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BRIEF COMMUNICATION

Ostracism Online: A social media ostracism paradigm

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Abstract We describe *Ostracism Online*, a novel, social me dia–based ostracism paradigm designed to (1) keep social interaction experimentally controlled, (2) provide researchers with the flexibility to manipulate the properties of the social situation to fit their research purposes, (3) be suitable for online data collection, (4) be convenient for studying subsequent within-group behavior, and (5) be ecologically valid. After collecting data online, we compared the Ostracism Online paradigm with the Cyberball paradigm (Williams & Jarvis *Behavior Research Methods*, *38*, 174–180, 2006) on need-threat and mood questionnaire scores (van Beest & Williams *Journal of Personality and Social Psychology 91*, 918–928, 2006). We also examined whether ostracized targets of either paradigm would be more likely to conform to their group members than if they had been included. Using a Bayesian analysis of variance to examine the individual effects of the different paradigms and to compare these effects across paradigms, we found analogous effects on need-threat and mood. Perhaps because we examined conformity to the ostracizers (rather than neutral sources), neither paradigm showed effects of ostracism on conformity. We conclude that Ostracism Online is a cost-effective, easy to use, and ecologically valid research tool for studying the psychological and behavioral effects of ostracism.

Keywords Ostracism · Rejection · Exclusion · Social media

The Ostracism Online paradigm: http://dx.doi.org/http://smpo.github.io/socialmedia/

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Ostracism—being ignored and excluded—elicits an intense negative psychological experience (Williams, 2007a, 2009). Two decades of research indicate that ostracism thwarts fundamental social needs of belongingness, self-esteem, meaningful existence, and control (Baumeister & Leary, 1995; Kenrick, Griskevicius, Neuberg, & Schaller, 2010; Williams, 2007b; Williams, 2009) and causes heightened negative affect (Williams, 2007b, 2009).

A brief episode of ostracism is sufficient to activate pain regions in the brain (Eisenberger, Lieberman, & Williams, 2003; Kross et al., 2011), impair self-regulation (DeWall, Maner, & Rouby, 2009), increase social susceptibility (Carter-Sowell, Chen, & Williams, 2008; Riva, Williams, Torstrick, & Montali, 2014), heighten sensitivity to emotions and person memory (Bernstein, Sacco, Brown, Young, & Claypool, 2010; Gardner, Pickett, & Brewer, 2000; Sacco, Wirth, Hugenberg, Chen, & Williams, 2011), induce coldness (IJzerman et al., 2012; Zhong & Leonardelli, 2008), and increase motivation to appease others' evaluations (Jamieson, Harkins, & Williams, 2010).

Researchers have designed various experimental paradigms in order to examine the consequences of ostracism, rejection, and social exclusion. These include manipulations of inclusion or ostracism in an emergent ball-tossing episode

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(Williams & Sommer, 1997), by asking participants to write autobiographical memories of being excluded or included (Pickett, Gardner, & Knowles, 2004), receiving false personality feedback indicating the participant will lead a life alone (DeWall et al., 2009; Twenge, Baumeister, Tice, & Stucke, 2001), being rejected as a work partner following a get-acquainted task (Nezlek, Kowalski, Leary, Blevins, & Holgate, 1997), and being ostracized in online or actual conversations (Gardner et al., 2000; Smith & Williams, 2004; Williams et al., 2002).

By far the most frequently used paradigm to examine ostracism's effects is Cyberball (Williams, Cheung, & Choi, 2000; Williams & Jarvis, 2006). Participants are seated alone in front of a computer and are told the experiment is about the effects of mental visualization. They are instructed to play an online game of ball toss and to visualize mentally who the others are, where they are playing, the weather, surroundings, and so on. Although they are informed that the experimenters are not interested in who throws the ball and who receives it, in actuality, participants are randomly assigned to receive the ball an equal share of the throws (inclusion) or, after one or two initial tosses, to never receive the ball again (ostracism). A typical game lasts just a few minutes, but the effects on self-reported needs and negative affect are substantial. The Cyberball paradigm has been shown to be highly effective and has been employed in over 200 published studies (for a list, see http://www1.psych.purdue.edu/~willia55/Announce/Cyberball_Articles.htm). However, such extensive utilization might increase the risk of participants recognizing the paradigm from previous studies or from introductory psychology courses. Furthermore, the current programming allows a maximum group size of only four people and can therefore not be used for research on ostracism in larger groups.

Cyberball and other computer-mediated paradigms have been used online, allowing for sampling more diverse population (Buhrmester, Kwang, & Gosling, 2011; Goodwin, Williams, & Carter-Sowell, 2010; Kraut et al., 2004; Skitka & Sargis, 2006; Williams & Wesselmann, 2011). Nevertheless, to our knowledge, no paradigms have been developed that draw on the most recent developments in computer-mediated communication, most notably the rise of social media as a primary form of social interaction.

Social media as a common mode of interpersonal communication

The use of social media for social interaction and information sharing has dramatically increased over the last few years. Surveys conducted in the United States show that the percentage of Internet users who use social media has increased from 8 % in 2005 to 72 % in 2013 (Brenner, 2013; Hampton & Goulet, 2011), and that the average time a user spends online has increased from 2 hr 10 min/day in 2007 to 5 hr 35 min/day in 2009 (Nielsen, 2012). In general, most people in contemporary societies use some form of computer-mediated communication and find it no less psychologically meaningful than other forms of communication (Riva, 2002).

Along with their psychological realism, social media formats possess several elementary mechanics that render them particularly suitable for manipulating ostracism. Most social media platforms provide members with the opportunity to communicate social attention to others through personalized feedback. They also provide a standardized means of communicating social attention, such as Facebook *likes* and Twitter *favorites* (Crawford, 2009; Riva, 2002). One can thus manipulate the level of social inclusion by varying the quantity of standardized social attention signals. Moreover, social media platforms can be used to study groups of varying magnitude. Finally, the content of the groups can be adapted to suit the researchers' purposes by changing the avatars and personalized information that social media users share on their profiles.

Ostracism Online[1]

Considering these advantages of using social media platforms for ostracism research, we developed *Ostracism Online*, a new social media–based ostracism paradigm that was designed to (1) keep social interaction highly controlled by preprogramming the behavior of the computerized group members, (2) offer researchers the possibility to manipulate the properties of the social group in a way that fits their research purposes, (3) be suitable for online data collection, (4) be suitable for studying the effect of ostracism on subsequent within-group behavior, and (5) be ecologically valid in present-day society.

