Group Dynamics: Theory, Research, and Practice

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BRIEF REPORT

Atimia: A Novel Group-Based Paradigm for Manipulating Ostracism and Group Members' Performance

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Ostracism, being excluded and ignored, is a socially painful experience that can lead to distressing consequences, including thwarted basic needs satisfaction and worsened mood (Williams & Nida, 2011). Ostracism researchers have relied heavily on a single paradigm: Cyberball (Williams, Cheung, & Choi, 2000), and although Cyberball has been conducted successfully with over 5,000 participants, there are few alternative paradigms to replicate ostracism's effects. Specifically, no alternative paradigms utilize a group-based interaction in which players continuously interact to achieve a goal. Additionally, researchers have not incorporated a key characteristic of the group that influences satisfaction: the efficacy of a group to accomplish a task (i.e., burdensomeness). To address these issues, we designed Atimia, a group-based game in which players take turns completing word-association items. We manipulated computer-controlled agents to either ostracize or include participants and to be burdensome (i.e., perform poorly) or nonburdensome. We found participants felt worse when they were ostracized, compared with when they were included, and when playing with a burdensome versus nonburdensome group. Ostracism effect sizes were comparable with Cyberball and other alternative ostracism paradigms. Similar to previous ostracism research, a group characteristic (burdensomeness) did not buffer the effects of ostracism. Examining beyond the immediate ostracism effects, participants were more interested in continuing with a nonburdensome group that included them compared with a burdensome, but inclusive, group or a group that ostracized (regardless of group burdensomeness). Initial results suggest Atimia is a means to replicate ostracism's effects and is a new tool for researchers studying groups.

Keywords: ostracism, social exclusion, burden, basic needs, group performance

When a group denies inclusion to one of its members, the ostracized (i.e., excluded and ignored) individual quickly experiences social pain—the pain associated with a loss, or perceived loss, of a social connection (see Macdonald & Leary, 2005, for a review). Social pain is part of an evolved social exclusion detection system (e.g., Leary & Baumeister, 2000)

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that is characterized by an increased activation in regions of the brain associated with experiencing physical pain—the dorsal anterior cingulate cortex and right ventral prefrontal cortex (see Eisenberger, Lieberman, & Williams, 2003). According to Williams (2009), the social pain alarm results in individuals feeling less satisfaction of basic needs and worsened mood. These ostracism effects are generally not moderated by group characteristics, including playing with computer-controlled players (Zadro, Williams, & Richardson, 2004) or with a despised outgroup (i.e., the KKK; Gonsalkorale & Williams, 2007). However, essentialism of the group (viewing groups as having a shared natural trait) has been shown to play a moderating role (Bernstein, Sacco, Young, Hugenberg, & Cook, 2010). It is worth noting that each of these studies were conducted using Cyberball.

Previously, ostracism researchers relied primarily on a single paradigm, Cyberball (Williams, Cheung, & Choi, 2000; Williams & Jarvis, 2006), and only recently have new paradigms been added. Cyberball involves participants believing they are throwing a virtual ball with at least two other players online. However, the players are actually computer-controlled agents who the experimenters preprogrammed to behave in a prescribed fashion, such as not throwing the ball to a participant. In part due to its ease of use, more than 5,000 participants have completed Cyberball studies (Williams & Nida, 2011). Only recently have alternative ostracism paradigms been developed, including recalling, in detail, a socially painful experience (e.g., betrayal, exclusion; Chen, Williams, Fitness, & Newton, 2008), mentally visualizing an interaction with an avatar that either depicts averted (ostracizing) or direct eye gaze (Wirth, Sacco, Hugenberg, & Williams, 2010), failing to receive a ball during a ball-toss game in an immersive virtual environment (IVE; Kassner, Wesselmann, Law, & Williams, 2012), or receiving, or failing to receive, attention when giving a speech via a Webcam (O-Cam; Goodacre & Zadro, 2010). These paradigms have only recently begun to address a concern with the reliance on Cyberball to study ostracism.

In the current research, we wanted to design a paradigm to address two limitations of Cyberball. The first limitation is validating ostracism effects that are a result of an interactive group task. The highest standard for demonstrating an effect is based on taking a multimethod approach (e.g., Campbell & Fiske, 1959), whereby an effect is validated using a host of different methods. Recent ostracism paradigms are alternative methods to Cyberball, but they either are not based on an interactive group task (e.g., averted eye gaze, O-cam) or require significant resources to conduct (e.g., IVE). We wanted to design an interactive group paradigm that was based on similar principles as Cyberball, but involved a different task. This type of paradigm could further validate previous ostracism effects found using Cyberball by implementing a multimethod approach.

The second limitation is also related to utilizing a multimethod approach—specifically, the ability to test previous research investigating moderators of ostracism. Generally, ostracism researchers have not found moderators of ostracism effects (see Williams, 2009, for a review), even when the ostracism should be discounted due to the ostracized participant receiving money for not being included (van Beest & Williams, 2006), for example. A limitation to drawing the conclusion that ostracism cannot be moderated is the restricted manner in which moderators were tested. In several of these studies (e.g., Gonsalkorale & Williams, 2007; van Beest & Williams, 2006; van Beest, Williams, & van Dijk, 2011; Wirth & Williams, 2009; Zadro, Boland, & Richardson, 2006; Zadro et al., 2004), the lack of significant moderation was based only on using Cyberball (or a slightly modified version); ostracism may be moderated by these variables in a different context, such as Atimia. When moderation of ostracism, based on a manipulation in Cyberball, did occur (e.g., Bernstein et al., 2010; Wirth, Lynam, & Williams, 2010), the researchers did not have an alternative group interaction paradigm to generalize their results.

