



“You’re leaving us?” Feeling ostracized when a group member leaves[☆]

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ABSTRACT

People leave groups. We examined the psychological consequences for the remaining group members; specifically, whether the departure of a member can produce feelings of ostracism (being excluded and ignored). We manipulated systematically the number of group members who left (zero, one, or two out of the two other group members) during a get to know you interaction (Study 1), a word creativity task (Study 2), and a virtual ball-toss game (Cyberball; Study 3). We measured participants' feelings of ostracism and associated outcomes overall and based on the relationships with each group member. Overall, participants felt worse when two group members left compared to one or no group members leaving. At the individual relationship level, we found evidence of partial ostracism as participants felt negative when evaluating their interaction with a group member who left. By using a multi-level approach, we found the everyday experience of a group member leaving produces a void, harming those left behind. We considered how this void could have implications for group dynamics theory and organizational practices.

Groups do not stay the same forever — rather, a group's composition changes over time. For instance, after playing for the New England Patriots for 20 seasons and winning six Super Bowls, Tom Brady, a veteran American National Football League (NFL) Quarterback, left the Patriots to join a different NFL team (Encyclopedia Britannica, 2023). Routinely, groups change over time due to group members leaving (Mathieu et al., 2014; Mortensen & Haas, 2018). This may include a family member leaving due to military service, or an academic colleague leaving the department for a new position. Group members may also leave unexpectedly, such as an employee walking off the job or a student leaving in the middle of a lecture. Because group change is ubiquitous, it is important to understand the social and emotional after-effects on the remaining group members following a change (e.g., Trainer et al., 2020).

When it comes to understanding when individuals feel the painful effects of ostracism (being excluded and ignored), researchers have generally kept the person doing the ostracism (the source) present throughout the interaction. Sources of ostracism stop throwing the ball to a participant (e.g., Dvir et al., 2019; Williams et al., 2000), avert their eye gaze (e.g., Wirth et al., 2010), or do not provide all necessary information (Jones et al., 2009; Jones & Kelly, 2010), but in each case they remain present. What happens though when a group member leaves

partway through the group interaction? Despite individuals leaving groups frequently, this has yet to be examined systematically.

1. Reacting to all group members leaving

We begin by considering an extreme case of *all* group members leaving. Would being left alone produce feelings of ostracism? This seems plausible given individuals are highly sensitive to the loss of a social connection — *all* group members leaving means the previous social connections are no longer active and the individual is now alone. According to the temporal need-threat model (Williams, 2009), any indication of potential ostracism is detected quickly and activates social pain (MacDonald & Leary, 2005) to focus the individual's attention on addressing the social situation. In the reflexive stage, the immediate response to ostracism, social pain, manifests as activation in the dorsal anterior cingulate cortex and right ventral prefrontal cortex, which are regions of the brain set to detect physical pain (Eisenberger, 2012; Eisenberger et al., 2003). The reflexive stage also involves other aversive outcomes including threatening fundamental needs (i.e., belonging, control, self-esteem, meaningful existence), which are necessary for everyday functioning, and negative affect (see Hartgerink et al., 2015 for a meta-analysis). Recently, Hales and colleagues (Hales et al., 2021;

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Hales & Williams, 2018) suggested a fifth need: self-certainty (Hogg, 2014). Initial research suggests following ostracism, individuals become uncertain about themselves and their identity. In addition to changes in the self, ostracism alters the group dynamic. Participants perceived less closeness with the group members as the severity of the ostracism increased (Hühnel et al., 2018). Based on these findings, it is reasonable to expect that group members leaving an individual all by themselves would prompt feelings of ostracism: increased social pain, reduced satisfaction of fundamental needs, and greater negative affect.

2. Reacting to a group member leaving

The investigation of group members leaving becomes even more interesting, albeit potentially more complicated, when just one of the group members leaves while some other group members still remain. We asked a second research question: When a group member leaves, does an individual respond with social pain and related outcomes due to losing a social connection or are possible ostracism effects kept at bay due to still having a remaining social connection? In this scenario, individuals may feel partial ostracism — being neither fully included, yet not completely excluded (Jones et al., 2009). This seems plausible given individuals feel partial ostracism in a variety of circumstances. It can occur when people are acknowledged by group members while still being excluded from key information (i.e., being out of the loop; Jones et al., 2009). Or partial ostracism could involve people being excluded and ignored at only some points during an interaction and included at others. Alternatively, it could involve being included to a lesser degree than other group members, or included in some domains, but not others (Jones et al., 2009). The situation of a group member leaving fits the definition of partial ostracism (Jones et al., 2009) as individuals are not fully included because a group member left, yet they are not completely excluded because at least one group member remains.

Research studies suggest partial ostracism is not as painful as full ostracism but leads to worse feelings than inclusion. For instance, in one of the first ostracism studies (i.e., Williams et al., 2000), researchers created a partial ostracism condition, by manipulating the likelihood of receiving a disk to be 20 % in comparison to full ostracism (0 %) or full inclusion (33 %). Based on an aversive impact scale (i.e., mood, intensity of ostracism, and perception of group cohesiveness combined), participants in the partial ostracism condition experienced more aversive outcomes compared to inclusion, but less aversive outcomes compared to full ostracism. Other partial ostracism experiences produce a similar pattern of results. For instance, when women are sexually objectified — being treated as a body for the use and pleasure of others (Bartky, 1990) — they feel more ostracized compared to non-sexually objectified women, but not as bad compared to those who were entirely ostracized directly through averted eye gaze (Dvir et al., 2021). On one hand, the severity of partial ostracism may lie between full ostracism and full inclusion.

On the other hand, in many situations, partial ostracism may be so subtle that it is no worse than inclusion. The *consensual model* proposes ostracism is not painful until there are at least two sources of ostracism in the group (Sandstrom et al., 2017). That is, an individual may not feel the harmful effects of ostracism until there seems to be an arrangement between at least two group members. Supporting the consensual model, Sandstrom et al. (2017) found when children were ostracized by one group member but included by two, they experienced no greater deficits on basic need satisfaction (except self-esteem) and mood compared to participants being included by all group members. When children were ostracized by two group members and included by one, they *did* experience less basic need satisfaction and happiness compared to included children. Therefore, at least for groups of four (participant plus three others), ostracism by at least two group members may be necessary to produce ostracism's aversive outcomes. This result may also apply to the currently postulated effect following discovering a single member of one's group is leaving.

Overall, to date, there appears to be relatively little research on the effects of group members leaving. Consistent with this, Trainer et al. (2020) conducted a comprehensive review which combed through a total of 1589 articles related to terms such as “team fluidity,” “team member change,” and “dynamic team composition.” Despite the prevalence of group members leaving and the potential for strong aversive responses, the researchers only identified 14 articles about the response to a group member leaving. These articles indicate a team member leaving disrupts team cognition, social integration, and performance (van Der Vegt et al., 2010). At a basic level, the group member leaving may take with them important and nonredundant information (Holtom et al., 2008; Parise et al., 2006; Summers et al., 2012). Likewise, a group member leaving disrupts the mental models or transactive memory systems the group utilizes, which hinders the group from performing effectively and reaching the group's goals (Akgün et al., 2005; Choi et al., 2010; Lewis, 2004). These types of outcomes are stronger when the group member is a leader or central member of the group because they take away greater quantity and quality of critical tacit knowledge (Groysberg et al., 2008), technical expertise, and social capital (Joe et al., 2013; Parise et al., 2006). Further, losing a central group member leads to less effective adapting to the loss, (Stuart, 2017), requires more time to recover (Hale et al., 2016), and causes an increased turnover in the group (Kacmar et al., 2006). These studies provide initial evidence showing a group member leaving is harmful to the group, but this research missed examining an individual's emotional reaction.

3. Research approach

To help best detect the potential social and emotional effects of a group member(s) leaving, we measured participants' overall response, and also their response to each group member individually. We applied this approach because the sort of partial ostracism triggered by a single group member leaving may not be captured entirely by a participant's overall response. Instead, researchers may need to investigate the nuanced relationship between the participant and each group member. When a group member leaves, it could cause a person to feel *relationally devalued* (Leary, 1999), especially by the particular group member who left. That is, the group member leaving could be signaling they regard the relationship with the individual as less valuable, important, and close (Leary & Baumeister, 2000). When one group member leaves, but another stays, people may feel relationally devalued by the one who left, but not necessarily the one who stays. To measure these differences sensitively, we assessed responses based on how participants felt overall and how participants felt in relation to each individual group member. Previously, researchers used the first method, asking participants how they felt in general (e.g., “I feel sad”) following interacting with the group. However, in these studies both group members behaved similarly (i.e., they both included the participant, or they both excluded the participant), so this level of analysis was sufficient. Whereas in the current research, the group member's behavior will differ within the same game. Therefore, we applied the principle of compatibility (i.e., analyzing specific outcomes using specific questions; Ajzen & Fishbein, 1977) to our questions and asked about specific interactions with group members in order to detect partial ostracism.