In Ostracism Online, participants are told they will engage in an online group task. In fact, only one person participates at a time, and preprogrammed computer scripts determine the behavior of the other group members. Participants are told that, in order for the group members to get acquainted, each of them has to create a personal profile consisting of an avatar and a short description of themselves. Next, participants engage in an introductory phase in which the group members can view each other's personal profiles. During this phase, group members can communicate social attention to one another in the form of a *like* (similar to a Facebook *like*). The level of ostracism is manipulated by the number of *likes* a participant's personal profile receives.

[1] Can be accessed through http://smpo.github.io/socialmedia/

Manipulation effectiveness

In order to assess the effectiveness of the Ostracism Online paradigm, we compared it with its most commonly used counterpart: Cyberball. In both paradigms, we created three conditions in which the number of social attention cues that participants received were manipulated to communicate either low levels of social attention (Ostracism condition), moderate levels of social attention (Inclusion condition), or high levels of social attention (Overinclusion condition).

We took an online sample in which participants were subjected to either Ostracism Online or Cyberball, after which we measured their self-reported need-threat and mood, and their subsequent behavior toward their group in a conformity task. We then used a Bayesian analysis of variance (Kruschke, 2010) to (1) infer the manipulation strength of each paradigm by estimating the contrasts between the conditions on our dependent variables, and (2) compare the manipulation strengths of the two paradigms by estimating the between-paradigm difference scores of the previously mentioned contrasts.

In line with previous research, we expect that within the Cyberball paradigm, participants in the Ostracism condition will report decreased need-satisfaction and positive mood, and increased negative mood relative to participants in the Inclusion and Overinclusion conditions. If Ostracism Online is an effective manipulation, the Ostracism Online between-condition contrasts should show effects similar to those of Cyberball in terms of direction, whereas the between-paradigm contrasts should show that the manipulation is either equally strong (i.e., the estimated between-paradigm difference scores are situated around zero) or stronger (i.e., the estimated between-paradigm difference scores are in favor of Ostracism Online).

As for conformity, previous research has shown that compared with a control group, ostracized participants conformed more to a new group in a subsequent conformity task (Williams et al., 2000). However, no research has looked at the relationship of ostracism and individuals' willingness to conform toward a group that ostracized them. As for the purpose of this article, the nature of the effect is only exploratory. However, we do expect that the effect of ostracism on conformity in the Ostracism Online paradigm is similar in direction to that of the effect of ostracism on conformity in the Cyberball condition, and at least equally consistent and strong.

We also looked at whether communicating high levels of social attention (Overinclusion) would have an inverse effect on need-satisfaction, mood, and conformity. This would mean that, compared with participants in the Inclusion condition, participants in the Overinclusion condition will report more need-satisfaction and positive mood, and less negative mood, as well as a trend in conformity that is opposite to that of the Ostracism condition. As for the comparison of the two paradigms, we expect that in the Ostracism Online paradigm, the difference in self-reported need-threat and mood between participants in the Inclusion condition and participants in the Overinclusion condition will be similar to Cyberball in terms of direction, and equally consistent and strong.

Method

Participants

Participants were recruited online from Amazon's Mechanical Turk platform through Crowdflower. Because the personal profiles of the fictional participants in this study included some references to the United States, we recruited only U.S. participants. When logged in to the study, respondents were shown a brief description that included a link to the (external) survey and a link to validate their code. They were told that the study was about visual perception and problem solving. Also, they were told that they needed to provide their Mturk ID since they were supposedly doing this task with other people through the M-Turk online platform. Participants in the Ostracism Online condition were allowed to participate only if they were familiar with social media platforms. This was clearly indicated in the description of the study on Crowdflower. Furthermore, in the Ostracism Online condition, the experiment was preceded by a short survey on the participants' social media use. Participants who indicated that they did not use social media and were not familiar with them, but nevertheless entered the study, were excluded from participation.

Participants who indicated that they experienced technical difficulties during the experiment ($N = 19$) or failed one of the manipulation checks ($N = 39$) were excluded from the analysis. In total, 266 American participants (M_{age} = 34.30 yr, SD_{age} = 11.13 yr) were included in the analysis. All participants were reimbursed $0.40 for the 20–30-min study. From this sample, 137 (42 males) were subjected to the Cyberball manipulation, whereas 129 (57 males) were subjected to the Ostracism Online manipulation. One participant did not complete the conformity measure and was thus coded as missing within the conformity dependent variable.

Procedure

At the start of the experiment, participants agreed with the terms and conditions stated in the informed consent form, after which they received their instructions. Participants were told that they would work on a group task together with other participants, with whom they would be connected through the Internet. In reality, only one participant at a time was involved. The other group members were computerized, and

all their interactive elements were simulated through predefined computer scripts.

After these instructions, participants were exposed to either the Cyberball manipulation or the Ostracism Online manipulation. Within each paradigm, they were randomly assigned to one of the three conditions: Ostracism, Inclusion, or Overinclusion. Directly after the manipulation, participants filled out the moods and needs questionnaire (van Beest & Williams, 2006) and completed the conformity task. Next, participants completed the manipulation checks. Finally, participants entered their demographics (age and gender), received an extensive debriefing on the purposes of the study and the nature of the deception, and were provided with a validation code to receive their payment.

Ostracism Online Participants in the Ostracism Online manipulation were directed to a web page in which they entered their initials, name, or nickname. Furthermore, they chose 1 of 82 personal avatars and wrote an introductory paragraph about themselves. The avatars were created using an online tool (http://pickaface.net). To maximize the likelihood that participants would be able to find an avatar they could relate to, we fully crossed gender, age, and skin color to create several avatars of each combination, along with several less humanoid avatars. As for the descriptions, participants were instructed to "*…write a paragraph in which you introduce yourself to the rest of the group. Write something you would like to tell about yourself —anything you want to share*."

After creating their profiles, participants were told that during the next 3 min they would be introduced to the 11 other members of their group: They would be able to see their avatars, read their descriptions, and respond to them by pressing a "like" button "*similar to the 'like' button on Facebook ('favorite' on Twitter, ♥ in Tumblr and Instagram, etc.)*." Additionally, participants were asked to form an impression of all the other group members in a way similar to that used in the Cyberball procedure (i.e., *"Try to imagine them in real life—how they might look or sound, what kind of people they are, how you would get along with them"*). Finally, participants were specifically asked to be attentive and not to switch pages or engage in unrelated tasks and were told that they "*might receive questions about these other people later in the experiment."* After a short period (3 sec), during which participants were ostensibly connected to the other participants, they were asked to click "continue" if they were ready to proceed.