Without an alternative paradigm, researchers are limited in their ability to test moderators because they may be drawing conclusions based on either aspects of the Cyberball paradigm or genuine effects of ostracism. Ultimately, we

[1] Atimia is derived from the ancient Greek term *atimia*, the penalization of the *atimos*, citizens indebted to Athens (Allen, 2000). A man in atimia was not able to conduct some business or engage in politics until his debt was repaid.

propose a paradigm to triangulate ostracism effects found in several Cyberball studies and in recent studies employing novel methods. In the current research, we compared each of these paradigms on the strength of their ostracism effects.

Our first goal was to provide researchers with a means of replicating Cyberball effects and to address Cyberball's limitations. To achieve our first goal, we developed Atimia,[1] a group-based interaction, ostensibly online, in which participants play with computer-controlled agents who vary in how often they choose the participant (or each other) and how well they perform a word association task. Atimia was designed to mimic all the characteristics that make Cyberball a valuable tool, such as being able to run multiple participants at once, being easy to program, and being a strong manipulation, while extending beyond Cyberball by adding a manipulation of player performance.

Group Member Performance

In addition to creating an easy-to-use ostracism paradigm, we wanted to be able to manipulate a second factor important in determining the satisfaction with one's group—how efficacious the group is in achieving its goal. How well a group performs on its associated tasks could have an impact on the benefits gleaned from membership. For instance, when a group performs well, individuals feel positive and identify with the group, a phenomenon known as Basking in Reflected Glory (BIRGing; Cialdini et al., 1976). Further, when a group is successful, the group members feel more group efficacy and interpersonal trust (Macy, 1995), which are feelings related to greater cooperation (Smith, Jackson, & Sparks, 2003). However, individuals try to distance themselves when a group performs poorly, a behavior referred to as Cutting Off Reflected Failure (CORFing; Snyder, Lassegard, & Ford, 1986). Group failure on a task leads to reductions in team morale (Lott & Lott, 1965; Taylor & Tyler, 1986), group cohesion (Brawley, Carron, & Widmeyer, 1988; Levine & Moreland, 1990), collective efficacy (Iso-Ahola, 1977; Riggs & Knight, 1994), and performance (Reisel & Kopelman, 1995).

From an evolutionary perspective, group efficacy is likely a trait valued highly by individual group members; all individuals benefit from groups, which will generate fitness benefits while minimizing potential fitness costs (Kurzban & Leary, 2001). Fitness costs come in the form of group members who are not successful in their own right, such as being poor cooperators or unable to contribute to group needs. Thus, members who encumber an individual or group from achieving its purpose may be deemed as burdensome. Therefore, any group composed of burdensome members may be a less attractive group with which to belong. Researchers (Wesselmann, Wirth, Pryor, Reeder, & Williams, 2013) recently demonstrated the aversion to working with burdensome group members when they found individuals ostracized a burdensome group member rather than engaging him or her.

The aversiveness to working with burdensome others raises an interesting but, as of yet, unexamined question: Could burdensome groups—those which impede an individual from reaching a goal—potentially decrease fundamental benefits (e.g., need satisfaction) derived from group membership? Unfortunately, paradigms like Cyberball are unable to address this question. However, we can examine our question by achieving the second goal of Atimia: to manipulate the efficacy of a participant's group members in completing a task. To examine group efficacy, we developed a performance component in Atimia. Specifically, we manipulated the efficacy of a participant's group members to complete a task by programming them to be burdensome (i.e., perform poorly) or nonburdensome.

Overview

We aimed to demonstrate that Atimia could successfully induce feelings of ostracism, specifically that ostracized, compared with included, participants would feel more social pain, less basic need satisfaction, and more negative mood. We also aimed to demonstrate that playing with a burdensome, versus nonburdensome, group would lead participants to feel more burdened by their group, less basic need satisfaction, and more negative mood.

We also aimed to test whether group characteristics (i.e., burdensomeness) could moderate ostracism's effects. If moderation of ostracism's effects by group burdensomeness were to occur, we could see one of two results. For the first

potential result, participants might feel worse being ostracized by a burdensome versus nonburdensome group, because ostracized participants may feel especially hurt that even a poorly functioning group does not want to include them. For the second potential result, participants could feel better being ostracized by a burdensome group, rather than nonburdensome group, because they no longer feel compelled to interact with a poorly functioning group; they could experience a sense of relief. To support an interaction hypothesis for either possible outcome, we would expect either no difference of group burdensomeness for included participants, or the direction of the effect would be similar for included participants compared with ostracized participants, but would not be as strong. Alternatively, results may replicate previous research (see Williams, 2009), demonstrating that the immediate effects of ostracism are not moderated. An unmoderated response would produce two main effects: exclusionary status (inclusion vs. ostracism) and group burdensomeness.

Method

Participants and Design

Two hundred thirty-five students from a small, southeastern university originally took part in the study to earn credit for a psychology course. Sixteen participants were removed due to a computer malfunction, due to requesting their data be discarded, or due to having previous experience with Atimia. The final sample consisted of 219 participants (64.4% female; M_{age} = 21.46, SD_{age} = 4.39) who were predominately White (63.0%) and African American (14.6%).[2]

Participants were randomly assigned to a 2 (exclusionary status: included vs. ostracized) × 2 (group burdensomeness: nonburdensome vs. burdensome) between-participants design.