A multi-level analysis approach also follows suggestions made by researchers (Arrow & McGrath, 1995; Moreland & Levine, 1982) to investigate how the dynamics between group members can change over the history of the group. In our case, this means examining overall outcomes from the group interaction and outcomes from specific individual relationships. In looking at partial ostracism, researchers applied a changing dynamics approach to evaluate liking of each group member (Chernyak & Zayas, 2010) and closeness with each group member (Hühnel et al., 2018) and found negative responses between group members who ostracized versus included the participant. We took this same approach by asking how much each group member made the participant feel ostracized and feel the effects associated with ostracism

(e.g., social pain). If people feel relationally devalued by the person who left, we expect greater feelings of ostracism (e.g., more negative affect) compared to the person who stayed.

Specifically, across three studies, participants did various group tasks with two other group members during which we manipulated the number of the group members who left — zero, one, or two — from a group that included the participant and two other group members. This approach allowed us to examine what we believe to be a partial form of ostracism, where participants are ostracized by some, the group member leaving, but not by all, as one group member stays. Previous research examining partial ostracism was inconsistent regarding how having one group member stay and one leave impacted a participant. Therefore, using multiple paradigms and multiple levels of analysis, we sought to carefully investigate participants' reactions when a group member left and a group member stayed.

4. Hypotheses

To assess participants' overall level, we asked them how they felt at the end of the group interaction. We hypothesized participants would experience greater social pain, more feelings of ostracism, less basic need satisfaction, more negative affect, and less connection with the group when both group members leave — the *both-group members-leave* condition — compared to both group member staying — *both-group members-stay* condition — or being ostracized by one group member and included by the other — the *one-group member-leaves* condition. This straightforward hypothesis is based on a consistent finding that full ostracism produced more negative outcomes than any degree of partial ostracism (e.g., Abayhan & Aydin, 2014; Chernyak & Zayas, 2010; DeWall et al., 2010; Hühnel et al., 2018; Jones et al., 2009; Jones & Kelly, 2010; Sandstrom et al., 2017).

In contrast, given the mixed results we described above, we did not make a specific hypothesis for comparing the both-group members-stay condition versus the one-group member-leaves condition. To conduct a full investigation though, we included comparing the both-group members-stay versus one-group member-leaves conditions in our pre-registered analysis plans.

Examining individual relationships, to best test potential partial ostracism effects triggered when a group member stays and a group member leaves (the one-group member-leaves condition), we also examined how participants responded to each group member individually. We used this approach to account for the possibility that people may feel relationally devalued by the group member who leaves, but not by the group member who stays. We hypothesized participants will have a more negative response to a group member who leaves compared to the group member who stays. In contrast, when both group members stay, or when both group members leave, there will be non-significant differences between the group members (given they behaved similarly).

5. Analysis plan and open materials

For all studies, to test participants' overall response level, we conducted a one-way ANOVA comparing the both-group members-leave condition to both-group members-stay condition and to the one-group member-leaves condition.

To evaluate participants' responses to the individual relationships with the group members, for each study, we also conducted a 3 (Leaving Condition: both-group members-stay vs. one-group member-leaves vs. both-group members-leave) $\times$ (2) (Group Member: member A vs. member B) repeated-measures ANOVA. We examined specifically, based on our hypotheses, if participants had a more aversive response to Group Member B leaving compared to Group Member A staying.

All comparisons at the overall level (between conditions) or for individual relationships (comparing between group members) were made using Tukey or Games-Howell (when homogeneity of variance was violated) post-hoc tests.

All materials and datasets are provided at <https://osf.io/ptuq9/>. For all the studies, we report all manipulations, measures, and exclusions.

6. Study 1 – Relationship closeness induction task

6.1. Method

6.1.1. Participants

We began by collecting responses from 493 U.S. MTurk workers who we paid \$2.00 USD for their participation. Applying pre-registered criteria for participants removals (<https://aspredicted.org/h38v-why.pdf>), we removed participants due to self-reporting being distracted ($n = 9$), self-reporting being interrupted ($n = 3$), self-reporting their data should not be used ($n = 9$), took more than 3 SDs to complete the study ($n = 11$), or if participants reported being suspicious about the group members ($n = 25$). While not pre-registered, 7 participants did not participate in the manipulation and were therefore removed. Lastly, 12 participants were removed for a combination of two or more criteria. These removals resulted in a final sample of 417 participants (55.9 % female; $M_{\text{age}} = 37.76$,¹ $SD_{\text{age}} = 11.69$, $\text{Range}_{\text{age}} = 18\text{--}87$) who were predominantly White (72.2 %), African American (11.8 %), or Asian (7.2 %). A power analysis using Super Power (Lakens & Caldwell, 2021) showed this sample size is sufficient to provide 80 % power to detect an interaction of effect size approximately $\eta_p^2 = 0.02$, and a simple effect mean difference between Player A and Player B of approximately $d = 0.17$ (assuming a correlation of $r = 0.3$ between participants responses for the two players).

6.1.2. Procedure

In all studies, participants began by providing their consent to participate. To create a situation where we could manipulate group members leaving, participants completed an adapted form of the Relationship Closeness Induction Task (RCIT; Sedikides et al., 1999). This task involves answering questions which become progressively more personal leading to induced closeness through mutual self-disclosure. We instructed participants they would do a "Get to Know You Task" involving questions about themselves. We told participants that following each question, the participant's group members would see their responses and participants would see how the other group members responded. Participants entered a non-identifying screen name and then joined a group (i.e., the Viking Turtles) with two other group members *bearry* and *verdant*. Participants had two minutes apiece to write their response to seven closeness induction questions, which increased in intimacy (e.g., "What are your hobbies?" "What is something you've always wanted to do, but might not ever be able to do?" "If you could change one thing about yourself, what would it be?").

Participants were randomly assigned to one of the following group interactions which varied the number of group members who left. 1) In the both-group members-stay condition, both group members answered all of the closeness induction questions. 2) In the one-group member-leaves condition, prior to seeing the group members' responses to question four (middle of the task), participant saw a message indicating "bearry/verdant chose to leave the Viking Turtles," and the response to the remaining closeness induction questions said, "bearry/verdant left the group." In this condition we counterbalanced which group member left, such that for half the participants bearry left first and for the other half verdant left first. 3) In the both-group members-leave condition, one group member left prior to seeing the group members' responses to question three and the other group member left prior to seeing the responses to question five. Participants saw the same notifications as the one-group member-leaves condition and we counter-balanced the order of group members leaving. We designed this condition so that on

¹ One participant put in an incorrect value and was not included in this age analysis but remained in other analyses.

average, the players left at the same time as a single player leaving, but did not leave together at the same time, which could appear suspicious. Following the closeness induction task, participants completed several questions about their experience.

6.1.3. Measures

Participants began by completing the manipulation check questions. Following these questions, in a randomized order, participants then completed measures assessing social pain, feelings of ostracism and basic needs, negative affect, and a measure of closeness with the group. For each measure, participants indicated their feelings overall (e.g., “I felt meaningless”) and also based on their relationship with each individual group member (e.g., “bearry/verdant made me feel meaningless”). For each measure, participants completed all questions about their feelings overall or based on the relationships with each individual group member, before moving to the next set of questions within the measure. We randomized each grouping of questions within a measure. With the exception of the manipulation checks, all questions were asked based on the end of the Relationship Closeness Induction Task game (e.g., “For the following questions, answer how you felt at the end of the Get to Know You Task”).

Manipulation Check Questions. Following the closeness induction task, participants began by completing manipulation check questions to ascertain if participants recognized accurately the number of group members who left based on the condition. In a randomized order, participants responded to the manipulation check questions: “How many group members, other than yourself, were still part of the group at the end?” “How many people were you participating with at the end of the Get to Know You Task?” “How many group members, other than yourself, finished the Get to Know You Task?” and “How many group members, other than yourself, started the Get to Know You Task?” For each question, participants indicated zero to three people.

Social Pain. Similar to previous research assessing social pain (e.g., Riva et al., 2011, 2014; Wirth et al., 2020), participants completed the Numerical Rating Scale-11 (NRS-11; Hartrick et al., 2003) which asked participants “How much pain did you experience at the end of the Get to Know You Task?” For each individual group member, participants responded to the question, “At the end of the Get to Know You Task, how much pain did bearry/verdant make you feel?” Participants responded based on a 0 (*Not pain sensation*) to 10 (*Most intense pain sensation imaginable*) scale.

Feeling Ostracized and Basic Need Satisfaction. We assessed participants’ feelings of ostracism and basic need satisfaction, based on feelings at the end of the closeness induction task. Participants reported their feelings of ostracism overall (i.e., “I felt excluded,” “I felt ignored”; $r_{\text{spearman-brown}} = 0.86$) and based on interacting with each group member (i.e., “bearry/verdant made me feel excluded,” “bearry/verdant made me feel ignored”; $r_{\text{spearman-brown}} = 0.87$).

Participants indicated their basic need satisfaction using a 15-item scale with 3 items apiece assessing the basic needs of belonging, control, self-esteem, meaningful existence, and self-certainty (e.g., Bastian & Haslam, 2010; Hales & Williams, 2018; Zadro et al., 2006; self-certainty items: Hales et al., 2021). Participants completed measures overall (e.g., “I felt disconnected,” “I felt meaningless,” “I felt unsure about what to do”; $\alpha = 0.85$) and based on their interaction with each group member (e.g., “bearry/verdant made me feel disconnected,” “bearry/verdant made me feel meaningless,” “bearry/verdant made me feel unsure about what to do” ($\alpha \geq 0.80$)). We followed previous research (e.g., McConnell et al., 2011; Rudert et al., 2017) and averaged the individual basic needs together to create an overall score with higher values indicating greater satisfaction.

