase 4

Transfer of Function Questionnaire. Having completed the Cyberball inclusion and exclusion conditioning games, participants were required to complete a post-experimental Transfer of Function Questionnaire. This questionnaire sought to determine whether participants felt they would be included in games that were previously established as being part of the same equivalence class (e.g., A1 and B1) as the Cyberball inclusion game (C1), and excluded from games (e.g., A2 and B2) that were from the same equivalence class as the Cyberball exclusion game (C2). Participants were also asked to rate whether they felt they would be excluded from or included in the directly trained C2 exclusion and C1 inclusion games. The instructions presented to participants in the Transfer of Function Questionnaire can be seen below:

296 *Please rate on a scale of 1-9 (1 = Excluded, 9 = Included), how included or*
297 *excluded you think you would be in the following games based on your experience*
298 *of the CASORS and BOCEEM games.*

299 Thus, participants were asked to rate on a scale of 1-9 whether they felt they would
300 be included or excluded from the following games: Lewoly (A2), Gedeer (B2), Casors
301 (C2), Matser (A1), Rigund (B1) and Boceem (C1).

302 *Phase 5*

303 **Cyberball Questionnaire.** Participants were also asked to complete a post-
304 experimental Cyberball questionnaire following both the exclusion and inclusion games.

305 **UWIST MACL.** This was identical to the pre-experimental UWIST MACL
306 measure.

307 **Debrief.** Having completed the final post-experimental questionnaire, participants
308 were thanked for their participation in the study and provided with a debrief information
309 sheet outlining the purpose of the current study. Participants were informed that the other
310 players in the Cyberball game were not students from other universities, but were in fact,
311 computer-generated participants. However, it must be noted that the current study did not
312 undertake a manipulation check to determine whether the experimental deception worked.

313 **Results and Discussion**

314 **Statistical Analysis.** Trials to criterion and mean percentage correct were examined
315 for equivalence training and testing, respectively. For the Transfer of Function
316 Questionnaire, a repeated measures Multivariate Analysis of Variance (MANOVA), with
317 Equivalence class (Class 1 and Class 2) and Game type (Exclusion or Inclusion) as factors,
318 and ratings to the Transfer of Function questionnaire as the dependent measure, was used to
319 examine potential differences between the trained and derived exclusion and inclusion
320 games. Changes in mood as measured by the UWIST MACL were examined using a

repeated measures MANOVA, with time (Time 1 and Time 2) and item (Hedonic, Stress, and Arousal) as factors, and ratings to these items, as the dependent measure. T-tests were conducted to examine differences between the composite ratings of need satisfaction to the Cyberball inclusion and exclusion games. A significance level of .05 was adopted for statistical analysis.

Equivalence Training and Testing. Two participants terminated their participation in the experiment before the end of the study and their data are therefore excluded from further analysis. When a participant ended their participation, the experimenter took note of his or her game order (i.e., exclusion or inclusion game first) so that the next participant would receive this game order. This was done as to ensure that the correct counterbalancing of games was achieved across participants. For the remaining ten participants, all met criteria during both equivalence training and test phases and required between 1 and 3 exposures to do so (M = 1.40, SD = 0.7). Participants required between 12 and 145 trials to meet criterion during equivalence training (M = 36.93, SD = 37.48). All ten participants met criterion during the equivalence test phase, with an overall mean of 98.44% (SD = 1.27) correct class consistent responding.

Transfer of Function Questionnaire. Results demonstrated that eight out of ten participants responded as predicted to C1 and C2. That is, 80% of participants rated that they felt they would be included in the C1 game and excluded from the C2 game. Of these participants, seven out of eight (87.5%) rated that they felt they would be excluded from games related (A2 and B2) to the C2 exclusion game, and included in games (A1 and B1) related to the C1 inclusion game (see Table 2 for participants' ratings with respect to the games on the Transfer of Function Questionnaire).

Figure 2 displays the mean ratings for participants on the post-experimental Transfer of Function Questionnaire. From this figure it can be seen that participants rated

an average of 2.33 (*SD* = 1.58) for the directly trained C2 exclusion game, and rated an average of 8.11 (*SD* = .78) for the directly trained inclusion game. In addition, Figure 2 shows participants' ratings for the derived exclusion games. On average, participants rated 3.11 (*SD* = 1.54) to A2, and 3.00 (*SD* = 1.94) to B2. To the derived inclusion games, participants rated an average of 7.67 (*SD* = 1.12) to A1 and 7.44 (*SD* = 1.01) to B1.