Materials

Atimia is a computer program designed using Ruby (Matsumoto, 2006) that runs similarly to Cyberball. Atimia is run locally on individual computers and uses Shoes (Shoes, 2010) as its graphical user interface. Researchers can generate different game play scenarios by using a control panel that guides the researchers through the manipulation options. From the control panel, researchers can dictate the criteria for when the game ends (total number of trials or based on the number of correct trials), the performance of the computer-controlled agents (i.e., how many trials the agents gets correct), the number of computer-controlled agents (1 or 2), how long agents take before giving an answer, the avatar for each agent, the names ascribed to each agent, and the position of the participant. The researchers can also control the Remote Associates Test (RAT) items (Bowden & Jung-Beeman, 2003; Mednick, 1968) that are used during the game (primarily, their difficulty). Lastly, Atimia can be launched using MediaLab (Jarvis, 2010).

Procedure

For the current experiment, participants were escorted to the laboratory, seated at a computer station, and then provided consent to partake in the study. Participants were told they would be interacting with others online in a group task called Atimia, a task designed to be an engaging group activity. The task involved playing a game in which participants solved RAT items (Bowden & Jung-Beeman, 2003; Mednick, 1968). To solve a RAT item, players must provide a word that links three disparate words; for instance, "over," "plant," and "horse" share the linking word "power" (i.e., "overpower," "power plant," and "horsepower"). The players took turns solving the RAT items and, upon completion of each item, the active player would choose the next player. The active game player was denoted by an opaque avatar in addition to a light blue name and accuracy score (in percent; see Figure 1). Following each round, accuracy scores and the round number updated. Although participants believed they were playing with two other individuals, they actually played with computer-controlled agents. Each time an agent was selected, the experimenter preprogrammed whether the computer gave the correct answer, the delay before

[2] The authors initially sampled 166 participants and then analyzed the data. Because a hypothesized interaction did not reach statistical significance, the authors collected an additional 69 participants.

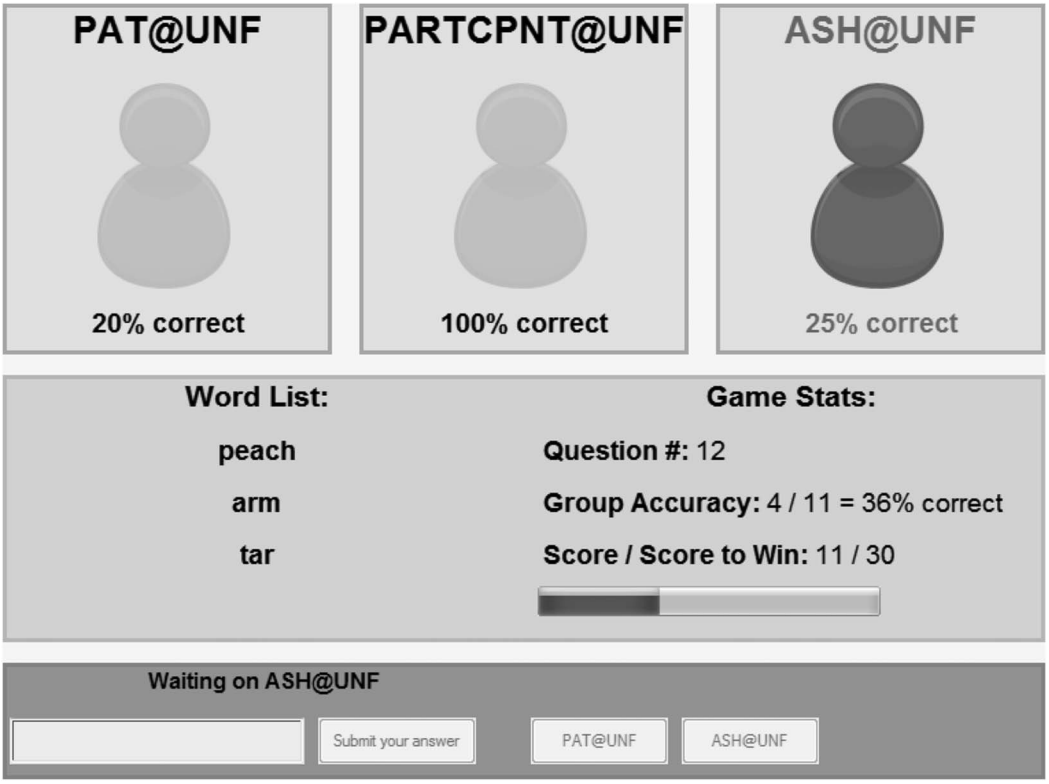

Figure 1. Screenshot of Atimia. The player currently solving the task (the right player, in this case) is denoted by an opaque avatar and light blue name and accuracy score.

the confederate responded (+1 to −1 standard deviation of the average player's time, based on pilot testing), and then whether the agent selected the participant or the other agent to go next. The game lasted approximately 5 to 7 min (slightly longer than Cyberball).

Participants began Atimia by entering an alias that logged them into an illusory game server in which they were positioned in the middle between the agent players PAT@UNF and ASH@UNF. The game itself started with the agents answering the first three RAT items, which acted as an additional demonstration of the task for the participant. Following the agents answering the first few RAT items, participants were randomly assigned to be ostracized or included; ostracized participants were selected once by each agent and then never again, whereas included participants were selected throughout the game (approximately 33% of the time). We manipulated the agents' performance so that they performed roughly as well as participants (approximately 80%)[3] or significantly worse (approximately 13%). The group completed 30 RAT items before the game ended. Additionally, to make the task outcome meaningful, participants were informed that the number of clues they would receive to solve an upcoming murder mystery (a nonexistent task) depended on the group's accuracy on the Atimia task.

Dependent Variables

Following the completion of the Atimia game, participants responded to several ques-

[3] Pilot testing demonstrated participants were approximately 80% correct.

tionnaires based on their experience *during* Atimia.[4]

Manipulation checks. As a manipulation check, participants indicated how often they were selected to complete a trial and what percent of the trials their group members got correct.