For feelings of ostracism and basic need satisfaction, participants responded on a 1 (*Not at all*) to 5 (*A great deal*) scale.

Negative Affect. Participants reported their negative affect overall on an 8-item scale (e.g., “I felt bad,” “I felt angry”; $\alpha = 0.85$) and based on interacting with each group member (e.g., “bearry/verdant made me

feel bad,” “bearry/verdant made me feel angry”; $\alpha \geq 0.78$; Giesen & Echterhoff, 2018; Hales et al., 2016). Participants responded on a 1 (*Not at all*) to 7 (*Extremely*) scale scored so higher values indicate more negative affect.

Inclusion of Other in Self (IOS). To measure how much participants felt connected to the group overall and to each individual group member, participants completed the Inclusion of Other in Self (IOS) scale (Aron et al., 1992). The IOS is a single-item, pictorial measure of closeness which involves selecting from a series of circles that vary in the extent they overlap — Venn-like diagrams of closeness. The more two circles overlap, the more closeness there is between oneself and other(s). Participants chose from one of seven diagrams with higher values indicating greater closeness.

6.2. Results

6.2.1. Manipulation checks

The manipulation checks indicated participants perceived the manipulation as we intended. See Table 1 for specific ANOVA results, 95 % CIs, and Means and Standard Deviations. Participants across the conditions all recognized they started with two group members ($F(2, 414) = 0.79$, $p = .456$, $\eta_p^2 < 0.01$; $ps \geq 0.409$, $ds \leq 0.16$). According to three manipulation check questions ($F_s \geq 321.87$, $ps < 0.001$, $\eta_p^2 \geq 0.61$), participants correctly noted the number of group members left at the end of the closeness induction task. This is based on participants accurately reporting how many group members were still part of the group ($ps < 0.001$, $ds \geq 2.46$), how many people the participant played with at the end of the Get to Know You Task ($ps < 0.001$, $ds \geq 1.37$), and generally how many group members finished the Get to Know You Task (no significant difference between both members stay and one member stays and one leaves, $p = .991$, $d = 0.05$; remaining $ps < 0.001$, $ds \geq 3.74$).

6.2.2. Overall response

The leaving manipulation (i.e., both-group members-stay vs. one-group member-leaves vs. both-group members-leave) had a significant effect on the overall outcome variables, (*weakest* ANOVA, $F(2, 414) = 24.96$, $p < .001$, $\eta_p^2 = 0.11$), with the exception of social pain ($F(2, 414) = 1.22$, $p = .298$, $\eta_p^2 = 0.01$). Participants reported more negative outcomes when both group members left compared to the both-group members-stay condition, and also compared to the one-group member-leaves condition. Specifically, both group members leaving caused participants to experienced increased feelings of ostracism ($ps < 0.001$; $ds = 0.70$), less basic need satisfaction ($ps < 0.001$; $ds \geq 0.65$),² more negative affect ($ps < 0.001$; $ds \geq 0.70$), and less closeness with the group ($ps < 0.001$; $ds \geq 0.74$). There were no significant differences between conditions for social pain ($ps \geq 0.313$, $ds \leq 0.17$). For all outcomes, there were no significant differences between the both-group members-stay versus the one-group member-leaves conditions ($ps \geq 0.196$, $ds \leq 0.021$).³

6.2.3. Individual relationship response

We found significant Leaving Condition by Group Member interactions for all measures, *weakest* ANOVA, $F(2, 414) = 5.14$, $p = .006$, $\eta_p^2 = 0.02$. See Table 2 for interaction ANOVA results, 95 % CIs, and Means and Standard Deviations. Examining our hypotheses, in the one-group member-leaves condition, participants responded more

² For all studies, we followed the preregistration and examined the traditional basic needs, without self-certainty. Across all studies, we found a similar pattern of results as the measures of five needs. We reported the results in the supplemental analyses.

³ For all studies, we conducted an exploratory analysis evaluating participants’ perceived closeness between the two group members. Results are in supplemental analyses.

Table 1

Study 1 (RCIT) Means, Standard Deviations, and 95 % Confidence Intervals for Manipulation Checks and Overall Responses.

Variable	Means and Standard Deviations			95 % Confidence Intervals and <i>p</i> -values		
	Both Group Members Stay (<i>n</i> = 134)	One Group Member Leaves (<i>n</i> = 145)	Both Group Members Leave (<i>n</i> = 138)	Both Group Members Stay vs. One Group Member Leaves	Both Group Members Stay vs. Both Group Members Leave	One Group Member Leaves vs. Both Group Members Leave
Manipulation Checks	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)			
Number of group members started the Get to Know You Task?	2.03 (0.21) ^a	2.08 (0.37) ^a	2.07 (0.39) ^a	−0.13, 0.04 <i>p</i> = .409	−0.13, 0.05 <i>p</i> = .505	−0.10, 0.11 <i>p</i> = .997
<i>F</i> (2, 414) = 0.79, <i>p</i> = .456, η_p^2 < 0.01						
How many group members were still part of the group at the end	2.02 (0.19) ^a	1.12 (0.35) ^b	0.13 (0.45) ^c	0.82, 0.98 <i>p</i> < .001	1.79, 1.99 <i>p</i> < .001	0.88, 1.11 <i>p</i> < .001
<i>F</i> (2, 414) = 1001.94, <i>p</i> < .001, η_p^2 = 0.83						
How many people were at the end of the Get to Know You Task	2.08 (0.30) ^a	1.24 (0.53) ^b	0.33 (0.78) ^c	0.72, 0.96 <i>p</i> < .001	1.59, 1.92 <i>p</i> < .001	0.73, 1.10 <i>p</i> < .001
<i>F</i> (2, 414) = 321.87, <i>p</i> < .001, η_p^2 = 0.61						
How many group members finished the Get to Know You Task	2.04 (0.19) ^a	2.03 (0.18) ^a	0.22 (0.66) ^b	−0.05, 0.06 <i>p</i> = .991	1.68, 1.96 <i>p</i> < .001	1.68, 1.95 <i>p</i> < .001
<i>F</i> (2, 414) = 914.37, <i>p</i> < .001, η_p^2 = 0.82						
Social Pain	0.81 (1.95) ^a	1.18 (2.33) ^a	1.12 (2.06) ^a	−0.98, 0.23 <i>p</i> = .313	−0.88, 0.26 <i>p</i> = .410	−0.55, 0.68 <i>p</i> = .968
<i>F</i> (2, 414) = 1.22, <i>p</i> = .298, η_p^2 = 0.01						
Feeling Ostracized	1.54 (1.02) ^a	1.58 (0.90) ^a	2.36 (1.29) ^b	−0.30, 0.24 <i>p</i> = .961	−1.14, −0.48 <i>p</i> < .001	−1.09, −0.47 <i>p</i> < .001
<i>F</i> (2, 414) = 24.96, <i>p</i> < .001, η_p^2 = 0.11						
Basic Need Satisfaction	3.71 (0.56) ^a	3.58 (0.62) ^a	3.15 (0.72) ^b	−0.04, 0.29 <i>p</i> = .196	0.37, 0.74 <i>p</i> < .001	0.25, 0.63 <i>p</i> < .001
<i>F</i> (2, 414) = 29.19, <i>p</i> < .001, η_p^2 = 0.12						
Negative Affect	2.45 (0.97) ^a	2.59 (0.95) ^a	3.36 (1.16) ^b	−0.43, 0.15 <i>p</i> = .484	−1.20, −0.62 <i>p</i> < .001	−1.06, −0.48 <i>p</i> < .001
<i>F</i> (2, 414) = 31.27, <i>p</i> < .001, η_p^2 = 0.13						
Closeness with the Group (IOS)	3.12 (1.73) ^a	2.79 (1.54) ^a	1.72 (1.33) ^b	−0.13, 0.80 <i>p</i> = .209	0.96, 1.84 <i>p</i> < .001	0.67, 1.47 <i>p</i> < .001
<i>F</i> (2, 414) = 31.01, <i>p</i> < .001, η_p^2 = 0.13						

Note. Different superscripts denote significant differences between conditions, *p* < .05. Confidence intervals are calculated based on the mean differences. Degrees of freedom may vary due to participants being able to skip questions.

Table 2

Study 1 (RCIT) Means, Standard Deviations, and 95 % Confidence Intervals for Individual Relationship Responses.