A MANOVA revealed a significant effect for Equivalence class ($F(3, 12) = 91.545$, $p = .001$, $\eta_p^2 = .958$). Follow-up comparison revealed a significant difference in ratings to the directly trained C1 and C2 games ($p = .001$), the derived symmetrical B1 and B2 games ($p = .001$), and the derived equivalence A1 and A2 games ($p = .001$). Thus, participants rated that they felt they would be excluded from games that were members (A2 and B2) of the same equivalence class as the directly trained exclusion game (C2), and included in games that were members (A1 and B1) of the same equivalence class as the directly trained inclusion game (C1).

Cyberball Questionnaire. In order to determine whether the Cyberball exclusion game was successful in inducing feelings of exclusion (ostracism), three manipulation checks were included at the end of the Cyberball Questionnaire. Average ratings to these questions indicated that when participants were exposed to the Cyberball exclusion game, they felt more ignored (*M* = 1.5, *SD* = .71) than when they were exposed to the Cyberball inclusion game (*M* = 3.8, *SD* =1.55, $t(9) = -4.867$, $p = .001$; $d = .69$). In addition, when participants were exposed to the Cyberball exclusion game, they reported that they felt more excluded (*M* = 1.5, *SD* = .50) than when they were exposed to the Cyberball inclusion game (*M* = 4.1, *SD* = 1.30; $t(9) = -6.50$, $p = .001$; $d = .80$). Furthermore, when participants were exposed to the Cyberball exclusion game, they correctly reported that they received the ball on a smaller percentage of throws (*M* = 5.1%, S*D* = 4.11%) in comparison to when they were exposed to the Cyberball inclusion game (*M* = 35.4%, *SD* =

10.89%; $t(9) = -10.324$, $p = .001$; $d = .88$). Thus, responses to these questions demonstrated that the osctracism manipulation was successful.

A composite score to Williams et al.'s (2000) four needs (belonging, self-esteem, meaningful existence and control) was taken for each participant when they were exposed to the exclusion (Cronbach's alpha = .495) and inclusion (Cronbach's alpha = .949) games. This analysis revealed that when participants were exposed to the Cyberball exclusion game, need satisfaction was, on average, 2.35 ($SD = 1.04$). In contrast, when participants were exposed to the Cyberball inclusion game, need satisfaction was, on average, 3.99 ($SD = .50$). The difference proved to be significant ($t(9) = -6.317$, $p = .001$; $d = .71$). Thus, composite scores following exposure to the Cyberball findings from this experiment are consistent with research in the area of ostracism (Jamieson et al., 2010; Williams, 2009), which demonstrate that being excluded threatens fundamental needs.

UWIST MACL. Potential changes in self-reported mood ratings as measured by the UWIST MACL were examined using a MANOVA. For this analysis, averages were taken for participant ratings to items in the Hedonic, Stress, and Arousal groups (see Figure 3). However, this analysis revealed no significant effect for Time ($F(3, 16) = .168$, $p = .916$; $\eta_p^2 = .031$). Thus, no significant differences between pre- and post-test measures of mood ratings were observed following exposure to the Cyberball inclusion and exclusion games. In addition, no main effect for item was observed.

The results of Experiment 1 demonstrated the transfer of exclusion and inclusion functions through equivalence classes. That is, in the Transfer of Function Questionnaire, 7 out of 10 participants rated that they would be included in the directly trained inclusion (C1) game, and excluded from the directly trained exclusion (C2) game. In addition, these participants rated that they would be included in games related to C1 (A1 and B1), and excluded from games related to C2 (A2 and B2). Findings from Experiment 1 also revealed

that participants reported lower need satisfaction following exposure to the Cyberball exclusion game, than following exposure to the Cyberball inclusion game. Thus, consistent with findings in the literature (Jamieson et al., 2010; Williams, 2009), results from Experiment 1 revealed that need satisfaction is threatened following exclusion on the Cyberball game.

Although findings from Experiment 1 revealed the transfer of exclusion and inclusion functions through equivalence classes, it may have been possible that participants' responses were a result of the comparison between the two games rather than the exclusion episode. That is, exposure to both an exclusion and inclusion game may have resulted in the observed transfer of functions. Thus, in order to more clearly determine the conditions under which exclusion functions transfer, it may be necessary to expose participants only to one game type. To that end, Experiment 2 was designed to expose participants to the Cyberball exclusion game, with no function attached to the second equivalence class. It was predicted that participants would rate the equivalence class with no function attached to it as neutral in terms of likelihood of future exclusion. Participants were first exposed to derived stimulus relations training and testing identical to Experiment 1, followed by the Cyberball exclusion game.

Experiment 2

Method

Participants

Twenty students, 8 male and 12 female, ranging in age from 19 to 41 (M = 24.45, SD= 6.53) were recruited through campus wide advertisements at University College Dublin. In return for participation, individuals received €5 in cash. Ethical approval was obtained from the departmental ethics committee before research commenced.