Participants then arrived at the "introduction" page, which was set up to resemble a social media website. The participants' descriptions and personal avatars were combined into personal profiles, and were displayed together with 11 other personal profiles that ostensibly belonged to other participants, but which were in fact preprogrammed (for an overview of the preprogrammed profiles, see Appendix 1).

The descriptions and avatars were created in a way that ensured maximal diversity in terms of age, gender, and race. We asked several individuals from different ages and backgrounds to write an introductory paragraph based on the instructions of the paradigm (all individuals were aware that their descriptions would be used for the paradigm). In order to minimize any unwanted effects related to social group membership and stereotypes, we edited these introductory paragraphs so that the hobbies and lifestyle practices in the profiles were as neutral as possible (e.g., removing indicators of social or financial status). In addition, we compared the computerized descriptions with descriptions from real participants that we acquired during a pilot study, to make sure that they were similar in terms of length, content, and degree of disclosure.

Participants were able to respond to the other profiles by pressing a *like* button underneath each profile. Each profile contained a counter, displaying the number of likes that the profile had received until that moment. Whenever participants received a *like,* they saw a pop-up notification informing them who had liked their post, after which their own counter increased by one. When participants "liked" another profile, the counter of this profile increased by one. The number of "likes" of each confederate profile increased as a function of preprogrammed scripts that were designed to imitate real-life user activity. The distribution of the preprogrammed likes for all the group members (displayed in Appendix 2) was designed to be a normal distribution (around 5.5 *likes*, the expected group average) that was slightly skewed to the left because it did not yet include the *likes* the participant could give. Finally, after 3 min, participants were told that they had completed the introduction phase and could move on to the next part of the experiment.

Dependent variables

Mood and need-threat questionnaire After the Ostracism manipulation, we administered the reflexive need questionnaire (van Beest & Williams, 2006; see Appendix 3), measuring the participants' need to belong (five items, $\alpha = .90$), the extent to which their self-esteem was threatened (five items, $\alpha = .89$), the extent to which they felt their life was meaningful (five items, $\alpha = .89$), and the extent to which they felt in control of their lives (five items, $\alpha = .71$). The questionnaire also assessed the participants' mood on several dimensions, asking them to what extent they felt good, bad, friendly, unfriendly, angry, pleasant, happy, and sad. For all questions, answers were given on a 5-point scale (1 = *not at all*; 5 = *extremely*).

Conformity task After these questions, participants were instructed to complete an embedded figure task (French, Ekstrom, & Price, 1963) with the group (Cyberball) or a part of the group (Ostracism Online) they had previously interacted with. During the conformity task, both the real

and the three other computerized participants were visually represented by the same avatars used in the manipulation. The procedure was conceptually similar to previous research on ostracism and conformity (see, e.g., Williams et al., 2000). On eight different trials, participants were instructed to examine the simple figure presented on the left side of the screen, and to judge whether or not that simple figure was part of the complex figure on the right side of the screen, without rotating or otherwise changing the direction of the figure. The conformity task was designed to increase in difficulty over time: Pretesting showed that trials 1 and 2 were fairly easy, trials 3, 4, and 5 were moderately difficult, and trials 6, 7, and 8 were most difficult.

Participants were told that the computer would randomize the order in which all the group members would give their answers. However, in reality, the participant always decided last. Furthermore, participants were told that their responses would be visible to the other group members, and vice versa. While waiting for their turn to respond, participants saw the responses of the computerized participants appear on the screen sequentially. The computerized participants were programmed to give a unanimously incorrect answer 50 % of the time, that is, in trials 3, 4, 6, and 8 (i.e., these were the cases in which conformity was measured). On all other trials, the group members were programmed to make unanimously correct responses.

Manipulation checks

Technical difficulties Participants who were subjected to the Cyberball manipulation were asked whether they were able to see the ball during the task, whereas participants in the Ostracism Online paradigm were asked whether they were able to read the descriptions and see the avatars during the introduction phase. As reported in the participant section, participants who experienced technical difficulties that prevented them from seeing the ball (Cyberball) or avatars (Ostracism Online) were excluded from the data set.

Attentiveness In the Ostracism Online group, we assessed attentiveness by directly asking participants to report their level of engagement in the study (questions and criteria displayed in Appendix 4). Participants were assured that the answers they provided would not influence their participation or reimbursement in any way. As an indirect assessment of engagement, we checked whether the participants read the questions by including an instructional manipulation check (IMC; Oppenheimer, Meyvis, & Davidenko, 2009): an item that instructed them to provide no answer, that is, to leave the question blank. Based on these questions, we calculated an index of inattentiveness, consisting of severe inattentiveness (failing the IMC or reporting disengagement from the online task), partial inattentiveness (reporting being distracted during the online task or not paying attention to own and others' likes), and attentiveness (not failing the IMC, reporting no distractions during the task, and paying attention to own and others' likes). Participants were excluded when they failed the IMC (N = 17), indicated that they had been browsing on the Internet or doing something else during the manipulation (N = 1), indicated that they had not read the other profiles during the manipulation (N = 1), or indicated that they had not been paying attention to their likes (N = 7) or to the likes of others (N = 11).

Manipulation internalization In order to make sure participants internalized the key information conveyed in the ostracism manipulations (i.e., the number of throws/"likes" they received relative to the rest of the group members), we asked participants in the Cyberball condition what percentage of the total ball throws they received during the task (open ended). In the Ostracism Online manipulation, we asked participants: "*Considering that there was some average number of 'likes' in the introduction task, how would you consider the number of 'likes' you received?*" Answers to the Ostracism Online question were given on a 3-point scale, with 1 = *under average*, 2 = *about average*, and 3 = *above average*.

Participants in the Cyberball manipulation perceived the ball to be thrown at them 17.7 % of the time in the Ostracism condition (SD = 15.24), 25.4 % in the Inclusion condition (SD = 8.24), and 37.3 % in the Overinclusion condition (SD = 16.95). Thus, whereas participants in the Inclusion and Overinclusion conditions were fairly accurate in their estimation, participants in the Ostracism condition overestimated the number of times they received the ball. A closer examination of data revealed two outliers in the Ostracism condition. These participants indicated that they received the ball 75 % and 80 % of the time, respectively. We therefore excluded these two participants from the analysis.