Variable	Both Group Members Stay			One Group Member Leaves			Both Group Members Leave		
	Member A	Member B		Member A	Member B		Member A	Member B	
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	95 % Confidence Interval and <i>p</i> -values	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	95 % Confidence Interval and <i>p</i> -values	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	95 % Confidence Interval and <i>p</i> -values
Social Pain	0.85 (2.08)	0.72 (1.83)	−0.07, 0.34 <i>p</i> = .198	0.92 (2.15)	1.19 (2.18)	−0.47, −0.07 <i>p</i> = .008	1.20 (2.19)	1.08 (1.89)	−0.08, 0.33 <i>p</i> = .231
<i>F</i> (2, 414) = 5.14, <i>p</i> = .006, η_p^2 = 0.02									
Feeling Ostracized	1.42 (0.92)	1.41 (0.91)	−0.07, 0.08 <i>p</i> = .845	1.40 (0.86)	1.58 (0.94)	−0.25, −0.10 <i>p</i> < .001	2.26 (1.31)	2.29 (1.30)	−0.11, 0.04 <i>p</i> = .335
<i>F</i> (2, 414) = 6.64, <i>p</i> = .001, η_p^2 = 0.03									
Basic Need Satisfaction	3.60 (0.51)	3.65 (0.50)	−0.12, 0.03 <i>p</i> = .191	3.62 (0.47)	3.27 (0.52)	0.28, 0.42 <i>p</i> < .001	3.00 (0.67)	3.06 (0.60)	−0.13, 0.01 <i>p</i> = .102
<i>F</i> (2, 414) = 40.98, <i>p</i> < .001, η_p^2 = 0.17									
Negative Affect	2.89 (1.00)	2.81 (1.00)	−0.07, 0.23 <i>p</i> = .284	2.88 (0.98)	3.91 (0.91)	−1.17, −0.89 <i>p</i> < .001	4.06 (0.87)	4.01 (0.90)	−0.10, 0.20 <i>p</i> = .500
<i>F</i> (2, 414) = 75.86, <i>p</i> < .001, η_p^2 = 0.27									
Inclusion of Other in Self (IOS)	2.76 (1.68)	3.01 (1.84)	−0.48, −0.03 <i>p</i> = .026	2.99 (1.78)	1.88 (1.45)	0.89, 1.32 <i>p</i> < .001	1.74 (1.34)	1.75 (1.30)	−0.23, 0.21 <i>p</i> = .949
<i>F</i> (2, 414) = 42.48, <i>p</i> < .001, η_p^2 = 0.17									

Note: Member B leaves in the one-group member-leaves condition, while Member A stays.

negatively to Group Member B, who left, compared to Group Member A, who stayed. Specifically, compared to the group member who stayed, the group member who left caused increased social pain (*p* = .008, *d* = 0.12), greater feelings of ostracism (*p* < .001, *d* = 0.20), decreased need satisfaction (See Fig. 1, *p* < .001, *d* = 0.71), greater negative affect (*p* < .001, *d* = 1.09), and decreased closeness (*p* < .001, *d* = 0.68). When comparing between both group members who stayed, participants

reported greater closeness with Group Member B than Group Member A (*p* = .026, *d* = 0.14); however, that was the only significant difference (*ps* ≥ 0.198, *ds* ≤ 0.07). There were no significant differences when comparing between both group members who left (*ps* ≥ 0.100, *ds* ≤ 0.10).

6.3. Discussion

Results indicate a clear negative effect of being left entirely by one's group compared to a condition where no one leaves and compared to a condition where one group member stays. Moreover, even a single group member leaving had detectable negative effects on how participants felt towards member who left compared to the one who stayed. This result suggests a degree of specificity in participants' responses to some of their group leaving. That is, participants felt relationally devalued by the group member who left, but not the one who stayed. Thus, this individual relationship analysis captures partial ostracism as participants identified and responded to who included versus ostracized them.

As an initial investigation, Study 1 examined responses to leaving in the context of a relatively involved group interaction task. The questions were designed to elicit closeness, and the absence of the other interactants may have been felt especially strong given the (previously) close nature of the interpersonal-sharing interaction. Further, the nature of the interaction task may have caused difficulties as group members leaving kept the participant from completing the inherent goal of the task — learning more about the group members.

Therefore, we conducted Study 2 to determine if these negative effects of leaving would also be detectable in a task-oriented situation, versus a more social situation, in which team-members contribute to a goal, but do not necessarily share interpersonal details about themselves in the process. Additionally, in Study 2, participants can continue to perform the task regardless of others leaving or not.

7. Study 2 – Remote associates task

7.1. Method

7.1.1. Participants

We initially collected data from 353 U.S. MTurk workers who we paid \$2.00 USD to participate. Following our pre-registration criteria (<https://aspredicted.org/shj6-k64s.pdf>), we removed participants who self-reported being distracted ($n = 8$) self-reported being interrupted ($n = 6$), self-reported their data should not be used ($n = 4$), or participants

indicated they were suspicious about the group members ($n = 16$). Although not pre-registered, we removed participants who left their answers blank, therefore not completing the manipulation ($n = 7$). Lastly, we removed any participants who met multiple criteria ($n = 4$). The final sample consisted of 308 participants (64.0 % female; $M_{\text{age}} = 38.03$, $SD_{\text{age}} = 11.59$, $\text{Range}_{\text{age}} = 19\text{--}76$) who were primarily White (75.6 %), African American (12.7 %), or Asian (7.5 %). A power analysis showed this sample size is sufficient to provide 80 % power to detect an interaction of effect size approximately $\eta_p^2 = 0.03$, and a simple effect mean difference between Player A and Player B of approximately $d = 0.19$ (assuming a correlation of $r = 0.3$ between participants responses for the two players).

7.1.2. Procedure

We employed a similar approach as Study 1 but replaced the Relationship Closeness Induction Task with a word creativity game - the Remote Associates Task (RAT; Bowden & Jung-Beeman, 2003; Mednick, 1968). We told participants they would do the word creativity game with other participants online and then gave them the instructions. Specifically, we told participants that each word creativity trial includes a list of three words and their challenge was to generate the fourth word that links the three words together. To illustrate a trial, participants were given the words “spoon,” “cloth,” and “card,” which are linked by the solution word “table” (i.e., tablespoon, tablecloth, card table). We noted the solution word can come before or after each of the three given words. Participants were instructed they would have 15 s to do each word creativity trial (before the question auto advanced) and they should make guesses. As a last step to introduce the game, participants did a practice problem.

Participants then began the group part of the word creativity task. Participants provided a non-identifying screen name and were then instructed to mentally visualize the group members during the word creativity game in order to know the group members better. We used similar instructions as Cyberball (Williams et al., 2000) and asked participants to mentally visualize the entire experience including what sort of people the group members are, where they are playing, and to create a complete mental picture if they were playing the game in real life. As in

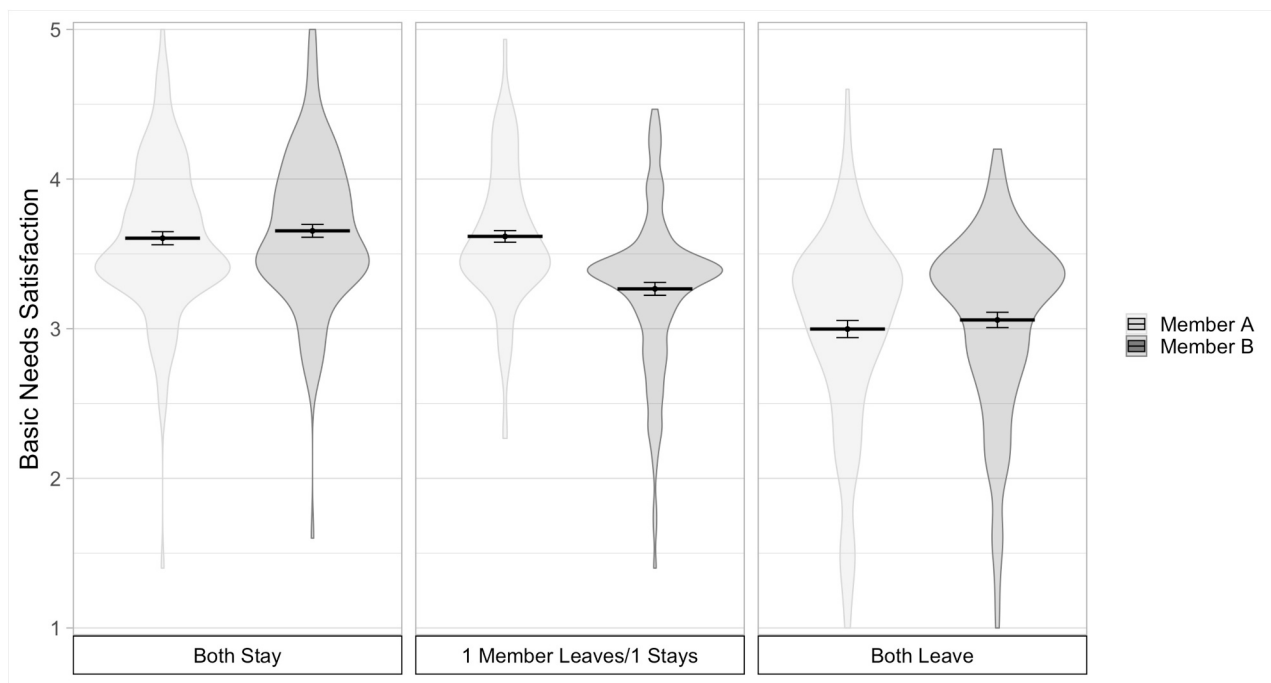


Fig. 1. Average basic needs satisfaction by condition in relation to Group Member A and Group Member B in Study 1.

Note. Total $N = 417$. Error bars represent ± 1 standard error of the mean. Group Member B was the one who left in the one-group member-leaves condition.

Table 3

Study 2 (RAT) Means, Standard Deviations, and 95 % Confidence Intervals for Manipulation Checks and Overall Responses.