421 **Apparatus and Setting**

422 This was identical to Experiment 1.

423 **Procedure**

424 The entire experimental procedure for Experiment 2 was identical to Experiment 1
425 with the following exceptions:

426 Participants were exposed to only the Cyberball exclusion game, and the Transfer
427 of Function Questionnaire differed in terms of the following instructions:
428 *Please rate on a scale of 1-9 (1 = Excluded, 9 = Included), how included or excluded you*
429 *think you would be in the following games based on your experience of the CASORS game.*
430

431 **Results and Discussion**

432 **Statistical Analysis.** Trials to criterion and mean percent correct were reported for
433 the equivalence training and testing phases, respectively. For the Transfer of Function
434 Questionnaire, a one-way within subjects Analysis of Variance (ANOVA) with
435 Equivalence class member (Class 1 and Class 2) as the factor and ratings to the Transfer of
436 Function questionnaire as the dependent measure, was used to examine differences
437 between average ratings to the directly trained and derived games, and the unrelated games.
438 Changes in mood as measured by the UWIST MACL were examined using a MANOVA,
439 with time (Time 1 and Time 2) and item (Hedonic, Stress, and Arousal) as repeated
440 measures, and ratings to these items as the dependent measure. A significance level of .05
441 was adopted for statistical analysis.

442 **Equivalence Training and Testing.** Five participants were unable to meet criterion
443 during the equivalence test phase, and their data is therefore excluded from further analysis.
444 For the remaining fifteen participants, all met criteria during both equivalence training and
445 test phases, and required between 1 and 3 exposures to do so (M = 1.67, SD = .82).

Participants required between 12 and 119 trials to meet criterion during equivalence training (M = 31.80, SD = 25.01). All 15 participants met criterion during the equivalence test phase, with an overall mean of 97.28% (SD = 1.41) correct class consistent responding.

Transfer of Function Questionnaire.

Results demonstrated that of 10 out of 15 participants rated that they felt they would be excluded from the C2 game. Of these participants, all rated that they felt they would be excluded from games related (A2 and B2) to the C2 exclusion game. In addition, and contrary to predictions, participants did not make neutral ratings to the unrelated games, but instead, rated that they would be "more" included in, or "less" excluded from, games (A1, B1, and C1) that were unrelated to the C2 exclusion game (see Table 3 for participants' ratings to all games during the Transfer of Function Questionnaire).

Figure 4 displays the mean ratings for participants included in the transfer group to the post-experimental Transfer of Function Questionnaire. As can be seen in Figure 4 participants rated the directly trained C2 exclusion game on average at 1.6 (SD = .70). In addition, participants' rated A2 at 2.9 (SD = 2.33), and B2 at 4.00 (SD = 3.02). Thus, feelings of exclusion were on average slightly less for participants to the derived A2 and B2 games. Figure 4 also displays the mean rating to the three game names that were unrelated (i.e., A1: Master; B1: Rigund; C1: Boceem) to the directly trained and derived exclusion games. On average ratings to the unrelated game names were 6.13 (SD = 2.50).

A within-subjects ANOVA revealed a significant main effect for Equivalence class member ($F(3, 27) = 6.37$), p = .022; η_p^2 = .415). Post-hoc comparisons with a Bonferroni correction applied revealed a significant difference between feelings of exclusion to C2 and the unrelated games (p = .001). No other differences were observed. Thus, feelings of exclusion were significantly less to games (A1, B1, and C1) that were unrelated to the directly trained exclusion game (C2). In contrast, there were no significant differences

between ratings to the derived exclusion and unrelated games. Such findings suggest that the transfer of feelings of exclusion to the derived members (A2 and B2) of the C2 exclusion equivalence class were not as strong as those reported in Experiment 1.

Cyberball Questionnaire. In order to determine whether the Cyberball exclusion game was successful in inducing feelings of exclusion (ostracism), three manipulation checks were included at the end of the Cyberball Questionnaire. This analysis revealed that the average rating to the feeling of being ignored was 3.7 (SD = 1.06), and the average rating was 3.6 (SD = 1.07), to the feeling of being excluded. In addition, on average, participants correctly reported that they received the ball less than the other participants (M = 6.5%, SD = 4.12%). Thus, average ratings to the question regarding the percentage of throws demonstrated that the ostracism manipulation was successful. However, average ratings to the feelings of being ignored and excluded were higher than those previously reported in the literature (see Jamieson et al., 2010; Williams, 2009).