As for participants in the Ostracism Online paradigm: When asked to estimate the number of *likes* they received relative to the rest of the group, participants in the Ostracism condition, which should have answered "under average" (i.e., "1") generally did so (M = 1.07, SD = 0.26). Participants in the Inclusion condition, who should have answered "average" (i.e., "2") also generally answered correctly (M = 2.12, SD = 0.44). Finally, participants in the Overinclusion condition, who should have answered "above average" (i.e., "3") also generally answered the question correctly (M = 2.92, SD = 0.27). We therefore considered the manipulation to have been successful.

Analysis

Bayesian analysis of variance In order to compare the effect of the manipulations on our dependent variables without inflating type 1 errors due to the large amount of contrasts

such a comparison requires, we used a Bayesian analysis of variance (BANOVA) (Gelman, 2005, 2006; Kruschke, 2010). More specifically, we adopted the model "ANOVAonewayNonhomogvarJagsSTZ.R" from Kruschke (2010; see Appendix 1 for the model syntax). The model uses a Gaussian likelihood to estimate several parameters that are useful for examining between-group differences on a dependent variable. In this case, we were specifically interested in the difference between the conditions within each paradigm (level 1 contrasts) and the between-paradigm difference in these level 1 contrasts (level 2 contrasts).

In order to do so, the model estimated the distribution of deflections within every group (i.e., Ostracism, Inclusion, Overinclusion) from the baseline (i.e., sample mean). Both the estimated baseline parameter and the estimated group deflection parameter had mildly informed normal priors with a mean of zero: They were scaled to suit standardized data, but were uninformed by previous research (because no previous research had examined the effects of the Ostracism Online paradigm). Furthermore, the precision of the baseline parameter prior was 0.001 (which is considered appropriate for standardized data; Kruschke, 2010). The precision parameters of the group deflections were estimated from the data, using a single gamma hyperprior (mode = 0.1, *SD* = 10; Kruschke, 2010). Because the group deflection precision parameters were estimated using a single hyperprior, the precision estimates of the groups were mutually informative: If the precision in certain groups was estimated to be high, the hyperprior caused shrinkage of the estimates of lower deflections in the other groups within the same variable. Considering that the condition differences were precisely defined and equal across conditions (i.e., 15 % total ball throws in Cyberball, four "likes" in Ostracism Online), and since we expected the effect to be ordinal in direction and the difference scores between the conditions to be equal in size across our three conditions, we felt that a mutually informed hyperprior would be suitable for estimating the precision of the distributions of the group deflections.

Finally, we modeled the contrasts in which we were interested: The posterior distribution of the level 1 contrasts was obtained by subtracting the predicted deflection from the baseline parameter of one group (e.g., Inclusion) from the predicted deflection from the baseline parameter of another group (e.g., Ostracism), resulting in a posterior predictive distribution of the difference score between these two groups. The posterior distribution of the level 2 contrasts was obtained by subtracting the posterior predictive scores of the Cyberball level 1 contrasts from the posterior predictive scores of the Ostracism Online level 1 contrasts.

In order to estimate the previously mentioned parameters, we ran three MCMC chains per dependent variable, each of which consisted of 5.000.000 iterations. We burned the first 5.000 iterations, and subsequently thinned the chains by saving only every fifth iteration, thus saving 1.000.000 iterations per chain. All the chains converged properly.

Data transformation

Because the relative differences between the conditions were comparable in both manipulations (i.e., 15 % ball throws in Cyberball and four "likes" in Ostracism Online) we standardized all the variables over the entire sample. Furthermore, in order for the data to fit the Gaussian likelihood of the model, the data needed to be approximately normally distributed. We therefore checked all our dependent variables for skewness and kurtosis. The skewness and kurtosis parameters of all the variables were between –1.00 and 1.00, except for the distributions of participant bad mood, unfriendly mood, anger, and sadness. We therefore used a square root transformation on participant bad mood (skewness .99, kurtosis –.23) and unfriendly mood (skewness .98, kurtosis –.35), an inverse transformation on participant anger (skewness .97, kurtosis –.89), and a natural logarithmic transformation on participant sadness (skewness .95, kurtosis –.56).[2]

Results

Figures 1 and 2 show the (unstandardized) condition means of all the dependent variables in the Cyberball and Ostracism Online manipulations, respectively. Furthermore, Tables 1 and 2 show the level 1 (i.e., between-condition) contrasts in the Cyberball and Ostracism Online paradigms, respectively. Finally, Table 3 shows the level 2 (i.e., between-paradigm) contrasts, which are plotted per contrast in Fig. 3 (Ostracism vs. Inclusion), Fig. 4 (Ostracism vs. Overinclusion), and Fig. 5 (Inclusion vs. Overinclusion). For the purpose of clarity, we reversed the counterindicative dependent variables (i.e., bad mood, unfriendly mood, angry mood, and sad mood) in the level 2 contrasts so that positive scores indicate a difference score in favor of Ostracism Online, whereas a negative score indicates a difference score in favor of Cyberball. All the Bayesian estimations of the contrasts include the mode (i.e., the most likely value of the contrast within its posterior predictive distribution) and a 95 % High Density Interval (HDI; i.e., the 95 % most likely values of the contrast within its posterior predictive distribution). Whenever the 95 % HDI did not overlap with zero, we interpreted that contrast as credible.

When examining the level 1 contrasts of the scores of participants in the Inclusion condition and participants in the Overinclusion condition, we found only one credible contrast. Participants in the Overinclusion condition felt more in control of their lives than participants in the Inclusion condition (HDI: –.84, –.09). Since only 1 of the 26 Inclusion vs. Overinclusion contrasts yielded a credible difference, we

[2] Using the nontransformed data in the model did not change the results meaningfully.