Variable	Means and Standard Deviations			95 % Confidence Intervals and <i>p</i> -values		
	Both Group Members Stay (<i>n</i> = 100)	One Group Member Leaves (<i>n</i> = 100)	Both Group Members Leave (<i>n</i> = 108)	Both Group Members Stay vs. One Group Member Leaves	Both Group Members Stay vs. Both Group Members Leave	One Group Member Leaves vs. Both Group Members Leave
Manipulation Checks	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)			
Number of group members at beginning $F(2, 305) = 0.05, p = .954, \eta_p^2 < 0.01$	2.06 (0.40) ^a	2.06 (0.31) ^a	2.07 (0.43) ^a	−0.13, 0.13 $p = 1.000$	−0.14, 0.11 $p = .962$	−0.14, 0.11 $p = .962$
How many group members were still part of the group at the end $F(2, 305) = 483.21, p < .001, \eta_p^2 = 0.76$	2.09 (0.38) ^a	1.09 (0.32) ^b	0.18 (0.58) ^c	0.88, 1.12 $p < .001$	1.76, 2.07 $p < .001$	0.76, 1.07 $p < .001$
How many people were at the end of the game $F(2, 305) = 400.07, p < .001, \eta_p^2 = 0.72$	2.10 (0.39) ^a	1.18 (0.46) ^b	0.20 (0.58) ^c	0.78, 1.06 $p < .001$	1.74, 2.06 $p < .001$	0.81, 1.15 $p < .001$
How many group members finished the game $F(2, 305) = 399.54, p < .001, \eta_p^2 = 0.72$	2.07 (0.46) ^a	1.10 (0.33) ^b	0.20 (0.59) ^c	0.84, 1.10 $p < .001$	1.69, 2.04 $p < .001$	0.74, 1.05 $p < .001$
Social Pain $F(2, 305) = 9.04, p < .001, \eta_p^2 = 0.06$	0.44 (1.50) ^a	0.73 (1.59) ^a	1.60 (2.77) ^b	−0.81, 0.23 $p = .382$	−1.89, −0.44 $p < .001$	−1.61, −0.14 $p = .015$
Feeling Ostracized $F(2, 305) = 33.07, p < .001, \eta_p^2 = 0.18$	1.23 (0.63) ^a	1.37 (0.75) ^a	2.20 (1.27) ^b	−0.37, 0.10 $p = .353$	−1.29, −0.64 $p < .001$	−1.17, −0.50 $p < .001$
Basic Need Satisfaction $F(2, 305) = 16.86, p < .001, \eta_p^2 = 0.10$	3.85 (0.48) ^a	3.75 (0.44) ^a	3.41 (0.75) ^b	−0.05, 0.26 $p = .243$	0.24, 0.65 $p < .001$	0.14, 0.54 $p < .001$
Negative Affect $F(2, 305) = 20.24, p < .001, \eta_p^2 = 0.12$	2.29 (0.90) ^a	2.52 (0.82) ^a	3.17 (1.30) ^b	−0.51, 0.06 $p = .162$	−1.24, −0.51 $p < .001$	−1.01, −0.30 $p < .001$
Inclusion of Other in Self (IOS) $F(2, 305) = 16.50, p < .001, \eta_p^2 = 0.10$	3.17 (2.05) ^a	2.81 (1.60) ^a	1.88 (1.33) ^b	−0.25, 0.97 $p = .351$	0.72, 1.86 $p < .001$	0.45, 1.41 $p < .001$

Note. Different superscripts denote significant differences between conditions, $p < .05$. Confidence intervals are calculated based on the mean differences. Degrees of freedom may vary due to participants being able to skip questions.

Table 4

Study 2 (RAT) Means, Standard Deviations, and 95 % Confidence Intervals for Individual Relationship Responses.

Variable	Both Group Members Stay			One Group Member Leaves			Both Group Members Leave		
	Member A	Member B	95 % Confidence Interval and <i>p</i> -values	Member A	Member B	95 % Confidence Interval and <i>p</i> -values	Member A	Member B	95 % Confidence Interval and <i>p</i> -values
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)		<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)		<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	
Social Pain $F(2, 305) = 5.57, p = .004, \eta_p^2 = 0.04$	0.37 (1.38)	0.43 (1.34)	−0.30, 0.18 $p = .628$	0.69 (1.97)	0.98 (1.95)	−0.53, −0.05 $p = .020$	1.69 (2.68)	1.42 (2.40)	0.04, 0.51 $p = .020$
Feeling Ostracized $F(2, 305) = 3.25, p = .040, \eta_p^2 = 0.02$	1.20 (0.56)	1.19 (0.55)	−0.08, 0.09 $p = .902$	1.28 (0.74)	1.42 (0.79)	−0.22, −0.06 $p < .001$	2.20 (1.24)	2.25 (1.29)	−0.13, 0.03 $p = .193$
Basic Need Satisfaction $F(2, 305) = 11.85, p < .001, \eta_p^2 = 0.07$	3.71 (0.41)	3.67 (0.42)	−0.05, 0.12 $p = .417$	3.61 (0.38)	3.30 (0.48)	0.23, 0.40 $p < .001$	3.15 (0.63)	2.90 (0.60)	0.18, 0.34 $p < .001$
Negative Affect $F(2, 305) = 52.66, p < .001, \eta_p^2 = 0.26$	3.05 (0.97)	2.99 (1.00)	−0.09, 0.20 $p = .441$	3.12 (0.80)	4.00 (0.69)	−1.02, −0.73 $p < .001$	3.97 (0.95)	3.96 (0.99)	−0.13, 0.15 $p = .869$
Inclusion of Other in Self (IOS) $F(2, 305) = 63.21, p < .001, \eta_p^2 = 0.29$	2.71 (1.87)	2.74 (1.88)	−0.25, 0.19 $p = .789$	3.12 (1.81)	1.62 (1.29)	1.28, 1.72 $p < .001$	1.73 (1.24)	1.76 (1.32)	−0.24, 0.18 $p = .796$

Note: Member B leaves in the one-group member-leaves condition, while Member A stays.

Study 1, participants were then assigned to be a member of the Viking Turtles. We told participants that after each word creativity trial, participants would see the responses of their group members, bearry and verdant.

Over the course of the 12 word creativity problems, we manipulated the leaving behavior of the group members (using random assignment and counterbalancing). In detail, either 1) both group members stayed throughout all the word problems (i.e., provided responses), 2) one group member left prior to the result for Trial 7, or 3) both group

members left — one group member left prior to results for Trial 6 and the other left before the results for Trial 8. Similar to Study 1, when a group member left, participants were notified the group member chose to leave and instead of a group member's answer, the response said, “bearry/verdant left the group.” As in Study 1, this condition was counter-balanced such that for half the participants bearry left first, and for half verdant left first. Upon completion of the word creativity task, participants answered several questions based on the group task.

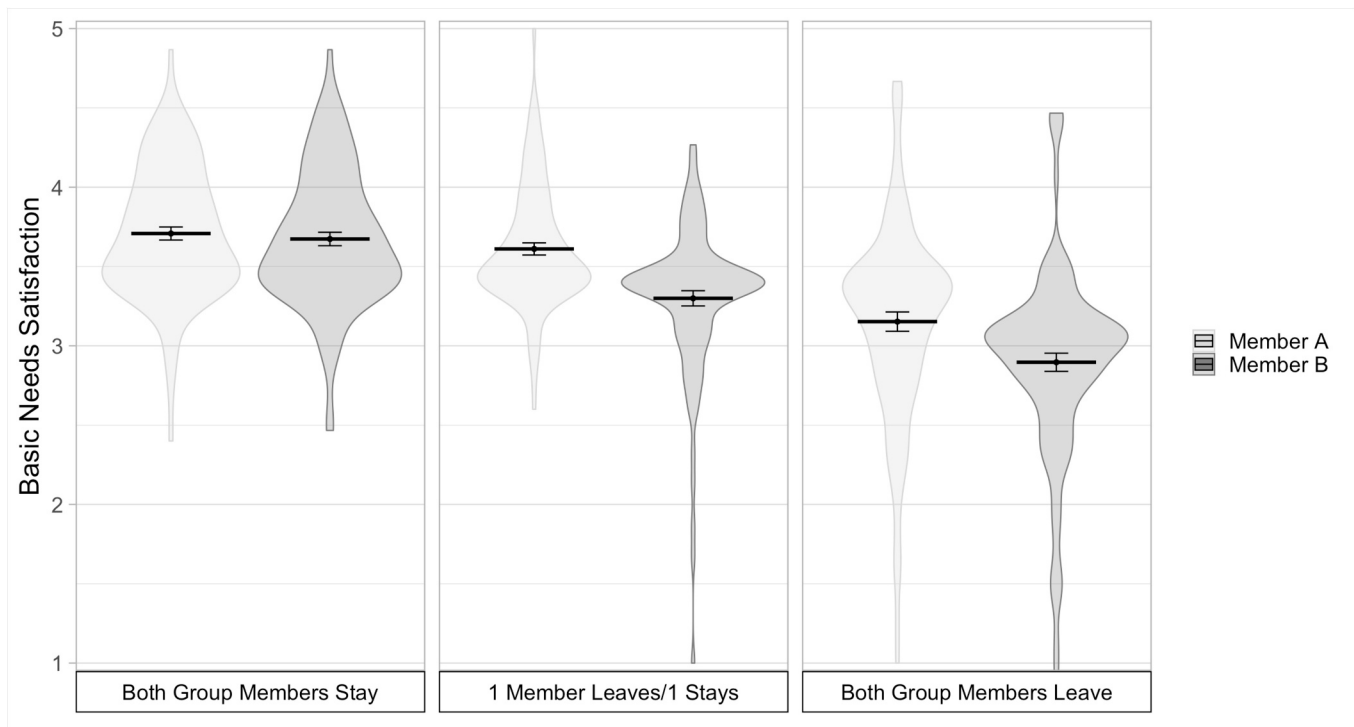


Fig. 2. Average basic needs satisfaction by condition in relation to Group Member A and Group Member B in Study 2.

