Stuck in a moment and you cannot get out of it: The lingering effects of ostracism on cognition and satisfaction of basic needs

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A B S T R A C T

Ostracism negatively affects fundamental needs and may impair some cognitive functions. The present study examined: (1) the duration of ostracism’s negative effects on fundamental needs, and (2) its associated effects on higher-order cognitive abilities. Participants were randomly assigned to be included or ostracized on Cyberball, and completed three assessments of fundamental needs over the course of 45–55 min, as well as measures of working memory, decision making, and task persistence. Results indicated significant decreases in fundamental needs immediately following ostracism and the persistence of these effects past the reflexive stage. Additionally, ostracism impaired working memory, decision making, and task persistence (but not basic attention). These results suggest that the negative effects of ostracism can last longer than a few minutes and affect executive functions, suggesting the need to examine downstream consequences of ostracism.

1. Introduction

Humans are social beings and have a fundamental need to belong (Baumeister & Leary, 1995). The negative effects of being ostracized are pervasive, indicating social inclusion is necessary for healthy psychological functioning (Williams, 2007). Much research has investigated how the experience of being ignored and excluded (i.e., ostracism; Williams, Cheung, & Choi, 2000; Williams & Nida, 2011) negatively affects emotional and mental health. However, few have assessed the temporal stability of these effects on basic needs and executive functions, which are the higher-order cognitive abilities associated with frontal lobe functioning (Lezak, Howieson, & Loring, 2004). The present study sought to examine the duration of the effects of a single ostracism event on these factors.

1.1. Temporal effects of ostracism

Previous research suggests that individuals respond to ostracizing events in three stages (Williams, 2009). The Reflexive stage includes immediate reactions to ostracism, during which pain is experienced and the ostracism experience is thought to threaten four fundamental psychological needs: belonging (forming lasting social relationships), self-esteem, control (belief in your ability to change your situation), and meaningful existence (belief your life has meaning). Individuals report decreases in these fundamental needs even after brief experiences of ostracism (Jamieson, Harkins, & Williams, 2010; Lau, Moulds, & Richardson, 2009; van Beest & Williams, 2006). Negative emotions are also experienced (Chow, Tiedens, & Govan, 2008; Legate, DeHaan, Weinstein, & Ryan, 2013). Thus, it is clear that there is an immediate pervasive negative reaction to ostracism.

The second stage is the Reflective stage, during which coping skills are employed to process ostracism (Williams, 2009). To date, only three studies have examined temporal effects outside the reflexive stage. These studies indicate that continued self-focus can prolong the effects of ostracism (Sethi, Moulds, & Richardson, 2013), and the arousal associated with ostracism dissipates slowly (Kelly, McDonald, & Rushby, 2012). Still other research indicates ostracism’s effects diminish over time (Lau et al., 2009). In each of these cases, a second assessment of fundamental needs occurred within 10 min of the initial ostracizing event, leaving questions about the time course and duration of ostracism’s effect unanswered.

Even fewer studies have examined ostracism’s effect during the final (Resignation) stage, during which coping resources are depleted and individuals become resigned to their ostracized state. Zadro and colleagues (2006) examined socially anxious individuals, finding increased levels of need threat 45 min after ostracism.

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(during the Resignation stage). This finding suggests that ostracism’s effects have the potential to negatively affect cognition well after an ostracizing event takes place. If fundamental needs are still affected after 45 min, then other actions taking place during the interim, such as tasks requiring cognitive abilities, may also be affected. Thus, it is clear that ostracism has strong negative consequences; however, the temporal stability of these effects is still unclear as is their effect on cognitive outcomes.

1.2. Ostracism and executive functions

If ostracism effects persist over time, then the potential for downstream consequences increases. One area where these consequences might emerge is on measures of executive functions, which include higher-order cognitive processes such as working memory, planning, organization, and decision making (Lezak et al., 2004). Several brain areas linked to executive functions have been associated with the experience of ostracism. Intact executive functions are important for the completion of many daily activities and have been linked to frontal lobe functioning (Lezak et al., 2004). Based on previous neuroimaging studies, these cognitive abilities may be especially affected following an ostracizing experience.

Neuroimaging research indicates increased activation during experiences of ostracism in the anterior and posterior cingulate cortex, medial frontal cortex, and prefrontal cortex (Baird, Silver, & Vague, 2010; Campbell et al., 2006; Eisenberger, Lieberman, & Williams, 2003; Kross, Egner, Ochsner, Hirsch, & Downey, 2007). Although neuroimaging research links brain areas associated with executive functions to the experience of ostracism, only a few studies have directly examined performance on executive function measures following ostracism. These studies found decreased performance on word search tasks (Lustenberger & Jagacinski, 2010) and worse attention/working memory among adolescent females (Hawes et al., 2012) immediately following ostracism. To date, no studies have utilized validated neuropsychological measures of executive functions in adult participants. Thus, research examining how ostracism affects other executive functions, such as working memory and decision making, is still needed.