Burdensomeness of the group. Participants indicated how much they felt their group members burdened them on six items (e.g., "The Group 1 interacted with hindered my ability to do well," "The Group 1 interacted with kept me from accomplishing our task," "The group members were not very good at the word task"; $\alpha = .86$). These questions were randomized and responded to on a 1 (*not at all*) to 5 (*extremely*) scale.

Feeling ostracized, social pain, basic need satisfaction, and negative mood. Participants completed several measures typical of ostracism research (e.g., Wirth & Williams, 2009; Zadro et al., 2006). To measure feelings of ostracism, participants responded to the items "I felt excluded" and "I felt ignored" ($r = .80$). Participants completed a basic needs satisfaction measure that assessed belonging (e.g., "I felt like an outsider"; $\alpha = .83$), control (e.g., "I felt I had the ability to significantly alter the course of the game"; $\alpha = .62$), self-esteem (e.g., "I felt good about myself"; $\alpha = .68$), and meaningful existence (e.g., "I felt nonexistent"; $\alpha = .86$). Each need was measured using five items, and we combined all the items for each need to create an overall scale ($\alpha = .91$), with higher values indicating greater need satisfaction. Participants also completed an eight-item mood scale (e.g., "I felt happy," "I felt angry"; positive items were reverse scored so that a higher score denoted worsened mood; $\alpha = .82$). These aforementioned items were randomized and on a scale of 1 (*not at all*) to 5 (*extremely*). Participants also completed a two-item measure of social pain (NRS-11; Hartrick, Kovan, & Shapiro, 2003; $r = .80$). Participants indicated how much pain they felt during the word game on a scale of 0 (*no pain sensation*) to 10 (*most intense pain sensation imaginable*), and how unpleasant the pain was on a scale of 0 (*not at all unpleasant*) to 10 (*most unpleasant imaginable*).

Desire for future group interaction. Participants answered two separate questions ($r = .78$) to indicate how much they wanted to play Atimia, and how much they wanted to do another task with the same group in the future, on a scale of 1 (*not at all*) to 7 (*very much so*).

Assessing participants' suspicion of playing with computer agents. After participants reported their demographic information, they were asked a series of questions investigating whether they were suspicious of playing with computer agents. In a funnel format style, participants were asked questions that became increasingly specific about whether they believed they were playing with computer agents or other real-world individuals. Specifically, we asked, in order, "How would you describe the word task game?" "What did you think of the other players' answers?" "What did you think this study was about?" and, lastly, we asked directly, "Did you feel like you were playing with live online players or a computer?"

As a suggested follow-up to the initial results, two coders independently evaluated each participant's open-ended response and indicated "yes" or "no" to the questions, "Did they appear to question whether or not the game was real?" and "Based on the participant's response to this question, did the participant indicate the other players were computer controlled?" Any differences between the coders' responses were resolved through discussion between the coders (coders disagreed on only 3% of the responses).

Results

For all dependent measures, we conducted 2 (exclusionary status: included vs. ostracized) $\times$ 2 (group burdensomeness: nonburdensome vs. burdensome) ANOVAs.[5]

Suspicion Checks

To address whether our results could be due to differences in the credibility of our manipulation, we conducted a series of binary logistic regressions using ostracism (1 = Ostracized, 0 = Included) and group burdensomeness (13% = 0, 80% = 1), as well as

[4] For brevity's sake, not all dependent variables were reported, but are available from the first author upon request.

[5] Upon request, confidence intervals for the analyses can be provided.

their resulting interactive term as predictors of the coded responses to four different questions from the funneled debriefing. For each funnel question, coders made two ratings, leading to eight potential dependent variables to assess credibility.

Overall, we found minimal indication that participants were suspicious of playing with computer-controlled players. In fact, no more than 4.1% of participants indicated suspicion on any of the coded responses, with the exception of the last coded response, in which 62.6% indicated they played with a computer-controlled player. Specifically, coders indicate "yes" or "no" to the question, "Based on the participant's response to this question, did the participant indicate the other players were computer controlled?" when they evaluated participants' response to the funnel question, "Did you feel like you were playing with live online players or a computer?" For this last response, participants may have indicated "yes" because they may have felt we would only ask if they were playing with computer or live players if it was the case they were not playing with live players; participants may have tried to save face. Additionally, for the majority of the coded responses, omnibus tests for the main effects and interactions were nonsignificant (ps $> .05$), indicating these factors did not result in differential feelings that (a) the game was fake or (b) the players were computer controlled. However, we did find two exceptions.

First, we found a significant effect for the omnibus test for the funnel question, "What did you think of the other players' answers?" when assessing if the participants thought the game was real, $\chi^2(3, N = 219) = 8.67$, $p = .034$. Follow-up Wald-tests did not yield significant results of either main effect or interaction term. However, we ran follow-up chi-square tests to examine whether exclusion and inclusion, or burdensome and nonburdensome, conditions led to differences in the perceptions of the game as being real or not. The chi-square test resulted in a significant difference between the burdensome and nonburdensome conditions, $\chi^2(1, N = 219) = 5.97$, $p = .015$. Looking at the burdensome and nonburdensome conditions, seven individuals in the burdensome condition questioned the reality of the game, whereas in the nonburdensome condition, none did. However, the seven participants represent a small proportion of participants in the burdensome condition (5.8%). Further, if we exclude these individuals from the analyses, all effects remain significant.[6]

Second, for the funnel question that asked participants if they thought they were playing with a live or computer-controlled player, we also found a significant omnibus test when coders evaluated if the participant's response indicated playing with a computer controlled player, $\chi^2(3, N = 219) = 9.63$, $p = .022$. Again, follow-up Wald-tests did not yield significant results of either main effect or interaction term. A chi-square analysis, however, did reveal that ostracized individuals were more likely to report believing they were playing with a computer than were included individuals, $\chi^2(1, N = 219) = 6.25$, $p = .012$. This result, however, should be taken with caution, particularly because prior studies show that even when individuals know they are playing with a computer, ostracism still hurts (Zadro et al., 2004), and when people are excluded during a game due to a computer error, the experience is still painful (Eisenberger et al., 2003).