A composite score (Cronbach's alpha = .826) to the four needs (belonging, self-esteem, meaningful existence and control) was taken for each participant (see Jamieson et al., 2010; Williams, 2009). This analysis revealed that, on average, need satisfaction for participants was 2.23 (SD = 0.34). Thus, consistent with research in the area of ostracism (Jamieson et al., 2010; Williams, 2009), being excluded threatens fundamental needs.

UWIST MACL. Potential changes in self-reported mood ratings, as measured by the UWIST MACL, were examined using a MANOVA. For this analysis, averages were taken for participant ratings to items in the Hedonic, Stress and Arousal groups (see Figure 5). This analysis revealed a significant main effect for Time ($F(3, 26) = 3.043$, $p = .047$, $\eta_p^2 = .260$). Follow-up analysis revealed a significant difference in participants' ratings to Hedonic items at pre- and post-test ($p = .024$). No other differences were observed and no

main effect for item was observed. Thus, in Experiment 2, participants had significantly higher ratings to Hedonic items before exposure to the Cyberball exclusion game.

General Discussion

In Experiments 1 and 2, we aimed to examine the transfer of exclusion and inclusion functions across equivalence classes. Taken together the results demonstrated that both inclusion functions (Experiment 1) and exclusion functions (Experiments 1 and 2) transferred across equivalence classes. That is, participants rated that they felt they would be excluded from the directly trained exclusion game (C2) and included in the directly trained inclusion game (C1). These ratings also transferred to other words (i.e., game names) that were experimentally trained as related to the exclusion (A2 and B2) and inclusion (A1 and B1) game. However, it must be noted that in Experiment 2, the difference in ratings to the derived exclusion and unrelated games was not statistically significant. In saying this however, the transfer of exclusion functions across an equivalence class in Experiments 1 and 2 suggest that the equivalence phenomenon might explain why individuals' response to exclusion is so strong (Williams et al., 2002). If exclusion on one game translates to potential exclusion from all games related to the target game, the relational nature of equivalence enhances the potential impact of an exclusion incident. Consistent with predictions from the equivalence literature (Dack, et al., 2009) participants' exclusion and inclusion ratings transferred to other words (i.e., game names) that were experimentally trained as related to the word present during the Cyberball game.

Although findings from Experiment 1 demonstrated the transfer of exclusion and inclusion functions it was questioned as to whether exposure to both types of games resulted in the observed transfer of functions. Experiment 2 was therefore designed in an attempt to address this issue and participants were exposed to only the Cyberball exclusion

game. Findings revealed that for a number of participants, feelings of exclusion transferred to the directly trained (C2), and related games (A2 and B2). In addition, participants rated that they felt they would be "more" included in, or "less" excluded from, games (A1, B1, and C1) that were unrelated to C2. Although differences between ratings to the derived exclusion games and the unrelated games were non-significant, a number of participants in Experiment 2 rated that they would be included in games that were part of the unrelated equivalence class despite having never directly experienced feelings if inclusion on the Cyberball game.

The Cyberball questionnaire employed in Experiments 1 and 2 sought to measure four types of needs: Belonging, Self-esteem, Control, and Meaningful existence. Findings from this analysis revealed a significant difference in participants' ratings to the four needs following the exclusion and inclusion games in Experiment 1. That is, exclusion from the Cyberball game was found to threaten need satisfaction. Similar findings were observed for participants in Experiment 2, following the Cyberball exclusion game. The finding that reported need satisfaction was threatened following exposure to the C2 exclusion game suggests that similar results would be observed if need satisfaction ratings were also taken for the related exclusion games (A2 and B2). Although the current proposal is speculative, the generalization of such ratings may have important implications for the development and implementation of interventions to reduce feelings (e.g., lowered sense of self-esteem, threats to meaningful existence) associated with an episode of ostracism. For instance, a recent study examined the effectiveness of focused attention (i.e. participants focus their attention on the here-and-now) on reducing the distress caused following ostracism from the Cyberball game (Molet, Macquet, Lefebvre, & Williams, 2013). Molet et al. (2013) found that although focused attention did not reduce the distress during the ostracism experience, recovery from ostracism was aided, as participants did not experience recurring

feelings of ostracism, after the task had concluded. Thus, future studies should seek to examine the effectiveness of similar interventions in reducing the potential generalization of feelings associated with exclusion (e.g., lower self-esteem) following an episode of ostracism.

The current experiments also sought to examine potential changes in mood as a result of being excluded or included in the Cyberball game. This was done by taking both pre- and post-experimental measures of mood, as measured by the UWIST MACL. Findings revealed no significant changes in participants' mood from pre- to post-times in Experiment 1. In Experiment 2, however, participants had significantly higher ratings to the Hedonic items before exposure to the Cyberball exclusion game. One potential reason for the lack of differences in Experiment 1, was that the post-experimental mood ratings, were taken following completion of both the exclusion and inclusion games. Thus, any changes in mood as a result of exclusion from the Cyberball game may not have been detected.