The use of behavioral measures to corroborate neuroimaging results is necessary as convergent evidence between neuroimaging and cognitive and behavioral assessments is not always found (e.g., Galton, Patterson, Xuereb, & Hodges, 2000) and when combined can increase predictive utility (e.g., Peters, Villeneuve, & Belleville, 2014). Thus, it is not clear whether the frontal lobe activation changes reported in neuroimaging studies correlate with impaired performance on formal executive function measures associated with everyday cognition.

1.3. The present study

The aims of the present study were twofold: (1) to examine the extent to which the negative effects of a single experience of ostracism on fundamental needs persist past the reflexive stage, and (2) to examine the effects of ostracism on some executive functions using validated neuropsychological measures. We hypothesized that the effects of ostracism would last past the reflexive stage. Based on previous neuroimaging research, we hypothesized that ostracism would decrease performance on measures of attention, working memory, and decision making.

2. Method

2.1. Participants

Seventy-four undergraduate students (ages 18–38, M_{age} = 19.50 [SD = 3.09]) at a regional campus of a large Midwestern university participated in the study for partial course credit. No inclusion or exclusion criteria were utilized. Eight participants reported a history of depression or anxiety (five in the inclusion group, three in the ostracism group). Most (64%) self-identified as Caucasian, and 55% were female. A computer malfunction caused the loss of some participant demographic data (n = 9).

2.2. Measures and manipulation

2.2.1. Cyberball

To induce feelings of social ostracism or inclusion, all participants played Cyberball, a virtual ball toss game (Williams et al., 2000). Cyberball has been used to induce a state of ostracism in over 175 studies, with results similar to those of non-Cyberball ostracism manipulations (e.g., Claypool & Bernstein, 2014; see Williams & Jarvis, 2006, or Williams & Nida, 2011, for review). Participants were informed that they would be playing the game with two other players over the Internet, and were asked to visualize themselves, the situation, and the other players. If the ball was thrown to them, they were instructed to click on the player they chose to toss the ball to next. A total of 30 tosses were made, lasting approximately 2 min. Participants were randomly assigned to an inclusion (n = 38) or ostracism (n = 36) condition. Those in the inclusion condition received the ball about 33% of the time, while those in the ostracism condition received the ball once from each player at the start of the game and never again.

2.2.2. Response to ostracism

The 20-item Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) and the Cyberball-specific Need Threat measure (Van Beest & Williams, 2006) assessed how participants currently felt. On the PANAS, responses to the positive and negative state mood items were averaged separately, with higher scores indicating greater levels of positive/negative mood (internal consistency: α = .89–.91). The Need Threat measure assesses threats to four basic fundamental needs: belonging, self-esteem, control, and meaningful existence. Higher total scores on each subscale indicate higher levels of the measured need (internal consistency: α = .68–.83).

2.2.3. Outcome measures

Neuroimaging research has shown that the anterior cingulate cortex and prefrontal cortex are affected following an ostracizing experience. In order to assess the brain regions utilizing neuropsychological measures, we administered tests of working memory (linked with the anterior cingulate and prefrontal cortex) and decision making (prefrontal cortex) (Lezak et al., 2004). A measure of task persistence was included to measure frontal/executive systems more generally.

Working memory was assessed with the Digit Span subtest from the Wechsler Adult Intelligence Scale-IV (WAIS-IV; Wechsler, 2008). Participants repeat increasingly lengthy strings of digits in the same order (Forwards), reversed (Backwards), and in numerical order (Sequencing). The longest successful digit span on each section was used to determine performance on this task (Wechsler, 2008). Performance on Digit Span Forwards assesses basic attention, whereas Digit Span Backwards and Sequencing assess working memory and mental manipulation (Lezak et al., 2004; Wechsler, 2008). The WAIS-IV Technical Manual (Wechsler, 2008) summarizes previous research indicating greater working memory demands during Backwards and Sequencing compared to Forwards. However, there are known correlations between Digit Span performance more generally and the Verbal Comprehension Index (Wechsler, 2008), likely due to the verbal and auditory nature of the task.