Manipulation Checks

Participants correctly reported being selected less often to solve a trial when they were ostracized versus included, $F(1, 215) = 161.72$, $p < .001$, $d = 1.79$[7] (see Table 1 for means and standard deviations). There was no significant main effect of group burdensomeness, $F(1, 215) = 0.51$, $p = .475$, $d = 0.08$, or

[6] After removing seven participants in the burdensome condition who indicated being suspicious of playing with computer players, we found an effect that was not significant previously. Specifically, we found a significant Group Burdensomeness × Exclusionary Status interaction, $F(1, 208) = 3.76$, $p = .054$, $\eta_p^2 = .02$, for feeling ostracized. For included participants, working with a burdensome group ($M = 2.46$, $SD = 1.23$) led to more feelings of ostracism than working with a nonburdensome group ($M = 1.89$, $SD = 1.08$), $t(109) = 2.55$, $p = .012$, $d = 0.49$. For ostracized participants, there was no significant difference between working with a burdensome ($M = 3.33$, $SD = 1.44$) versus nonburdensome group ($M = 3.04$, $SD = 1.63$), $t(99) = -0.15$, $p = .88$, $d = 0.03$.

[7] All Cohen's d scores are calculated without including the N per condition.

Table 1
Means and Standard Deviations for Manipulation Checks, Burdensomeness, Feeling Ignored and Excluded, Basic Needs, Negative Mood, Social Pain, and Desire for Future Interaction

	Exclusionary status											
	Included						Ostracized					
	Burdensome (n = 63)		Nonburdensome (n = 52)		Total (n = 115)		Burdensome (n = 57)		Nonburdensome (n = 47)		Total (n = 104)	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Manipulation checks												
Number of times selected	8.68	5.37	7.77	3.74	8.27	4.70	2.14	0.72	2.38	0.82	2.25	0.77
Accuracy of group members	19.76	11.42	68.27	10.21	41.70	26.56	21.75	11.64	73.28	8.82	45.04	27.79
Burdensomeness	4.74	1.38	2.84	1.35	3.88	1.66	5.35	1.27	4.32	1.69	4.88	1.55
Feeling ostracized	2.40	1.22	1.89	1.08	2.17	1.18	4.27	1.00	4.31	1.12	4.29	1.05
Social pain												
Degree	2.05	1.87	1.89	1.65	1.98	1.77	3.07	2.16	2.78	2.50	2.94	2.31
Unpleasantness	1.67	1.68	1.54	1.24	1.61	1.49	2.16	2.19	2.23	2.52	2.19	2.34
Basic needs												
Overall	3.16	0.61	3.45	0.64	3.29	0.64	2.14	0.62	2.23	0.64	2.18	0.62
Belonging	3.10	0.76	3.56	0.78	3.31	0.80	1.99	0.86	2.12	0.93	2.05	0.89
Control	2.70	0.83	2.98	0.87	2.83	0.86	1.86	0.61	1.78	0.59	1.82	0.60
Self-esteem	3.19	0.74	3.41	0.68	3.29	0.72	2.68	0.73	2.72	0.77	2.70	0.75
Meaningful existence	3.66	0.87	3.84	0.79	3.74	0.84	2.05	0.89	2.30	0.94	2.16	0.92
Negative mood	2.58	0.73	2.20	0.54	2.41	0.68	3.08	0.68	3.10	0.84	3.09	0.76
Desire for future interactions	1.79	1.23	3.73	1.81	2.67	1.80	1.57	1.08	1.93	1.29	1.73	1.18

a significant Exclusionary Status × Group Burdensomeness interaction, $F(1, 215) = 1.52$, $p = .219$, $\eta_p^2 < .01$.

As intended, participants in the burdensome condition ($M = 20.71$, $SD = 11.52$) reported their group members were correct less often than those in the nonburdensome group ($M = 70.65$, $SD = 9.85$), $F(1, 215) = 1184.62$, $p < .001$, $d = 4.66$. Ostracized, compared with included, participants indicated their group members were correct more often, $F(1, 215) = 5.80$, $p = .017$, $d = 0.12$.[8] However, there was no significant interaction, $F(1, 215) = 1.08$, $p = .301$, $\eta_p^2 < .01$.

Burdensomeness

Participants felt they were burdened more when working with a burdensome ($M = 5.03$, $SD = 1.36$) versus nonburdensome ($M = 3.54$, $SD = 1.68$) group, $F(1, 215) = 57.75$, $p < .001$, $d = 0.97$. Additionally, ostracized participants perceived the group to be more burdensome than included participants, $F(1, 215) = 29.14$, $p < .001$, $d = 0.62$. We found a significant Exclusionary Status × Group Burdensomeness interaction, $F(1, 215) = 5.11$, $p = .025$, $\eta_p^2 = .02$. Specifically, for included participants, the increased feeling of being burdened when working with a burdensome versus nonburdensome group member was greater, $t(113) = 7.42$, $p < .001$, $d = 1.39$, compared with the difference between working with a burdensome versus nonburdensome group member when participants were ostracized, $t(102) = 3.55$, $p = .001$, $d = 0.69$.