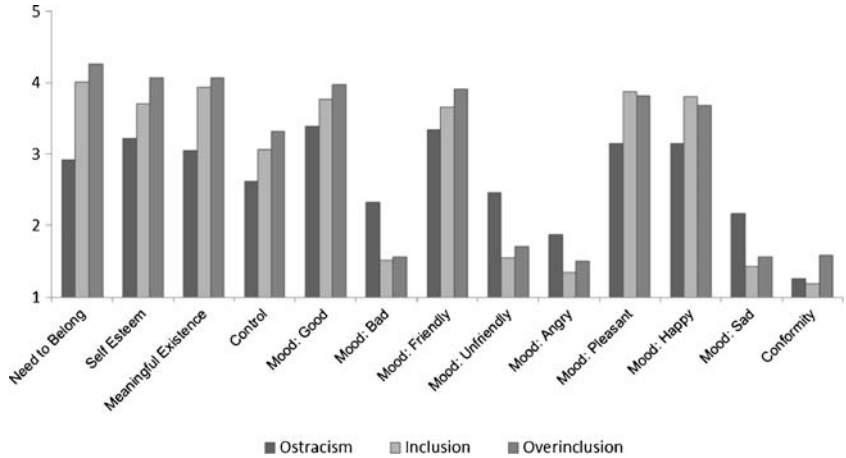

Fig. 1 Means of dependent variables per condition (Cyberball)

concluded that neither Cyberball nor Ostracism Online was effective in manipulating Overinclusion.

However, both manipulations were successful in manipulating ostracism. The Cyberball level 1 contrasts (Table 1) show that, compared with participants in the Inclusion condition and participants in the Overinclusion condition, participants in the Ostracism condition scored themselves credibly lower on their need to belong (Inclusion HDI: –1.34, –0.62; Overinclusion HDI: –1.58, –0.86), self-esteem (Inclusion HDI: –0.87, –0.10; Overinclusion HDI: –0.99, –0.22), meaningful existence (Inclusion HDI: –1.19, –0.43; Overinclusion HDI: –1.32, –0.56), control (Inclusion HDI: –0.85, –0.11; Overinclusion HDI: –1.14, –0.39), and the extent to which they felt pleasant (Inclusion HDI: –0.95, –0.20; Overinclusion HDI: –0.91, –0.15) and happy (Inclusion HDI: –0.90, –0.17; Overinclusion HDI: –0.79, –0.02), whereas they rated themselves credibly higher on the extent to which they felt bad (Inclusion HDI: 0.30, 1.10; Overinclusion HDI: 0.24, 1.07), unfriendly (Inclusion HDI: 0.31, 1.16; Overinclusion HDI: 0.16, 1.02), and sad (Inclusion HDI: –0.26, 1.05; Overinclusion HDI: 0.13, 0.95). Furthermore, participants in the Ostracism condition rated themselves angrier than participants in the Inclusion condition (HDI: 0.10, –0.91), but not angrier than participants in the Overinclusion condition (HDI: –0.04, 0.78). Participants in the Ostracism condition rated themselves credibly lower on the extent to which they felt good (HDI: –0.92, –0.14) and friendly (HDI: –0.85, –0.09) than did participants in the Overinclusion condition, but not lower than participants in the Inclusion condition (HDI: –0.73, 0.74 and –0.34, 0.13, respectively).

The Ostracism Online paradigm yielded effects that were similar to Cyberball in terms of direction (Table 2). Compared with participants in the Inclusion condition and participants in the Overinclusion condition, participants in the Ostracism condition rated themselves credibly lower on their need to belong (Inclusion HDI: –1.79, –1.17; Overinclusion HDI: –1.83, –1.15), self-esteem (Inclusion HDI: –1.62, –0.91; Overinclusion HDI: –1.81, –1.03), meaningful existence (Inclusion HDI: –1.62, –0.92; Overinclusion HDI: –1.86, –1.13), control (Inclusion HDI: –1.19, –0.46; Overinclusion HDI: –1.69, –0.89), and the extent to which they felt good (Inclusion HDI: –1.44, –0.67; Overinclusion HDI: –1.60, –0.78), friendly (Inclusion HDI: –1.41, –0.62; Overinclusion HDI: –1.53, –0.70), pleasant (Inclusion HDI: –1.56, –0.82; Overinclusion HDI: –1.72, –0.95), and happy (Inclusion HDI: –1.58, –0.83; Overinclusion HDI: –1.67, –0.91), while at the same time rating themselves

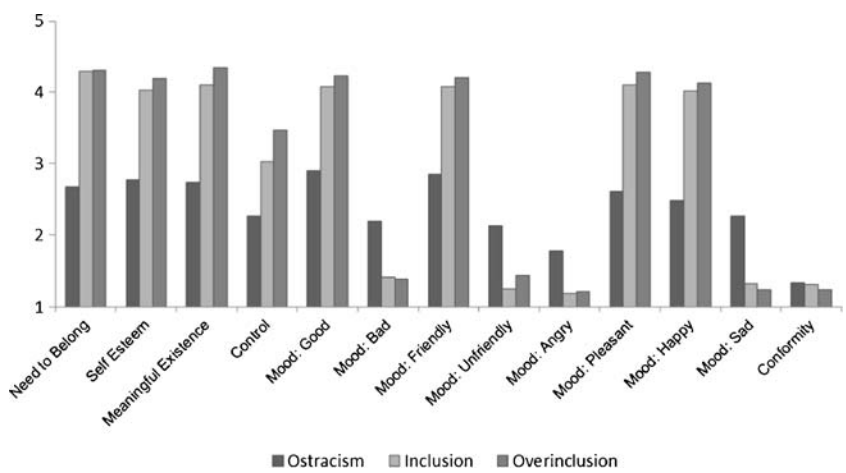

Fig. 2 Means of dependent variables per condition (Ostracism Online)

Table 1 Estimation of standardized between-condition contrasts (Cyberball)