In addition to promoting basic understanding of exclusion in a new paradigm, and the factors (e.g., perceived lack of control) in the environment that affect social exclusion, the current experiment explored the effects of exclusion that are potentially important to understanding clinical disorders such as depression. For instance, the current findings may bear relevance to the literature on learned helplessness in which an individual learns to behave helplessly due to a perceived lack of control over the outcome of a situation (Seligman, 1975). That is, following repeated exposure to an aversive situation from which an individual cannot escape, feelings of helplessness may govern behavior. Later, when the individual is presented with the opportunity to escape the aversive situation, they are unable to do so due to this perceived lack of control. With respect to the current findings, following exposure to the Cyberball exclusion game, participants reported a decreased sense of "control". The current findings may therefore be

important in the sense that the feelings of lack of control reported following exclusion on the Cyberball game may, generalize to other situations (e.g., work and personal life) in an individual's life. The current results may also inform us about the problems experienced by people that can occur without direct experience (e.g., a fear of spiders without ever being in contact with one). Furthermore, and as demonstrated in the current experiment, exclusion attempts can transfer to stimuli that are closely related to the targeted stimulus, such generalization could cause a negative cascade that would aggravate disorders such as depression (Walther, Nagengast, & Trasselli, 2005).

The current findings demonstrate that feelings of exclusion can generalize from direct exposure to exclusion to other activities related to the exclusion exposure that have never been directly encountered. This has implications for the literature on both cyber and social exclusion in that the negative effects of exclusion are far broader than an individuals' response to the exclusion instance (e.g., mood change, lower self esteem, etc.) but also to contexts that are linked to the exclusion instance (e.g., any game labeled as similar to the original game an individual is excluded from). For example, previous research has shown that exclusion negatively impacts a sense of belongingness, which in turn, can lead to higher levels of withdrawal (O'Reilly & Robinson, 2009). In addition, threats to control following an instance of exclusion may result in antisocial thoughts and behaviors (Williams, Case, Govan, & Forgas, 2003). Accounting for the generalized impact of exclusion in terms of derived stimulus relations provides a bottom up account of the mechanisms involved in the pervasive impact of exclusion.

Future research could examine the effects of varying the instructions given to the participants when they are rating their level of exclusion functions. In complex human performance, there are many rules that may be derived, and which could impact on the generalization of exclusion functions, especially in clinically-relevant situations. One

595 avenue for future research might examine whether different patterns of relational
596 responding result in 'derived exclusion'. For example, previous research has demonstrated
597 derived relational responding in accordance with multiple stimulus relations such as
598 'distinction,' 'hierarchy,' 'conditionality,' 'causality,' and 'opposition' (e.g., Dymond, &
599 Barnes, 1995; Dymond, Roche, Forsyth, Whelan, & Rhoden, 2008; Gil, Luciano, Ruiz, &
600 Valdivia-Salas, 2012; Steele & Hayes, 1991). Two examples that may be particularly
601 interesting in respect to the current phenomenon is the relations of 'opposition', and
602 'comparison' (i.e., 'more than'/ 'less than'). Expanding the model from equivalence
603 relations to multiple stimulus relations would bolster the derived stimulus relations'
604 account of the generalization of exclusion. In turn, this may provide additional dimensions
605 to a model of how exclusion (e.g., how ostracised an individual is socially) are produced by
606 certain contingencies, and how they can generalize to other stimuli related to the initial
607 exclusion episode.
608

609 **Acknowledgments**

610 This work was funded by a grant from the European Commission FP7 Marie Curie CIG.
611

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Table 1

Nonsense Words Used As Game names and their Assignment to Equivalence Classes

	A	B	C
Class 1	Matser	Rigund	Boceem
Class 2	Lewoly	Gedeer	Casors

Table 2

Individual ratings to the games presented during the Transfer of Function Questionnaire for participants in Experiment 1 (1 = *Excluded*; 9 = *Included*).

Participant	A1	B1	C1	A2	B2	C2
1*	5	8	6	6	5	4
2	7	8	9	3	1	1
3	8	8	8	3	3	3
4	8	8	8	2	2	2
5	8	9	9	3	3	2
6	8	8	8	1	1	1
7	5	5	7	5	5	1
8	8	8	8	2	2	2
9	7	7	7	3	3	3
10*	8	8	9	6	7	6

* represents participants that did not demonstrate the basic effect (i.e., rate C2 as excluded and C1 as included), and thus, these participants were not included in the transfer group for statistical analysis.