Note. Total $N = 308$. Error bars represent ± 1 standard error of the mean. Group Member B was the one who left in the one-group member-leaves condition.

7.1.3. Measures

Participants completed the same measures used in Study 1 which focused on the participant's experience at the end of the word creativity game. Participants completed the four manipulation check questions assessing participants' recall of who stayed or left during the word creativity game. Following the manipulation checks and applying the same approach as Study 1, participants responded to the measures by evaluating their feelings overall and based on the interaction with each group member. Applying these two levels of analysis, participants reported their social pain, feelings of ostracism (overall $r_{\text{spearman-brown}} = 0.89$; group member $r_{\text{spearman-brown}} \geq 0.87$), basic need satisfaction (overall $\alpha = 0.83$; group member $\alpha \geq 0.76$), negative affect (overall $\alpha = 0.85$; group member $\alpha \geq 0.74$), and the participant's connection to the group overall and each individual group member.

7.2. Results

7.2.1. Manipulation checks

Our manipulation of group members leaving worked as we designed — see Table 3 for specific ANOVA results, 95 % CIs, and Means and Standard Deviations. Participants accurately reported starting with two group members in each condition ($F(2, 305) = 0.05, p = .954, \eta_p^2 < 0.01$; $ps \geq 0.962, ds \leq 0.03$). Based on the three manipulation check questions, participants indicated correctly how many group members left in each condition ($Fs \geq 399.54, ps < 0.001, \eta_p^2 \geq 0.72, ds \geq 1.87$).

7.2.2. Overall response

As in Study 1, the leaving manipulation had a significant effect on the overall outcome variables, *weakest* ANOVA, $F(2, 305) = 9.04, p < .001, \eta_p^2 = 0.06$. When both group members left the participant's group, participants felt worse compared to the both-group members-stay condition, and also compared with the one-group member-leaves condition. In detail, participants indicated more social pain ($ps \leq 0.015, ds \geq 0.39$), greater feelings of ostracism ($ps < 0.001, ds \geq 0.80$), worsened basic need satisfaction ($ps < 0.001, ds \geq 0.55$), more negative affect ($ps <$

$0.001, ds \geq 0.60$), and decreased closeness with the group ($ps \leq 0.001, ds \geq 0.63$). There were no significant differences when comparing the both-group members-stay versus the one-group member-leaves conditions ($ps \geq 0.162, ds \leq 0.026$).

7.2.3. Individual relationship response

We found a significant Leaving Condition by Group Member interaction for all outcomes, *weakest* ANOVA, $F(2, 305) = 3.25, p = .040, \eta_p^2 = 0.02$. See Table 4 for each interaction ANOVA results, 95 % CIs, and Means and Standard Deviations. Supporting our hypotheses, when participants were in the one-group member-leaves condition, participants indicated a more negative response to Group Member B, who left, compared to Group Member A, who stayed. Participants reported more social pain ($p = .020, d = 0.15$), increased feelings of ostracism ($p < .001, d = 0.18$), reduced basic need satisfaction (See Fig. 2, $p < .001, d = 0.72$), increased negative affect ($p < .001, d = 1.18$), and less closeness ($p < .001, d = 0.96$). When participants were in a group where both group members left, participants experienced more social pain when reporting about Group Member A compared to Group Member B ($p = .020, d = 0.11$). For basic need satisfaction, participants felt less need satisfaction when responding to Group Member B versus Group Member A ($p < .001, d = 0.42$). Otherwise, there were no other significant differences between group members when both group members stayed or left ($ps \geq 0.193, ds \leq 0.04$).

7.3. Discussion

The results of Study 2 conceptually replicated the findings from Study 1. Even in a task-oriented context, being left by both group members induced feelings of social pain, ostracism, basic need threat, negative affect, and feeling separated from the group. And, when a single group member left, while still being included by another, participants felt worse in response to the person who left. This outcome suggests a targeted sense of relational devaluation specifically from the leaver.

Table 5

Study 3 (Cyberball) Means, Standard Deviations, and 95 % Confidence Intervals for Manipulation Checks and Overall Responses.

Variable	Means and Standard Deviations			95 % Confidence Intervals and <i>p</i> -values		
	Both Group Members Stay (<i>n</i> = 151)	One Group Member Leaves (<i>n</i> = 144)	Both Group Members Leave (<i>n</i> = 148)	Both Group Members Stay vs. One Group Member Leaves	Both Group Members Stay vs. Both Group Members Leave	One Group Member Leaves vs. Both Group Members Leave
Variable	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)			
Manipulation Checks	2.01 (0.26) ^a	2.04 (0.26) ^a	2.03 (0.26) ^a	−0.10, 0.04 <i>p</i> = .615	−0.08, 0.06 <i>p</i> = .890	−0.06, 0.09 <i>p</i> = .880
Number of group members started Cyberball $F(2, 440) = 0.44, p = .643, \eta_p^2 < 0.01$						
How many group members were still part of the group at the end $F(2, 440) = 1544.29, p < .001, \eta_p^2 = 0.88$	2.03 (0.27) ^a	1.07 (0.33) ^b	0.05 (0.33) ^c	0.88, 1.05 <i>p</i> < .001	1.90, 2.06 <i>p</i> < .001	0.93, 1.10 <i>p</i> < .001
How many people were at the end of Cyberball $F(2, 439) = 719.31, p < .001, \eta_p^2 = 0.77$	2.07 (0.28) ^a	1.16 (0.45) ^b	0.18 (0.52) ^c	0.79, 1.02 <i>p</i> < .001	1.77, 2.00 <i>p</i> < .001	0.86, 1.10 <i>p</i> < .001
How many group members finished Cyberball $F(2, 440) = 872.79, p < .001, \eta_p^2 = 0.80$	2.03 (0.20) ^a	1.10 (0.38) ^b	0.16 (0.52) ^c	0.82, 1.04 <i>p</i> < .001	1.77, 1.98 <i>p</i> < .001	0.84, 1.05 <i>p</i> < .001
Social Pain $F(2, 440) = 9.46, p < .001, \eta_p^2 = 0.04$	0.96 (2.12) ^a	0.56 (1.45) ^a	1.57 (2.35) ^b	−0.09, 0.90 <i>p</i> = .135	−1.22, 0.00 <i>p</i> = .049	−1.56, −0.48 <i>p</i> < .001
Feeling Ostracized $F(2, 439) = 47.15, p < .001, \eta_p^2 = 0.18$	1.73 (1.18) ^a	1.48 (0.87) ^a	2.77 (1.51) ^b	−0.04, 0.53 <i>p</i> = .100	−1.42, −0.68 <i>p</i> < .001	−1.63, −0.96 <i>p</i> < .001
Basic Need Satisfaction $F(2, 439) = 78.92, p < .001, \eta_p^2 = 0.26$	3.78 (0.70) ^a	3.82 (0.61) ^a	2.89 (0.83) ^b	−0.22, 0.14 <i>p</i> = .852	0.68, 1.10 <i>p</i> < .001	0.73, 1.13 <i>p</i> < .001
Negative Affect $F(2, 440) = 45.76, p < .001, \eta_p^2 = 0.17$	2.65 (1.12) ^a	2.74 (0.98) ^a	3.79 (1.30) ^b	−0.38, 0.20 <i>p</i> = .733	−1.47, −0.81 <i>p</i> < .001	−1.36, −0.73 <i>p</i> < .001
Inclusion of Other in Self (IOS) $F(2, 440) = 49.97, p < .001, \eta_p^2 = 0.19$	4.04 (1.99) ^a	3.14 (1.62) ^b	2.03 (1.56) ^c	0.40, 1.40 <i>p</i> < .001	1.52, 2.49 <i>p</i> < .001	0.67, 1.54 <i>p</i> < .001

Note. Different superscripts denote significant differences between conditions, $p < .05$. Confidence intervals are calculated based on the mean differences. Degrees of freedom may vary due to participants being able to skip questions.

Table 6

Study 3 (Cyberball) Means, Standard Deviations, and 95 % Confidence Intervals for Individual Relationship Responses.