Feeling Ostracized

Participants felt more ostracized (excluded and ignored) when ostracized by the group than included, $F(1, 215) = 201.50$, $p < .001$, $d = 1.90$. No significant main effect of burden, $F(1, 215) = 2.38$, $p = .124$, $d = 0.16$, or an exclusionary status by burdensomeness interaction emerged, $F(1, 215) = 3.18$, $p = .076$, $\eta_p^2 = .02$.

Social Pain

Ostracized, compared with included, participants felt a greater degree of social pain and more unpleasantness of the social pain, Fs ≥ 5.03, ps $\leq .026$, ds ≥ 0.30. There were no other significant main effects of group burdensomeness, Fs ≤ 0.64, ps $\geq .423$, ds ≤ 0.10, or Exclusionary Status × Group Burdensomeness interactions, Fs ≤ 0.15, ps $\geq .700$, η_p^2s $< .01$.

Basic Need Satisfaction

Participants felt less basic need satisfaction (all needs combined) when ostracized compared with when included, $F(1, 215) = 173.25$, $p < .001$, $d = 1.76$. Participants also felt less need satisfaction when working with a burdensome ($M = 2.68$, $SD = 0.80$) compared with a nonburdensome ($M = 2.87$, $SD = 0.88$) group, $F(1, 215) = 4.79$, $p = .030$, $d = 0.23$. There was no significant Exclusionary Status × Group Burdensomeness interaction, $F(1, 215) = 1.33$, $p = .251$, $\eta_p^2 < .01$.

Looking at the basic needs individually, for all needs, there was a significant effect of exclusionary status (Fs ≥ 36.19, ps $\leq .001$, ds ≥ 0.80). Examining the effects of group member burdensomeness, participants working with a burdensome group ($M = 2.57$, $SD = 0.98$) felt less belonging than those working with a nonburdensome group ($M = 2.88$, $SD = 1.12$), $F(1, 215) = 6.93$, $p = .009$, $d = 0.30$. However, for the remaining needs, the direction of the effect was the same as the overall needs, but differences between conditions were not significant, Fs ≤ 3.24, ps $\geq .073$, ds ≤ 0.18. For all needs individually, there were no significant interactions, Fs ≤ 2.93, ps $\geq .088$, η_p^2s $\leq .01$.

Negative Mood

For negative mood, we found ostracized participants felt more negative mood than included participants, $F(1, 215) = 53.89$, $p < .001$, $d = 0.95$. Furthermore, participants working with a burdensome group ($M = 2.82$, $SD = 0.75$) felt marginally more negative mood than those working with a nonburdensome group ($M =$

[8] Participants' perception of their group members' performance (number of trials correct) was only intended to be affected by the group burdensomeness manipulation. However, we found an unanticipated effect of exclusionary status. To account for this unintended effect, we conducted Exclusionary Status × Group Burdensomeness ANCOVAS for all DVs using participants' perception of their group members' performance as a covariate. These analyses led to there no longer being a significant group burdensomeness main effect for basic need satisfaction, mood, or desire for future interaction (Fs ≤ 0.63, ps $\geq .430$). The remaining results continued to be significant.

2.63, $SD = 0.83$), $F(1, 215) = 3.55$, $p = .061$, $d = 0.24$. We found a significant Exclusionary Status × Group Burdensomeness interaction, $F(1, 215) = 4.47$, $p = .036$, $\eta_p^2 = .02$. Specifically, included participants felt worsened mood when working with a burdensome versus nonburdensome group, $t(113) = 3.15$, $p = .002$, $d = 0.59$, whereas ostracized participants did not report a significant difference based on group burdensomeness, $t(102) = -0.15$, $p = .883$, $d = 0.03$.

Desire for Future Interaction

Ostracized participants were less inclined to report wanting to interact with the same group members in the future than were included participants, $F(1, 215) = 29.63$, $p < .001$, $d = 0.61$. Those working with a burdensome ($M = 1.68$, $SD = 1.16$) versus nonburdensome ($M = 2.87$, $SD = 1.81$) group were also less inclined to report wanting to interact with the group again, $F(1, 215) = 38.40$, $p < .001$, $d = 0.78$.

A significant Exclusionary Status × Group Burdensomeness interaction emerged, $F(1, 215) = 18.34$, $p < .001$, $\eta_p^2 = .08$. To understand this significant interaction, we conducted a multiple comparison analysis. Using Sidak post hoc tests, we found participants were more likely to want to work with their group again when the group included them and the group was nonburdensome than any of the other conditions (ps $< .001$, ds ≥ 1.15). There were no significant differences between the remaining conditions (i.e., included by a burdensome group, ostracized by a nonburdensome group, ostracized by a burdensome group; ps $\geq .713$, ds $\geq .33$).

Atimia's Effectiveness Compared With Other Ostracism Paradigms

Overall, Atimia was similarly as effective as other ostracism manipulations in causing individuals to feel excluded and ignored (i.e., ostracized) and thwarting basic need satisfaction (see Table 2). This conclusion is based on comparing the strength of Atimia's ostracism effects with those effects found using Cyberball (Williams et al., 2002; Study 1), face-to-face ostracism (Warburton, Williams, & Cairns, 2006), an IVE (Kassner et al., 2012), the averted eye gaze paradigm (Wirth et al., 2010; Study 2), and the O-Cam paradigm (Goodacre & Zadro, 2010). To equate Atimia's results to other paradigms, we calculated ostracism's effects based on participants that played with a nonburdensome group. Comparing Atimia with Cyberball, effect sizes suggest Atimia produces a weaker effect on manipulation checks (which tell us how ostracized or included participants felt in each paradigm) belonging, and control; effects on self-esteem and meaningful existence seem comparable. Atimia had a stronger effect on manipulation checks than face-to-face exclusion.[9] Atimia seems to have produced less of an effect on manipulation checks, belonging, and self-esteem compared with the IVE, but the two appeared comparable on control and meaningful existence. The ostracism manipulation in Atimia resulted in generally greater effects on manipulation checks and each of the needs compared with the averted eye gaze paradigm and O-Cam. Ultimately, Atimia produced strong effects, and an overview of the effect sizes for each paradigm indicates researchers can select from ostracism paradigms that vary in the strength of their effects.