Table 3

Individual ratings to the games presented during the Transfer of Function Questionnaire for participants in Experiment 1 (1 = *Excluded*; 9 = *Included*).

Participant	A1	B1	C1	A2	B2	C2
1	8	8	7	2	3	2
2	8	8	8	3	4	2
3*	1	1	1	9	9	9
4*	2	2	7	2	8	7
5	5	5	5	4	6	1
6*	2	2	2	7	9	9
7	8	8	8	2	2	2
8*	8	9	9	7	6	7
9*	6	6	6	9	8	8
10	6	7	7	2	2	2
11	9	9	9	1	1	1
12	1	1	1	9	9	1
13	6	6	6	3	9	3
14	1	4	4	2	3	1
15	7	7	7	1	1	1

* represents participants that did not demonstrate the basic effect (i.e., rate C2 as excluded), and thus, these participants were not included in the transfer group for statistical analysis.

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738

739 **List of figures**

740 *Figure 1.* A screenshot example of the Cyberball game participants were exposed to in
741 Experiments 1 and 2.

742

743 *Figure 2.* The mean ratings to the directly trained exclusion (C2) and inclusion (C1) games
744 presented in the Transfer of Function Questionnaire in Experiment 1. Also shown are the
745 mean ratings to the derived exclusion (A2 and B2) and inclusion (A1 and B1) games. "T
746 Exclusion" refers to the directly trained exclusion game (C2), "T Inclusion" refers to the
747 directly trained inclusion game (C1), "S Exclusion" refers to ratings to the derived
748 symmetrical exclusion game (B2), "S Inclusion" refers to ratings to the derived
749 symmetrical inclusion game (B1), "E Exclusion" refers to ratings to the derived
750 equivalence exclusion game (A2), and "E Inclusion" refers to the derived equivalence
751 inclusion game (A1). * = $p < .05$

752

753 *Figure 3.* The mean ratings to the Hedonic, Stress and Arousal adjective groups in the
754 UWIST MACL, at pre- and post-test in Experiment 1. Error bars represent standard errors.

755

756 *Figure 4.* The mean ratings to games presented in the Transfer of Function Questionnaire in
757 Experiment 1. "T" refers to ratings to the directly trained exclusion game, "S" refers to
758 ratings to the derived symmetrical exclusion game (B2), "E" refers to ratings to the derived
759 equivalence exclusion game (A2), while "Unrelated" refers to the mean ratings to the three

games (A1, B1 and C1) that were unrelated to the directly trained and derived exclusion games. * = $p < .05$

Figure 5. The mean ratings to the Hedonic, Stress and Arousal adjective groups in the UWIST MACL, at pre- and post-test in Experiment 1. Error bars represent standard errors. * = $p < .05$

Figure 1

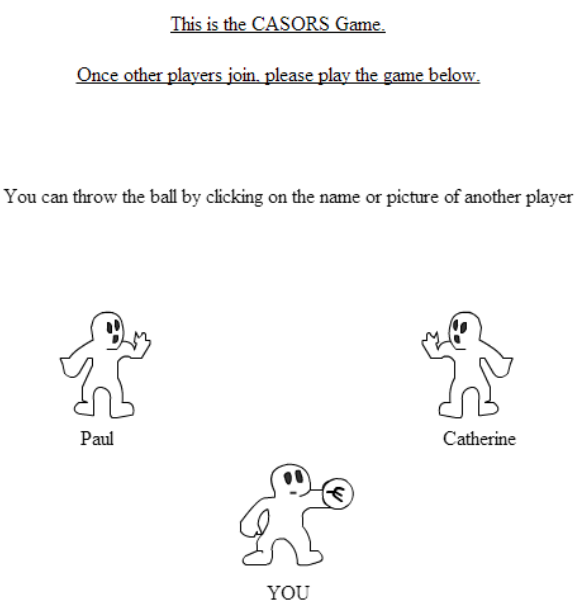
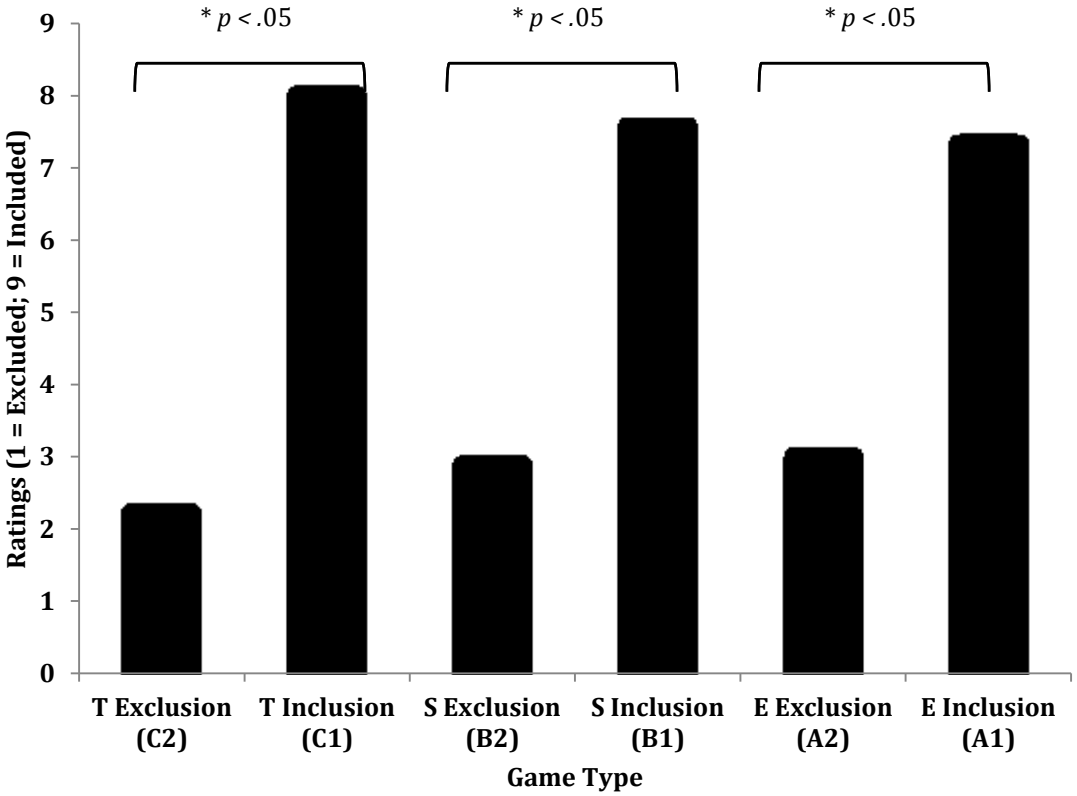