	Contrast 1: Ostracism vs. Inclusion	Contrast 2: Ostracism vs. Overinclusion	Contrast 3:Inclusion vs. Overinclusion
Need to belong	**–0.98****	**–1.22****	–0.24
	(–1.34, –0.62)	**(–1.58, –0.86)**	(–0.55, 0.07)
Self-esteem	**–0.48****	**–0.61****	–0.12
	(–0.87, –0.10)	**(–0.99, –0.22)**	(–0.47, 0.22)
Meaningful existence	**–0.81****	**–0.94****	–0.12
	(–1.19, –0.43)	**(–1.32, –0.56)**	(–0.45, 0.20)
Control	**–0.48****	**–0.76****	0.19
	(–0.85, –0.11)	**(–1.14, –0.39)**	(–0.54, 0.15)
Mood good	–0.33	**–0.52****	–0.19
	(–0.73, 0.74)	**(–0.92, –0.14)**	(–0.54, 0.16)
Mood bad	**0.70****	**0.66****	–0.04
	(0.30, 1.10)	**(0.24, 1.07)**	(–0.40, 0.32)
Mood friendly	–0.26	**–0.46****	–0.21
	(–0.34, 0.13)	**(–0.85, –0.09)**	(–57, 0.15)
Mood unfriendly	**0.73****	**0.59****	–0.14
	(0.31, 1.16)	**(0.16, 1.02)**	(–0.51, 0.22)
Mood angry	**0.50****	0.37	–0.14
	(0.10, 0.91)	(–0.04, 0.78)	(–0.50, 0.23)
Mood pleasant	**–0.57****	**–0.53****	0.04
	(–0.95, –0.20)	**(–0.91, –0.15)**	(–0.30, 0.39)
Mood happy	**–0.51****	**–0.41****	0.10
	(–0.90, –0.12)	**(–0.79, 0.02)**	(–0.25, 0.45)
Mood sad	**0.66****	**0.54****	–0.12
	(0.26, 1.05)	**(0.13, 0.95)**	(–0.48, 0.24)
Conformity	0.09	–0.13	–0.16
	(–0.28, 0.33)	(–0.45, 0.19)	(–0.49, 0.16)

Notes. 95% HDI between brackets

** HDI does not overlap with 0

higher on the extent to which they felt bad (Inclusion HDI: 0.29, 1.08; Overinclusion HDI: 0.29, 1.10), unfriendly (Inclusion HDI: 0.42, 1.15; Overinclusion HDI: 0.19, 0.99), angry (Inclusion HDI: 0.19, 0.98; Overinclusion HDI: 0.13, 0.96), and sad (Inclusion HDI: 0.47, 1.27; Overinclusion HDI: 0.54, 1.35).

Results showed that neither Cyberball nor Ostracism Online influenced the participants' level of conformity to the same group on a subsequent conformity task (all the conformity HDIs overlap with 0, see Tables 1 and 2). We therefore concluded that, although previous research showed that people conform more toward a new group after being ostracized (Williams et al., 2000), they are not more inclined to conform with the group that has just ostracized them. This is not surprising, because attitudes and behaviors toward the ostracizing group are often antisocial and retaliative (Twenge et al., 2001). For our purpose of comparing the two manipulations, the results confirmed our expectations that Ostracism Online and Cyberball would show similar effects of Ostracism (and Overinclusion) on conformity.

Paradigm comparisons

The level 2 contrasts showed no credible differences in the extent to which their Overinclusion conditions induced different levels of need fulfillment, negative mood, or positive mood compared with their Inclusion conditions (Table 3, Fig. 5). As Fig. 5 clearly illustrates, the HDIs of all the variables are localized around zero, containing a fair amount of both positive and negative predicted values. We therefore conclude that—although we did not predetermine a region of practical equivalence—trend wise, the two manipulations seem to be equally (in-) effective in manipulating Overinclusion.

As for the effects of the Ostracism condition in the paradigms, the level 2 contrasts show that, compared with both included and overincluded participants, participants in the Ostracism condition reported credibly less self-esteem (Inclusion HDI: 0.26, 1.29; Overinclusion HDI: 0.28, 1.36), good mood (Inclusion HDI: 0.19, 1.29; Overinclusion HDI: 0.12, 1.21), friendly mood (Inclusion HDI: 0.22, 1.33;

Table 2 Estimation of standardized between-condition contrasts (Ostracism Online)

	Contrast 1: Ostracism vs. Inclusion	Contrast 2: Ostracism vs. Overinclusion	Contrast 3: Inclusion vs. Overinclusion
Need to belong	**–1.48****	**–1.50****	–0.01
	(–1.79, –1.17)	**(–1.83, –1.15)**	(–0.30, 0.27)
Self-esteem	**–1.26****	**–1.42****	–0.16
	(–1.62, –0.91)	**(–1.81, –1.03)**	(–0.50, 0.17)
Meaningful existence	**–1.27****	**–1.49****	–0.22
	(–1.62, –0.92)	**(–1.86, –1.13)**	(–0.50, 0.07)
Control	**–0.83****	**–1.3****	**–0.47****
	(–1.19, –0.46)	**(–1.69, –0.89)**	**(–0.84, –0.09)**
Mood good	**–1.06****	**–1.19****	–0.13
	(–1.44, –0.67)	**(–1.60, –0.78)**	(–0.47, 0.20)
Mood bad	**0.69****	**0.69****	0.01
	(0.29, 1.08)	**(0.29, 1.10)**	(–0.30, 0.38)
Mood friendly	**–1.01****	**–1.12****	–0.03
	(–1.41, –0.62)	**(–1.53, –0.70)**	(–0.33, 0.34)
Mood unfriendly	**0.79****	**0.59****	–0.20
	(0.42, 1.15)	**(0.19, .99)**	(–0.52 to 0.12
Mood angry	**0.58****	**0.54****	0.04
	(0.19, 0.98)	**(0.13, 0.96)**	(–0.37, 0.29)
Mood pleasant	**–1.19****	**–1.33****	–0.15
	(–1.56, –0.82)	**(–1.72, –0.95)**	(–0.49, 0.20)
Mood happy	**–1.20****	**–1.29****	–0.09
	(–1.58, –0.83)	**(–1.67, –0.91)**	(–0.43, 0.26)
Mood sad	**0.87****	**0.94****	0.08
	(0.47, 1.27)	**(0.54, 1.35)**	(–0.25, 0.40)
Conformity	0.01	–0.04	0.03
	(–0.30, 0.32)	(–0.28, 0.36)	(–0.328, 0.35)

Notes. 95% HDI between brackets

** HDI does not overlap with 0

Overinclusion HDI: 0.11, 1.20), pleasant mood (Inclusion HDI: 0.10, 1.14; Overinclusion HDI: 0.28, 1.34), and happy mood (Inclusion HDI: 0.16, 1.22; Overinclusion HDI: 0.35, 1.41) relative to when they were ostracized in the Ostracism Online manipulation than when they were ostracized in the Cyberball manipulation (Table 3, Figs. 3 and 4).