Decision making was assessed with the Iowa Gambling Task (IGT; Bechara, 2008; Bechara, Damasio, Damasio, & Anderson,
The standard, 100-trial IGT was administered. During the task, participants select cards one at a time, earning money and sometimes also losing money. Decks A and B have high immediate rewards but long-term negative outcomes, whereas Decks C and D have lower immediate rewards but long-term positive outcomes. In addition, Decks A and C experience losses on 50% of trials while Decks B and D experience losses on only 10% of trials (for additional information, see Bechara, 2008). The percent selections from each individual deck were examined for the first 40 (“decision making under ambiguity”) and last 60 (“decision making under risk.” Brand, Recknor, Grabenhorst, & Bechara, 2007) trials (Block 1 and Block 2, respectively; Brand et al., 2007). The IGT has been validated as a measure sensitive to prefrontal cortex impairment, and has been shown associated with performance on other standard executive tasks including the Wisconsin Card Sorting Test and the Tower of Hanoi (see Bechara, 2008, for discussion).

Participants’ level of task persistence was measured using an unsolvable puzzle task. Participants were told that they could take as much time as needed to trace a geometric figure without lifting their writing instrument. The duration of time spent attempting to solve the puzzle can be conceptualized as a measure of self-control or effort (see Baumeister, Bratslavsky, Muraven, & Tice, 1998). Executive functions include volition and self-regulation (Lezak et al., 2004), and performance on this task may help tap into these processes.

### 2.3. Procedure

The study was approved by the university’s Institutional Review Board, and all participants provided written informed consent. Participants first completed Cyberball, followed by the Digit Span, IGT, and unsolvable puzzle tasks in a counterbalanced order. In order to track the effects of ostracism over time, the Need Threat measure and PANAS were administered immediately after Cyberball and at two additional times (see Section 3). The length of the study session following Cyberball administration varied, depending on the time spent on the puzzle task.

### 2.4. Data analysis

To assess the effect of the ostracism manipulation, independent-samples t-tests were conducted on the PANAS and the Need Threat measures. To assess differences on the additional administrations of the Need Threat measure, mixed-model ANOVAs were conducted. Finally, independent-samples t-tests were conducted comparing the two groups on the remaining measures (Digit Span, IGT, unsolvable puzzle).

### 3. Results

#### 3.1. Group differences in demographics and responses to ostracism

There were no differences between groups in age, t(60) = 0.70, p = .49; or gender, χ²(1, N = 64) = 0.33, p = .57. Immediately following the Cyberball task, individuals in the ostracism condition reported lower levels of Belonging (Cohen’s d = −2.14), Self-Esteem (Cohen’s d = −0.77), Control (Cohen’s d = −1.53), and Meaningful Existence (Cohen’s d = −1.39) than individuals in the inclusion condition (see Table 1).

#### 3.2. Persistence of ostracism effects

Mixed ANOVAs with condition as the between-subjects variable and time as the within-subjects variable were conducted on each of the four fundamental needs (see Fig. 1). There were no differences in mood immediately following ostracism, so the reporting of the additional administrations is omitted. For the remaining analyses, Time 1 occurred immediately following Cyberball, Time 2 20–30 min after Cyberball, and Time 3 45–55 min following Cyberball. These time intervals represented the length of time needed to complete the counterbalanced cognitive tasks.

##### 3.2.1. Belonging

The main effect of time was significant, F(2,110) = 3.61, p = .03, η² = .06, indicating belonging was lower at Time 1 than Time 2 (p = .02) and Time 3 (p = .05), with no differences between Time 2 and Time 3 (p = .98). The main effect of group was also significant, F(1,55) = 28.84, p < .01, η² = .34. Participants in the ostracism group (M = 2.75, SD = 1.50) reported lower belonging than participants in the inclusion group (M = 4.28, SD = 0.99), p < .001. The time by group interaction was significant, F(2,110) = 6.71, p = .002, η² = .11. At Time 1, individuals in the ostracism group (M = 2.23, SD = 1.07) reported lower levels of belonging than individuals in the inclusion group (M = 4.35, SD = 0.97), p < .001. Those who were ostracized (Time 2: M = 2.96, SD = 1.53; Time 3: M = 3.06, SD = 1.78) continued to report lower levels of belonging than those who were included (Time 2: M = 4.29, SD = 0.94; Time 3: M = 4.19, SD = 0.80), p < .01. Thus, ostracized individuals felt lower belonging overall and this persisted across all three time points.