Figure 2


* p < .05
* p < .05
* p < .05
Ratings (1 = Excluded; 9 = Included)
9
8
7
6
5
4
3
2
1
0
T Exclusion (C2)
T Inclusion (C1)
S Exclusion (B2)
S Inclusion (B1)
E Exclusion (A2)
E Inclusion (A1)
Game Type

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794 Figure 3

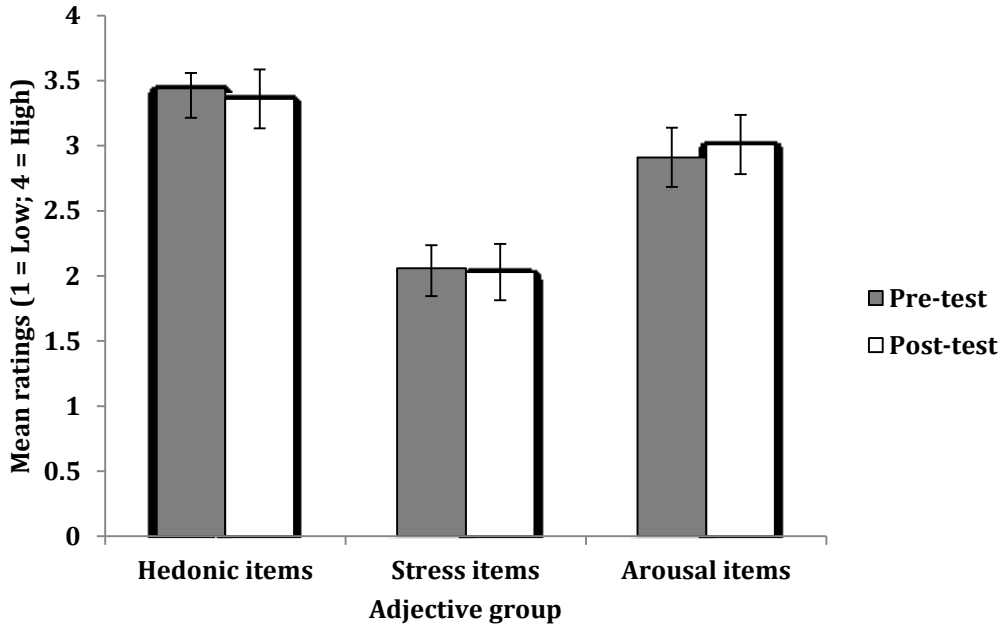

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Figure 4