Discussion

The results suggest we achieved the two goals that motivated the development of Atimia. For our first goal, we found support that Atimia can be utilized to replicate ostracism's effects successfully. Participants ostracized by, compared with included by, the group felt more ostracized, greater social pain, less basic need satisfaction (for all needs), and worsened mood. The current study replicated effects of ostracism resulting from a group-based interaction, similar to what occurs during Cyberball. In some cases, Atimia's effects were weaker compared with Cyberball, but Atimia produced effects that were equal, if not stronger, than alternative ostracism paradigms (e.g., averted eye gaze). Atimia may not have produced as strong of effects as Cyberball because the task takes longer, giving participants more of an opportunity

[9] We were unable to compare Atimia with the face-to-face ostracism paradigm on basic need satisfaction effects because the basic needs were not reported for the face-to-face paradigm. There may be some variation in the way the basic needs were asked for each of the paradigms.

Table 2
Comparing Effect Sizes Between Social Exclusion Paradigms on Manipulation Checks, Belonging, Control, Self-Esteem, and Meaningful Existence

	Social exclusion paradigm					
Variable	Atimia Cohen's *d*	Cyberball Cohen's *d*	Face-to-face exclusion Cohen's *d*	Immersive virtual environment Cohen's *d*	Averted eye gaze Cohen's *d*	O-Cam Cohen's *d*
Manipulation checks	2.20	2.99	1.06	3.10	0.83	0.83
Belonging	1.68	2.55	NA	2.15	0.54	1.18
Control	1.61	2.35	NA	1.46	0.60	0.43
Self-esteem	0.95	1.15	NA	1.67	0.41	0.85
Meaningful existence	1.77	1.92	NA	2.01	0.73	1.46

Note. NA indicates the data was not available.

to recover during the experience (see Wesselmann, Wirth, Mroczek, & Williams, 2012).

Evaluating our second goal, the manipulation of the group members' performances adversely impacted participants. Specifically, individuals playing with burdensome group members, compared with nonburdensome group members, felt more burdened by the group, greater thwarted basic need satisfaction, and more negative mood. When we investigated the significant Exclusionary Status × Group Burdensome interactions, we found that for included participants, burdensomeness of the group adversely affected feelings of being burdened by the group and negative mood. However, for ostracized participants, group burdensomeness had less, or no, impact. Specifically, included participants felt more burdened by the group and more negative mood when playing with a burdensome versus nonburdensome group. For ostracized participants, the increase in feeling burdened by a burdensome, versus nonburdensome, group was less compared with the aversive effects for included participants. For negative mood, group burdensomeness did not cause a significant difference for ostracized participants. Ultimately, we demonstrated Atimia is a vehicle for investigating ostracism and the effect of group burdensomeness on individuals.

We also found group burdensomeness and exclusionary status interacted to affect the desire to work again with the group, but there was generally no significant interactions of these two factors on the immediate (reflexive) responses to the game. Participants appeared to only be interested in continuing with the group if they were included and the group performed well. Participants chose to no longer continue with the group when they were ostracized (see Mettee, Taylor, & Fisher, 1971; Pepitone & Wilpizeski, 1960) and when participants were included by a burdensome group. If participants were included by a burdensome group, they were no more interested in continuing to work with the group compared with if the group ostracized them. For immediate responses, based on reactions during the game, group burdensomeness failed to moderate the effects of ostracism. This result is similar to previous research that found a lack of moderation by group characteristics (e.g., Gonsalkorale & Williams, 2007; Zadro et al., 2004). Despite how burdensomeness can induce fitness costs to the group (Kurzban & Leary, 2001), participants still felt bad being ostracized by a group, even if it functioned poorly. This outcome suggests that making the group less efficacious did not appear sufficient enough to discount the meaning of the ostracism.

Limitations

We need to acknowledge several limitations to our current research that could be resolved in future research. We drew conclusions about the effectiveness of Atimia based on a single study conducted only with college students. Whereas many of the effect sizes, especially on outcomes typical of ostracism (e.g., basic needs, mood), were large and likely to lead to reliable effects, it is possible these effects are specific to the current study. We were also limited in compar-

ing Atimia with previous results of Cyberball and other ostracism paradigms. We had to rely on previously reported results, which could have used slightly different measurement items, and in some cases, relevant results were not included which limited our ability to make comparisons. However, we felt the studies we made comparisons with were representative of the specific ostracism paradigm. The best solution for both of these limitations is replication and direct comparisons of ostracism manipulations done using Atimia versus other ostracism paradigms.

We are also limited because we focused solely on player performance as a means of creating burdensome group members. We felt the group member's player performance was an important place to start, given how humans have evolved to want to associate with groups generating fitness benefits with minimal costs (Kurzban & Leary, 2001). However, it is important to consider that group members may be burdensome for a host of other reasons, such as being a poor partner for social exchange, having social costs outweigh their benefits, or not meeting the criteria for being a valuable group member (Kurzban & Leary, 2001). A group member may also be burdensome if he or she fails to reciprocate acts of altruism (Trivers, 1971) or does not possess positive skills or attributes (Tooby & Cosmides, 1996). To fully establish that burdensome group members reduce satisfaction with the group, researchers would need to examine multiple forms of burdensomeness.