Furthermore, we found that, compared with participants in the Inclusion condition, participants in the Ostracism condition rated themselves credibly lower on their need to belong (HDI: 0.04, 0.97) when they were ostracized in the Ostracism Online paradigm than when ostracized in the Cyberball paradigm (Fig. 3). Moreover, compared with the participants in the Overinclusion condition, ostracized participants reported credibly less meaningful existence (HDI: 0.04, 1.08) when they were ostracized in the Ostracism Online paradigm than when they were ostracized in Cyberball.

Trend wise, the level 2 contrasts concerning the effect of ostracism also confirmed our expectations: The HDIs of all Ostracism vs. Inclusion level 2 contrasts (see Fig. 3) and Ostracism vs. Overinclusion level 2 contrasts (see Fig. 4) are situated around, and often above, zero. This implies that for all the need-threat questionnaire variables that did not yield a credible difference between Ostracism Online and Cyberball, the trend showed that Ostracism Online was either more effective than Cyberball, or at least equally effective.

Discussion

In this article, we set out to test the effectiveness of Ostracism Online, a newly designed ostracism manipulation. In order to do so, we compared it with its classic Cyberball counterpart. Since we (1) found several credible level 2 contrasts in favor of Ostracism Online in the need-threat and mood questionnaire, (2) did not find any credible level 2 contrasts in favor of Cyberball in the need-threat and mood questionnaire, (3) found that the effects of the different conditions on conformity were similar between paradigms, and (4) found that the noncredible level 2 contrast intervals were either situated around zero or showed a trend in favor of Ostracism Online, we concluded that Ostracism Online is slightly more effective,

Table 3 Estimation of between-manipulation contrasts (Ostracism Online vs. Cyberball), per condition-contrast

	Contrast 1: Ostracism vs. Inclusion	Contrast 2: Ostracism vs. Overinclusion	Contrast 3: Inclusion vs. Overinclusion
Need to belong	**0.50****	0.28	–0.23
	(0.04, 0.97)	(–0.22, 0.77)	(–0.65, 0.19)
Self-esteem	**0.78****	**0.82****	0.04
	(0.26, 1.29)	**(0.28, 1.36)**	(–0.44, 0.52)
Meaningful existence	0.46	**0.56****	0.95
	(–0.05, 0.97)	**(0.04, 1.08)**	(–0.34, 0.52)
Control	0.34	0.53	0.19
	(–0.17, 0.86)	(–0.003, 1.07)	(–0.32, 0.70)
Mood good	**0.73****	**0.67****	–0.06
	(0.19, 1.29)	**(0.12, 1.21)**	(–0.54, 0.42)
Mood bad	–0.02	0.04	0.05
	(–0.56, 0.51)	(–0.52, 0.59)	(–0.44, 0.55)
Mood friendly	**0.76****	**0.65****	–0.11
	(0.22, 1.30)	**(0.11, 1.20)**	(–0.62, 0.40)
Mood unfriendly	0.05	–0.001	–0.05
	(–0.48, 0.58)	(–0.57, 0.56)	(–0.54 to 0.42)
Mood angry	0.08	0.18	0.9
	(–0.45, 0.61)	(–0.37, 0.74)	(–0.39, 0.59)
Mood pleasant	**0.62****	**0.81****	0.19
	(0.10, 1.14)	**(0.28, 1.34)**	(–0.30, 0.68)
Mood happy	**0.69****	**0.88****	0.19
	(0.16, 1.22)	**(0.35, 1.41)**	(–0.31, 0.67)
Mood sad	0.21	0.40	0.19
	(–0.33, 0.75)	(–0.15, 0.96)	(–0.29, 0.68)
Conformity	0.02	–0.17	–0.19
	(–0.42, 0.46)	(–0363, 0.28)	(–0.65, 0.26)

Notes. 95% HDI between brackets

** HDI does not overlap with 0

or at least as effective, as Cyberball in manipulating ostracism (vs. Inclusion or Overinclusion).

There are several possible explanations for Ostracism Online yielding overall slightly stronger effects than Cyberball. First of all, the group by which the participant is ostracized is larger in the Ostracism Online paradigm (11 group members) than in the Cyberball paradigm (3 group members), which causes the participants in the Ostracism

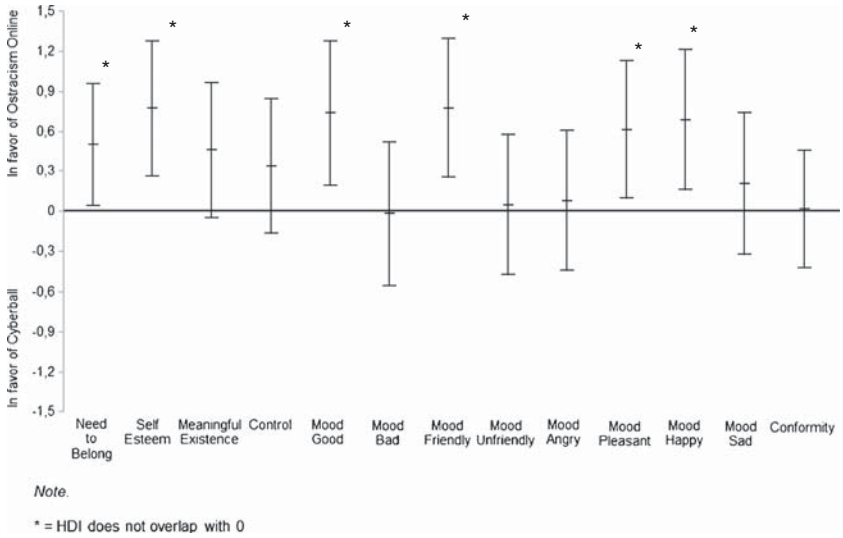

Fig. 3 Estimation of between-manipulation contrasts (Ostracism vs. Inclusion)