Variable	Both Group Members Stay			One Group Member Leaves			Both Group Members Leave		
	Member A	Member B		Member A	Member B		Member A	Member B	
Variable	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	95 % Confidence Interval and <i>p</i> -values	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	95 % Confidence Interval and <i>p</i> -values	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	95 % Confidence Interval and <i>p</i> -values
Social Pain $F(2, 440) = 9.35, p < .001, \eta_p^2 = 0.04$	0.89 (1.89)	1.03 (2.22)	−0.33, 0.04 <i>p</i> = .118	0.42 (1.35)	0.85 (1.66)	−0.63, −0.25 <i>p</i> < .001	1.53 (2.33)	1.39 (2.30)	−0.04, 0.33 <i>p</i> = .132
Feeling Ostracized $F(2, 440) = 15.11, p < .001, \eta_p^2 = 0.06$	1.66 (1.08)	1.72 (1.09)	−0.15, 0.03 <i>p</i> = .218	1.27 (0.71)	1.59 (0.86)	−0.42, −0.23 <i>p</i> < .001	2.53 (1.44)	2.51 (1.39)	−0.07, 0.11 <i>p</i> = .714
Basic Need Satisfaction $F(2, 440) = 42.49, p < .001, \eta_p^2 = 0.06$	3.72 (0.72)	3.66 (0.75)	−0.03, 0.16 <i>p</i> = .198	3.89 (0.55)	3.30 (0.65)	0.49, 0.69 <i>p</i> < .001	2.97 (0.82)	2.98 (0.79)	−0.11, 0.09 <i>p</i> = .794
Negative Affect $F(2, 440) = 71.21, p < .001, \eta_p^2 = 0.25$	2.96 (1.18)	3.01 (1.15)	−0.19, 0.10 <i>p</i> = .562	2.67 (1.01)	3.80 (1.01)	−1.28, −0.98 <i>p</i> < .001	4.10 (1.10)	4.11 (1.13)	−0.16, 0.14 <i>p</i> = .910
Inclusion of Other in Self (IOS) $F(2, 440) = 106.90, p < .001, \eta_p^2 = 0.33$	3.69 (2.00)	3.59 (1.99)	−0.14, 0.34 <i>p</i> = .407	3.97 (1.93)	1.75 (1.31)	1.97, 2.46 <i>p</i> < .001	1.94 (1.47)	1.97 (1.54)	−0.27, 0.21 <i>p</i> = .823

Note: Member B leaves in the one-group member-leaves condition, while Member A stays.



Fig. 3. Average basic needs satisfaction by condition in relation to Group Member A and Group Member B in Study 3.

Note. Total $N = 443$. Error bars represent ± 1 standard error of the mean. Group Member B was the one who left in the one-group member-leaves condition.

We conducted Study 3 to further test the robustness of this effect by examining the impact of a group member leaving in the middle of a group activity: a ball-throwing game called Cyberball. We took a similar approach as previous research which manipulated the number of players who ostracized the participant (Sandstrom et al., 2017; Study 2).

8. Study 3 - Cyberball

8.1. Method

8.1.1. Participants

Our preliminary sample consisted of 491 U.S. MTurk workers paid \$2.00 USD for participating. Based on pre-registered criteria (https://aspredicted.org/gsync-x733.pdfAssign_Folder), we removed participants who self-reported being distracted ($n = 9$), self-reported being interrupted ($n = 3$), self-reported their data should not be used ($n = 3$), took more than 3 SDs to complete the study ($n = 5$), or if participants were suspicious about the group members ($n = 9$). Unfortunately, the condition participants were assigned failed to record in 9 cases, causing us to also have to remove these participants. We also removed participants if they met two or more of the criteria ($n = 10$). This resulted in a final sample of 443 participants (59.6 % female; $M_{\text{age}} = 37.91$, $SD_{\text{age}} = 11.92$, $\text{Range}_{\text{age}} = 19\text{--}76$) who were predominantly White (67.2 %) or African American (13.5 %). A power analysis showed this sample size is sufficient to provide 80 % power to detect an interaction of effect size approximately $\eta_p^2 = 0.02$, and a simple effect mean difference between Player A and Player B of approximately $d = 0.16$ (assuming a correlation of $r = 0.3$ between participants responses for the two players).

8.1.2. Procedure

To manipulate group members leaving, we employed an updated

version of Cyberball capable of running in Qualtrics (Williams et al., 2000; go to cyberball.osu.edu). Consistent with previous Cyberball studies (e.g., Wirth, 2016), participants were tasked with mentally visualizing a ball-tossing experience supposedly with other players online — instead, the players were computer-controlled avatars. Cyberball began with two players, named *bearry* and *verdant*, who included the participant throughout the game. We manipulated the situation such that either 1) both players stayed throughout a 150 s (2.5 min) game, 2) one player left and one player stayed, or 3) both players left. When a single player left (counter-balancing which player), they left mid-game, after 75 s. When both players left, one left after 60 s and the other after 90 s (as in earlier studies, counter-balancing which player left first). When a player left, their avatar was replaced with a notification saying “bearry/verdant has left the game.” After both players left, the participant held the ball and continued mentally visualizing until the Cyberball game was over.

8.1.3. Measures

Participants completed the same measures as the two previous studies; in this case, applied to the end of the Cyberball game. Participants completed the same four manipulation check questions. Likewise, as assessed previously, participants again reported based on their feelings overall and based on their interaction with each group member. Participants reported their social pain, feelings of ostracism (overall $r_{\text{spearman-brown}} = 0.93$; group member $r_{\text{spearman-brown}} \geq 0.91$), basic need satisfaction (overall $\alpha = 0.91$; group member $\alpha \geq 0.89$), negative affect (overall $\alpha = 0.89$; group member $\alpha \geq 0.85$), and a participant’s connection to the group overall and each individual group member.

8.2. Results

8.2.1. Manipulation checks

The manipulation of group members leaving worked as anticipated. See Table 5 for specific ANOVA results, 95 % CIs, and Means and Standard Deviations. Similar to the previous manipulations, participants in all conditions reported starting with two group members ($F(2, 440) = 0.44$,

⁴ One participant put in an incorrect value and was not included in the age analysis but was included in the remaining analyses.

$p = .643$, $\eta_p^2 < 0.01$; $ps \geq 0.615$, $ds \leq 0.12$) and correctly recognized how many group members left during Cyberball based on the three manipulation check questions ($Fs \geq 719.31$, $ps < 0.001$, $\eta_p^2s \geq 0.77$; all $ps < 0.001$, $ds \geq 2.01$).

8.2.2. Overall response

The leaving manipulation had significant effects on all overall outcomes as participants reported worse outcomes when both group members left compared to the both-group members-stay or the one-group member-leaves conditions, *weakest* ANOVA, $F(2, 440) = 9.46$, $p < .001$, $\eta_p^2 = 0.04$. That is, participants reported more social pain ($ps \leq 0.049$, $ds \geq 0.27$), increased feelings of ostracism ($ps < 0.001$, $ds \geq 0.78$), less basic need satisfaction ($ps < 0.001$, $ds \geq 1.16$), more negative affect ($ps < 0.001$, $ds \geq 0.91$), and less closeness with the group ($ps < 0.001$, $ds \geq 0.70$). Only for the IOS measure of closeness was there a significant difference between the both-group members-stay versus the one-group member-leaves conditions ($p < .001$, $d = 0.50$). Participants felt closer when one group member stayed versus both group members left. There were no remaining significant differences between these conditions ($ps \geq 0.135$, $ds \leq 0.022$).

8.2.3. Individual relationship response

For all measures, we found significant Leaving Condition by Group Member interactions, *weakest* ANOVA, $F(2, 440) = 9.35$, $p < .001$, $\eta_p^2 = 0.04$. See Table 6 for interaction ANOVA results, 95 % CIs, and Means and Standard Deviations. Key to supporting our hypotheses, in the one-group member-leaves condition, participants responded more negatively to Group Member B (who left) compared to Group Member A (who stayed). Group Member B caused more social pain ($p < .001$, $d = 0.29$), increased feelings of ostracism ($p < .001$, $d = 0.41$), less basic need satisfaction (See Fig. 3, $p < .001$, $d = 0.98$), greater negative affect ($p < .001$, $d = 1.12$), and less closeness ($p < .001$, $d = 1.34$). In contrast, when comparing Group Member A to Group Member B in the conditions where both stayed or both left, there were no significant differences between group members ($ps \geq 0.118$, $ds \leq 0.07$).

8.3. Discussion

Study 3 replicated the previous two studies by indicating being left by both group members produced the most aversive consequences compared to both group members staying or only having one group member remain. We again detected differences at the level of individual relationships. Participants reported partial ostracism by responding negatively — indicating feeling relationally devalued — to the group member who left versus the group member who stayed in the one-group member-leaves condition. These effects occurred despite the minimalistic nature of the group interaction (i.e., tossing a ball virtually).

9. General discussion

A group's composition is not static as the eventual departures of some (or all) group members is inevitable. When this happens, it appears the group members left behind are harmed. Across three studies, we found both the full effects of ostracism when examining outcomes overall and partial ostracism when examining individual relationships between the participant and each group member. On overall outcomes, we found when two group members left, compared to both group members staying or one group member leaving (and one staying), participants felt ostracized: increased social pain, more feelings of ostracism, less basic need satisfaction, more negative affect, and less closeness with the group. But when just one group member leaves, based on the overall outcomes (typical of ostracism research; see Williams, 2009), it appears a group member leaving was not bothersome as this situation was not significantly worse than being included. This may be due to not having the majority of the group leaving which would demonstrate a consensus (e.g., Sandstrom et al., 2017) indicating the

group members coordinated to leave the participant.