##### 3.2.2. Self-Esteem

The main effect of time was not significant, F(2,110) = 1.52, p = .22. There was a significant main effect of group, F(1,55) = 7.46, p = .008, η² = .12. Those who were ostracized (M = 5.01, SD = 1.28) reported lower levels of self-esteem compared to those who were included (M = 5.67, SD = 0.98), p = .008. The time by group interaction was not significant, F(2,110) = 1.40, p = .25. Thus, ostracized individuals reported lower self-esteem independent of time point.

### Table 1

Table means and standard deviations for study variables.

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<thead>
<tr>
<th></th>
<th>Ostracism</th>
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<th>p</th>
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<td></td>
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<td>SD</td>
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<td>Unsolvable puzzle</td>
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<td>259.80</td>
<td>353.21</td>
<td>294.69</td>
</tr>
</tbody>
</table>

Note: PANAS = Positive and Negative Affect Schedule, Positive (P) or Negative (N) subscale, administered before (Pre) or after (Post) ostracism manipulation; Need Threat = Belonging (B), Self-Esteem (SE), Control (C), or Meaningful Existence (ME); DS = Digit Span, Forwards (F), Backwards (B), or Sequencing (S); IGT = Iowa Gambling Task; percent deck (A, B, C, D) selections by Trials 1–40 (Block 1) and Trials 41–100 (Block 2); Unsolvable puzzle: time spent on puzzle in seconds. Bolded values indicate significance at the p < .05 level.
3.2.3. Control
The main effect of time was not significant, $F(2,110) = 0.39$, $p = .68$. There was a significant main effect of group, $F(1,55) = 26.56$, $p < .001$, $\eta^2_p = .33$. Lower levels of control were reported by those who were ostracized ($M = 2.44$, $SD = 1.38$) than those who were included ($M = 4.04$, $SD = 1.30$), $p < .001$. The time by group interaction was not significant, $F(2,110) = 1.69$, $p = .19$. Thus, ostracized individuals reported lower levels of control independent of time point.

3.2.4. Meaningful existence
The main effect of group was significant, $F(1,55) = 12.47$, $p = .001$, $\eta^2_p = .19$. Those who were ostracized ($M = 3.19$, $SD = 1.68$) reported lower levels of meaningful existence than those who were included ($M = 4.30$, $SD = 1.18$), $p = .06$. The main effect of time was marginal, $F(2,110) = 2.91$, $p = .06$, $\eta^2_p = .05$ (scores at Time 1 lower than scores at Time 3, $p < .05$). The time by group interaction was significant, $F(2,110) = 4.40$, $p = .02$, $\eta^2_p = .07$. At Time 1, individuals in the ostracism group ($M = 2.59$, $SD = 1.45$) reported lower levels of meaningful existence than individuals in the inclusion group ($M = 4.36$, $SD = 1.11$), $p < .001$. Those who were ostracized ($M = 3.33$, $SD = 1.76$) continued to report lower levels of meaningful existence than those who were included ($M = 4.29$, $SD = 1.28$) at Time 2, $p = .02$. No differences were seen at Time 3 (Ostracism: $M = 3.66$, $SD = 1.83$; Inclusion: $M = 4.25$, $SD = 1.30$), $p = .16$. Thus, ostracized individuals felt lowered meaningful existence overall, and this persisted across Time 2 but not Time 3.

3.3. Ostracism and cognition
Ostracized individuals had lower Digit Span Sequencing (Cohen’s $d = –0.53$) but not Forwards or Backwards (Table 1), indicating working memory difficulty on only one of the two tasks. During the early IGT trials, ostracized individuals exhibited worse performance, as they selected more from a deck widely considered indicative of pathological decision making (Deck A; Bechara, 2008) (Cohen’s $d = 0.69$). This riskiness persisted into the final IGT trials, as ostracized participants continued to make riskier decisions (greater Deck B selections; Cohen’s $d = 0.54$). Participants who were ostracized gave up more quickly on the unsolvable puzzle than those who were included (Cohen’s $d = –0.62$), showing less task persistence.

4. Discussion
The present study is one of the first to examine the duration of ostracism’s negative effects beyond the reflexive stage, and the first to demonstrate deficits in some executive functions in adults using standard neuropsychological tasks. The current findings expand our understanding of the enduring negative impact of a single ostracizing event on psychological outcomes and highlight potential mechanisms by which such outcomes may emerge.

Most previous research has assessed these needs immediately after ostracism (e.g., Jamieson et al., 2010; Lau et al., 2009; Williams et al., 2000). The previous studies that have assessed time effects had individuals answer self-focused questions that likely led to increased rumination about the ostracizing event, in turn increasing the duration of its effects (Sethi et al., 2013), or found effects in socially anxious individuals only (Zadro et al., 2006). By having participants complete cognitive tasks unrelated to social interaction following Cyberball, the current study tested the negative effects of a single ostracism experience on fundamental needs and cognitive task performance over time when attention was diverted away from the self.