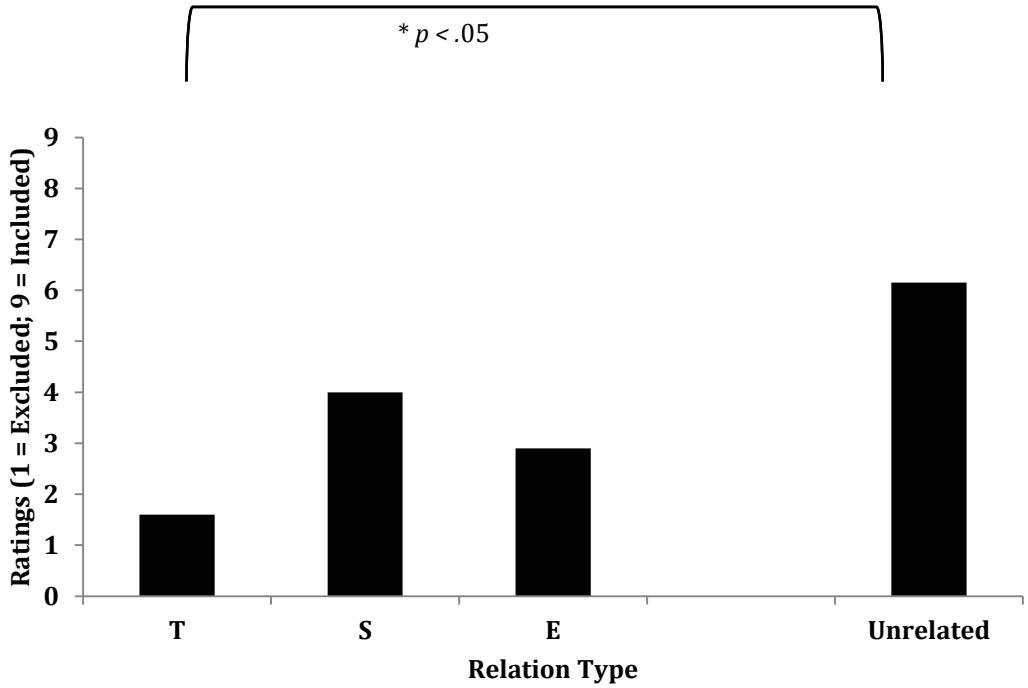
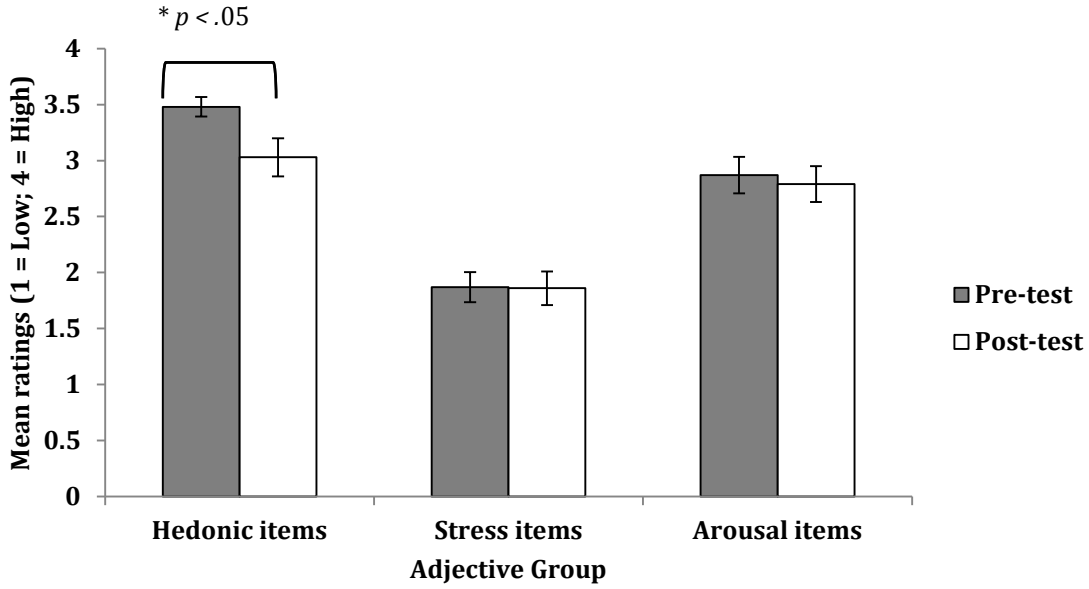

* p < .05
Ratings (1 = Excluded; 9 = Included)
0
1
2
3
4
5
6
7
8
9
T
S
E
Unrelated
Relation Type

Figure 5


* p < .05
Mean ratings (1 = Low; 4 = High)
4
3.5
3
2.5
2
1.5
1
0.5
0
Hedonic items
Stress items
Arousal items
Adjective Group
Pre-test
Post-test