However, when evaluating participants' relationships with individual group members, results indicated participants *did feel* the same effects that are triggered by ostracism even though they were also not being ostracized completely. This form of partial ostracism occurred because participants felt more ostracized, increased social pain, less basic need satisfaction, more negative affect, and less closeness with the group member who left compared to the group member who stayed. This pattern of results suggests a targeted reaction in which participants feel relationally devalued specifically by the person who left, but not by the one who stayed. In order to detect these more subtle effects of partial ostracism, the level of analysis — overall versus the individual relationships with each group member — mattered. In addition to showing that leaving can be sufficient to trigger ostracism-related responses, these findings also help expand partial ostracism research by introducing a new form of partial ostracism. We also introduced a multi-level of analysis approach which may enhance detecting other instances of partial ostracism.

9.1. Implications and future directions

These findings document that, at least under some conditions, departures from a group can cause the remaining members to feel ostracized and hurt. Because group members leaving is a ubiquitous event in organizations (e.g., Hausknecht & Trevor, 2011; Mathieu et al., 2014; Mortensen & Haas, 2018), social groups, therapy groups, and families, this implies that a frequent source of threat to one's basic psychological needs is people choosing to leave the groups one belongs to. Given this reality, organizations and leaders may wish to 1) consider this as an additional cost of having high turnover rates (O'Connell & Kung, 2007), and 2) mindfully anticipate these departures and consider ways to minimize psychological impact on the remaining members (e.g., holding going away celebrations). To palliate a group member leaving, leaders could remind remaining members of their social bonds, enhance connections to social surrogates (e.g., television characters, comfort food, nature connectedness), or encourage religious connections; all suggested buffers against ostracism (Eck et al., 2016). Future research can explore if these potential buffers do indeed protect individuals from the loss of a group member.

These results raise an additional concerning possibility: the negative effects of one group member leaving may increase the desire for other group members to follow suit and leave as well — what is known as an *exit chain* (Sgourev, 2011) or *turnover contagion* (Felps et al., 2009). This possibility follows a similar logic as the so-called “bad apple effect,” where one group member's norm violating behavior may inspire other group members to similarly violate group norms (e.g., Kerr et al., 2009). One “bad apple” leaving may spoil the barrel by prompting other group members to also leave. This may be due to group members departing, at least under some conditions, having an accelerating effect. Others may leave the group because a group member leaving both normalizes the process of leaving (in fact, potentially introducing the idea in the first place) and encourages group members to leave because benefits of remaining in the group are decreasing. Accordingly, a key direction for future research is to understand the conditions under which individual group departures produce not only negative feelings in the remaining members, but also a desire to leave themselves. We found without an explicit means of leaving (there was no leave-button), there were no differences in rates of attrition between conditions (closest to significant, $\chi^2(2, N = 417) = 0.45$, $p = .800$). However, if we provided participants with an explicit button or option enabling them to leave mid-activity — we may have observed evidence of a leaving cascade.

In all three studies, we see individuals are able to differentiate their responses to sources of inclusion and ostracism within a group interaction, which suggests the social monitoring system is more sophisticated than was illustrated previously when looking only at group level effects. Our results indicate the social monitoring system (Kerr & Levine, 2008;

Leary, 1999) is set at the individual relationship level. This makes sense considering within a group, to keep the resources the group provides, it would be better to interact with the source(s) of inclusion versus the source(s) of ostracism. This appears to be the case given ostracized, versus included individuals are more likely to look at a source of possible inclusion (Böckler et al., 2014). Further, individuals are particularly attentive to individuating information following exclusion (e.g., Claypool & Bernstein, 2014), suggesting that an ostracized individual would be attentive to a source of inclusion. If individuals would feel the effects of ostracism overall due to only one group member leaving, they would miss out on potentially being able to stay in the group by focusing on the relationship with an inclusive group member.⁵ In essence, by detecting the degree of connection at the individual group member level (i.e., relational evaluation; Leary, 2001), an individual can focus on the inclusive group member (or members), thus keeping a connection to the group, rather than leaving the group simply because one group member is not being inclusive.

By using a version of the Inclusion of Other Scale (Aron et al., 1992) we got a glimpse into the changing dynamics caused by group members disrupting the group by leaving. The forces of group members leaving not only affect the individual directly (e.g., causing social pain), but these forces also affect the interpersonal dynamics of the group by causing relationships to change. Ostracized participants indicated they were cast away (decreased closeness) when both group member left, suggesting it could be difficult to repair a group after this occurs. It may even be difficult to mend the relationship with one source of ostracism, potentially due to focusing on maintaining a greater closeness with the remaining source of inclusion. Alternatively, a disjointed group may signal a need to find a new group. The modified IOS measure provided a behind the scenes look at dynamic shifts in groups and could be a beneficial tool for examining how changes in group membership can have a ripple effect.

9.2. Limitations and future directions

The current research establishes a beginning point for understanding the response to a group member leaving, which means there remains important factors which were not addressed. Future research can investigate when a group member leaving produces partial ostracism effects on overall measures (i.e., feeling worse than both group members staying, but better than both group members leaving), which we did not find. One possibility for examining this experimentally, based on the consensual model (Sandstrom et al., 2017), could be having two group members leave, but at least one group member stays. Two group members leaving shows coordination to ostracize, which Sandstrom et al. argue is needed to induce ostracism, but one group member remaining still provides a social connection. There may also be individual differences associated with sensitivity to exclusion which could moderate overall ostracism feelings in the one group member leaves condition, such as a fear of social pain (Riva et al., 2014), rejection sensitivity (Downey & Feldman, 1996), or agreeableness (Graziano & Eisenberg, 1997). Future research explicitly examining having two group members leave and one stay would tease apart if the outcomes of both group members leaving are due to coordination of the group members ostracizing the participant or because of the experience of being left alone. Similarly, future research could also address the possibility that group composition changes other than a group member leaving (e.g., when new members join, or are replaced) have effects on individual's affect and needs satisfaction within the group.

Of central importance is the question of what attributions individuals made for the group member leaving — possible internal versus external

explanations (e.g., Yaakobi, 2022). In the present research, this was not systematically manipulated or held constant. In Study 1, participants could have internally attributed the group member's departure — construing it as the leaver's negative reaction to the participant's response to get-to-know-you questions. Although, in Studies 2 and 3, such internal attributions seem less plausible. Presumably participants inferred the leaver, who was completing the study remotely online, had competing urgent demands for their attention, or simply got bored and lost interest in the task. Participants could have responded differently to internal attributions in Study 1 compared to possible external attributions in Studies 2 and 3 (Heider, 1958; Kelley & Michela, 1980). It is entirely likely, that these effects will be even stronger in situations where it is clear that the leaver is choosing to leave agentically versus compelled to do so situationally, and more so yet if the participant themselves appears to be the reason the group member wants to leave (e.g., Nezlek et al., 1997). Likewise, an unexpected departure may be more painful than an anticipated departure resulting from the natural evolution of a group (e.g., graduation; Wirth et al., 2017). We can also compare attributions for when one versus both group members leave. When one group member leaves, participants could make an external attribution (the player was bored), but if both group members leave, the participant could make an internal attribution (I am boring). Thus, an important direction for future research is to systematically investigate how attributions and norms affect responses to group members leaving (e.g., we do not assume, for example, the passengers on a trolley routinely feel ostracized when their fellow travelers get off at a stop).

The current research sets up the possibility of showing where moderation of an ostracism experience can occur. Previous ostracism research finds the strong effect of ostracism is robust to moderation by factors which typically affect the strength of an outcome (e.g., gender; Williams, 2009). Researchers (Chen & Williams, 2007) contend partial ostracism may be easier to moderate than full ostracism. For instance, in out of the loop research (a form of partial ostracism), when participants knew they were missing information due to unintentional or unpreventable circumstances, the aversive impact of missing information was buffered (Jones et al., 2009; Jones & Kelly, 2010). Likewise buffering occurred if the missing information was positive compared to negative (McCarty et al., 2022). Therefore, using a multi-level approach (a sensitive assessment), future research is ripe for examining moderating factors which could influence the participant's response to the departing group member, such as if the group member leaving is burdensome.

10. Conclusion

It is a painful experience to be left behind when a group member leaves. The individual left behind experiences ostracism and its sequelae, whereas if there is one group member remaining when the other leaves, individuals did not feel ostracized overall. However, measures of individual relationships with each group member indicate participants feel ostracized by the group member who leaves compared to the group member who stays. Collectively, these studies indicate group departures are not just inconvenient, they can hurt the people who are left behind.

Open practices

Our databases and materials are open access: <https://osf.io/ptuq9/>
Preregistrations of the studies:

Study 1: <https://aspredicted.org/h38v-whyn.pdf>

Study 2: <https://aspredicted.org/shj6-k64s.pdf>

Study 3: <https://aspredicted.org/gsync-x733.pdf>

CRedit authorship contribution statement

James H. Wirth: Writing – review & editing, Writing – original draft, Resources, Methodology, Investigation, Formal analysis,

⁵ We did not find consistent evidence of an enhanced relationship with Group Member A who stayed in the one-group member-leaves condition compared to the both-group members-leave condition. See Supplemental Table 1.

Conceptualization. **Andrew H. Hales:** Writing – review & editing, Methodology, Investigation, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare no conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jesp.2024.104708>.

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