The results indicate that the negative effects of an experience of ostracism on fundamental needs last into the Resignation stage even when participants are not permitted to ruminate. Participants in the present study continued to endorse decreased fundamental needs up to 55 min following the ostracism event, despite using that time to complete unrelated cognitive tasks. Thus, we have shown the negative effects of a single ostracism experience can linger and negatively affect both task persistence and performance.

We have also shown initial evidence that ostracism affects some executive functions. Previous research has shown negative effects of ostracism on cognitive abilities (Hawes et al., 2012), and functional neuroimaging research implicates areas associated with executive functions (Baird et al., 2010; Campbell et al., 2006; Eisenberger et al., 2003; Kross et al., 2007). Our results indicate ostracism can negatively affect decision making (Iowa Gambling Task) and some working memory processes (Digit Span Sequencing), as well as decrease task persistence (Unsolvable Puzzle). No group differences were found on a basic attention task, which is easier to complete than working memory tasks (Lezak et al., 2004; Wechsler, 2008), and this difference in performance based on task complexity is consistent with previous research in ostracism (Hawes et al., 2012). The lingering loss of fundamental needs following ostracism may negatively affect tasks that require more cognitive effort—when those systems may be occupied recovering from ostracism. These finding suggest that future research on ostracism should focus on more complex cognitive functions.

This study is the first to show the negative effects of ostracism on decision making, and corroborate neuroimaging results using a less expensive, behavioral measure. On the IGT, participants are given little information, needing to carefully attend to the wins/losses to maximize profit. Our results indicated ostracized individuals chose more from Deck A, the riskiest deck (Bechara, 2008), during early trials. Thus, participants who recently experienced ostracism may have focused more on the high immediate gains associated with this deck, ignoring the long-term negative consequences. After the risks of each deck became apparent (i.e., Block 2), ostracized individuals continued to make riskier decisions by selecting more from Deck B. Deck B, like Deck A, is associated with large immediate gains and long-term losses; however, the losses only occur on 10% of trials (50% with Deck A; Bechara, 2008). Continued selections from Deck B indicate a continued focus on immediate rather than long-term outcomes (Buelow, Okdie, & Blaine, 2013). When experiencing ostracism in the real world, individuals
may make short-sighted decisions, such as engaging in risky behaviors that have a potential for long-term negative outcomes. In addition, ostracized individuals may attempt to regain control or engage in activities to gain immediate gratification to fill those missing needs. Finally, individuals with neurological disorders often show impairments on cognitive tasks, including those measuring decision making. As individuals with neurological disorders are at greater risk for social exclusion, it is possible that these cognitive changes may be due in part to the experience of ostracism in one’s daily life, and future research should investigate this potential occurrence.

4.1. Limitations

One limitation of the present study is that not all executive functions were assessed, highlighting the need for future research to examine how ostracism impacts other executive functions such as inhibition, problem solving, and cognitive flexibility. Assessing cognitive performance hours or even days later would allow for an understanding of the long-term effects of an isolated ostracism experience on cognition. Also, the current study failed to find increased negative mood following the ostracism event. However, the measure used to assess affect (PANAS) may not have accurately captured the mood elements that typically decline in the ostracism literature (e.g., the PANAS does not measure “anger”). Moreover, the participants were given paper-and-pencil measures of the PANAS and Need Threat after the study manipulation. This, albeit brief, interaction with the study researcher could have raised participant mood enough to nullify group differences. Finally, some researchers argue that being ostracized can lead to a numbness or flattening of affect (Baumeister, DeWall, Ciarocco, & Twenge, 2005; Twenge, Catanese, & Baumeister, 2003), indicating further research is needed on how ostracism affects different aspects of the emotional experience.

4.2. Conclusions and future directions

The results of the current study suggest that a single ostracism experience negatively affects some executive functions, and its effects on fundamental needs can persist beyond the reflexive stage. Future research should continue to investigate the duration of these effects and the extent to which they may impact other executive functions. If the negative consequences of ostracism persist beyond a short period of time, they could impact subsequent tasks hours or even days later. That is, having a brief ostracism experience may subsequently affect the ability to successfully navigate future tasks that require higher-order cognitive functions. Finally, while the present results relied on a single ostracizing experience, one might imagine that repeated experiences of ostracism might lead individuals to chronic failure on tasks that require intact executive functions.

References