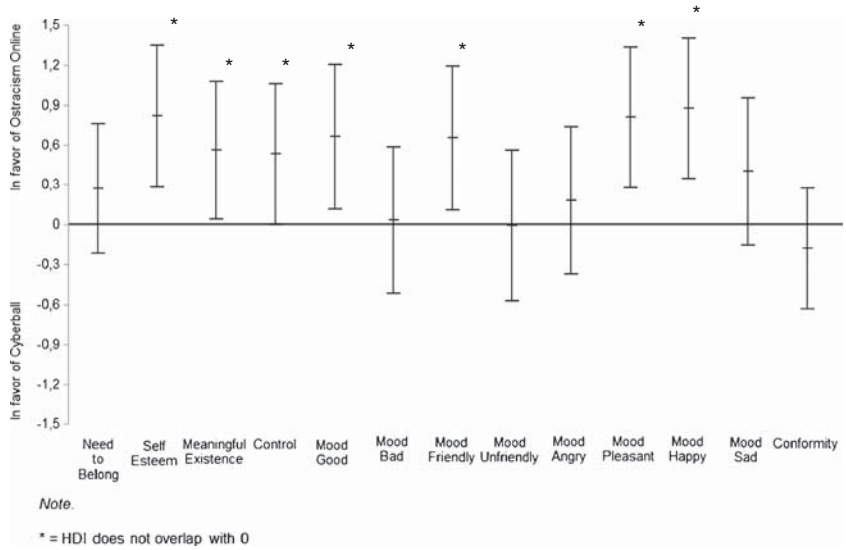

Fig. 4 Estimation of between-manipulation contrasts (Ostracism vs. Overinclusion)

Online paradigm to receive a relatively smaller share of the total social attention signals within the group compared with participants in the Cyberball manipulation. As such, a participant might feel more ostracized in the Ostracism Online paradigm than in the Cyberball paradigm. A second explanation might be that the *likes* that were used in Ostracism Online might signal more than just social attention, and that an absence of *likes* might be more likely to be interpreted as rejection than not receiving a ball in Cyberball, causing participants in the Ostracism Online paradigm to respond slightly more strongly to the Ostracism condition than participants in the Cyberball condition. A third explanation might relate to the fact that the actual symbolic object that is being ostracized in Ostracism Online is a personal profile, consisting of the participants' self-descriptive introductory paragraph complemented by an avatar that the participants picked themselves, whereas in Cyberball participants are represented solely by a neutral, standardized avatar. As such, the ostracism in Ostracism Online might feel more personal for participants, because it is (ostensibly) based on their own personal preferences and decisions.

On the basis of our results, we argue that Ostracism Online is an effective paradigm for manipulating ostracism and a useful addition to the ostracism research methodology for several reasons. First of all, the social interaction within the paradigm is preprogrammed. This provides researchers with both experimental control and flexibility to adapt the level and means of communication to their research purposes. In this particular experiment, we framed the standardized communication in terms of *likes* for the purpose of ecological validity, because this method of communication is very similar to that of various large social media platforms (most notably, Facebook). However, *liking* bears an inherent social judgment. Researchers who study ostracism through ignoring rather than exclusion can therefore simply reprogram Ostracism Online so that the communication is framed in terms of group members

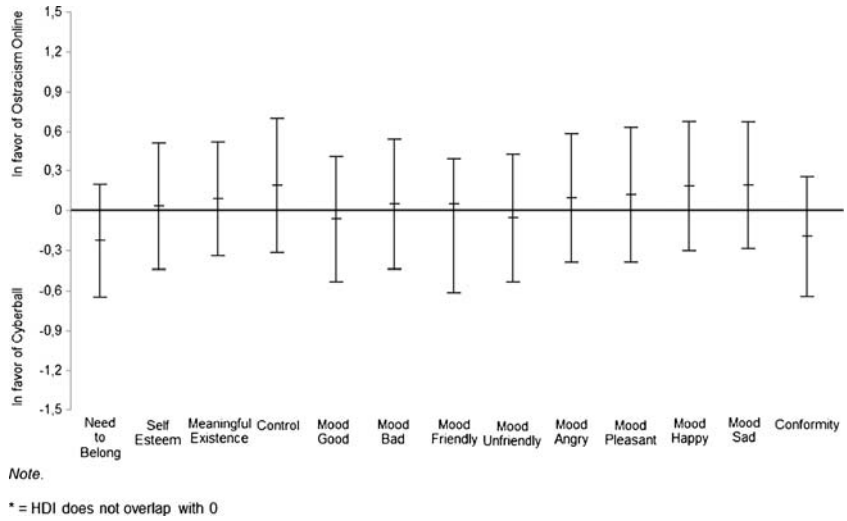

Fig. 5 Estimation of between-manipulation contrasts (Inclusion vs. Overinclusion)

indicating whether or not they have read the personal profile, by changing the *likes* into *reads*. Moreover, researchers interested in manipulating explicit social rejection rather than implicit ostracism can reprogram Ostracism Online in a similar way by changing the *likes* to *dislikes*.

Ostracism Online also allows researchers to adapt the group content and size to suit their research purposes. Ostracism Online can be reprogrammed to expose participants to ostracism in both smaller and larger groups. Additionally, the avatars of the group members can be changed to one of the other preprogrammed avatars, newly created avatars, or pictures. This way, researchers can easily manipulate the group members' age, gender, skin color, or physical attractiveness in order to study the effects of stereotyping or mate choice on ostracism. Also, Ostracism Online allows the personalized information of group members to be changed to create group members with specific personal characteristics. This makes Ostracism Online very convenient for researchers who are interested in the relationship of ostracism and, for example, political or religious beliefs.

The full source code of Ostracism Online is available for research purposes. Because the code is annotated and supplemented by an instruction manual, setting up an experiment and modifying most of the parameters does not require extensive programming experience. Programming experience might be necessary for implementing larger, structural changes.

With regard to data collection, our results showed that Ostracism Online is suitable for online data collection. However, it can also be used in other research environments, such as a psychology lab. Ostracism Online can be used, for instance, to study the neurological underpinnings of (online) ostracism or social rejection by exposing participants to the introductory phase of Ostracism Online while they are in an fMRI scanner. Future research is needed, however, in order to validate the Ostracism Online paradigm in different experimental settings.

Ostracism Online is also suitable for studying individuals' group behavior after being ostracized. Incorporating the personal profiles (or only the avatars) in a subsequent task allows researchers to study the effect of ostracism on several forms of group behavior, such as conformity, performance, and group creativity.

Finally, Ostracism Online is a programming template that can be used to study phenomena other than ostracism. By setting the *likes* to very high or very low levels across the group, Ostracism Online can be used to manipulate (and thus study the effect of) group cohesion. Also, by disabling the "likes" function, Ostracism Online can serve as a standard introductory phase in any online group behavior study.

In summary, Ostracism Online is a versatile and flexible template for studying group behavior. It is especially suited to studying the effects of ostracism in an experimentally controlled manner, which provides high ecological validity because its conceptual framework draws on the rapid worldwide increase in social media use.

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