Potential Future Uses of Atimia

Our ultimate goal is to provide researchers studying groups with a tool to replicate previous ostracism effects, but even more so, to examine new questions involving group interactions. Similar to past Cyberball studies (e.g., Goodwin, Williams, & Carter-Sowell, 2010; Wirth & Williams, 2009), researchers can use Atimia to manipulate the characteristics of the group members (e.g., race) through large-sized avatar pictures. Researchers can also use Atimia similarly to Cyberball and program the sequence of confederates' throws, potentially creating a scenario in which a confederate group member is ostracized by the other confederate players (e.g., Wesselmann et al., 2013). Also similar to Cyberball, Atimia can be used as a dependent variable to measure behavior (e.g., Pryor, Reeder, Wesselmann, Williams, & Wirth, 2013; Wesselmann et al., 2013). Both programs log which player the participant chooses, which gives researchers the opportunity to examine how characteristics of the participant's group member might influence which group member is selected. Simulating a previous manipulation of burden in Cyberball (i.e., a slow-throwing confederate player; Wesselmann et al., 2013), researchers in Atimia can also create a burdensome player by manipulating how long it takes to generate an answer or to select the next player (or a combination of the two). By incorporating features similar to Cyberball into Atimia, researchers can take a multimethod approach to further validate their ostracism effects, eliminating the reliance on drawing conclusions based solely on using Cyberball. In addition to replicating functions found in Cyberball, we incorporated features into Atimia that will open up new investigations of how groups impact an individual.

In Atimia, we also expanded the methods for directing how the group interaction develops. In Cyberball, researchers can set a schedule, indicating when each computer agent will throw the ball to the participant or the other agent. In addition to using a schedule file (similar to Cyberball), researchers can using settings in Atimia to cause agent players to always select the player that previously selected them (reciprocity), to not select the player that just selected them (nonreciprocity), or to choose randomly which player is selected next. This selection feature could be used to study the effects of reciprocity in groups (e.g., Nowak, 2006). For participants, researchers can create two different selection schemes: free-will versus round robin. In the free-will scheme, participants can freely choose which group member they would like to complete the next trial, similar to Cyberball. In the round-robin scheme, participants can only select the next designated player each time. This type of manipulation could be used to investigate the impact of structured versus unstructured group interactions. For example, previous research suggests individual feel more comfortable when interacting with minority groups when the task is structured compared with unstructured (e.g., Apfelbaum & Sommers, 2009; Apfelbaum, Sommers, & Norton, 2008; Shelton, Richeson, & Salvatore,

2005). Lastly, researchers can set a game of Atimia to end after a total number of rounds completed (similar to Cyberball) or after the group gets a total number of trials correct. Manipulating how the Atimia game ends could be an alternative form of burden to the one used in our study; if a group member (or members) prevents the group from completing the task by consistently being incorrect, the participant may feel burdened. The group experience during Atimia can be affected by manipulations of player's performance, which cannot be done in Cyberball because there is no "performance" to be assessed.

The players' performance component of Atimia provides researchers with a means to manipulate the performance of the group members and to measure how a participant's performance is affected by the group. Atimia provides the ability to manipulate the participant's performance by giving him or her more challenging RAT items, thereby decreasing the participant's performance, while keeping the confederate players' performance steady. This manipulation of participant's performance would allow for an investigation of how individuals feel when they burden others (e.g., Van Orden, Lynam, Hollar, & Joiner, 2006), a phenomenon yet to be investigated systematically. Alternatively, researchers can examine how individuals feel when their performance is superior to the groups (e.g., Carter-Sowell et al., 2010). Instead of using performance as an independent variable, researchers could use performance as a dependent variable. For instance, one could examine the effect of mood contagion (Kelly & Barsade, 2001) on the participant's mood and ability to generate the linking word (a performance measure) by depicting the confederate players in various moods. The added performance component of Atimia generates new opportunities to understand group behavior that are not possible with the current version of Cyberball.

To maximize the utility of Atimia, we will provide researchers with an open-source version that will permit researchers to make any modifications to the program to fit their needs. For instance, researchers could change the task from solving RAT items to completing problems correctly (e.g., a math problem). Alternatively, researchers could manipulate mortality salience (Greenberg, Solomon, Pyszczynski, 1997; Pyszczynski, Solomon, & Greenberg, 2003) by having participants complete word stems that result in either death-related words or mood-neutral words. Evidence of mortality salience increasing the effects of ostracism would support the contention that ostracism is a form of social death (Williams & Nida, 2011). Researchers could also examine how group characteristics and the behavior of group members toward the participants would influence when individuals decide to leave a group by including an option to leave the game (e.g., van Vugt & Hart, 2004). Ultimately, by sharing an open-sourced version of Atimia, researchers can modify the game to fit any study they would like to conduct.

Conclusion

We demonstrated that Atimia is an effective means to make individuals feel ostracized and to manipulate the efficacy of one's group in completing a task. Participants did not fully benefit from group membership when they were ostracized and when they played with burdensome group members. Further, we found individuals only desired to continue with groups that included them and were successful; it seems that individuals will not always want to stay with a group merely because the group included them. Individuals may forfeit almost certain inclusion in a subsequent task if the group did not fully satisfy them (e.g., fulfill basic needs). Ultimately, we believe the current results demonstrate how Atimia can fill the important role of replicating effects previously demonstrated primarily using Cyberball and of the potential for Atimia to be used as a tool for investigating group dynamics.

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