

ORIGINAL ARTICLE

Relations between discrimination, rejection sensitivity, negative affect, and decrements in problem-solving ability following social rejection: An experimental investigation

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Abstract

Introduction: While negative affect and problem-solving deficits have been consistently linked to suicidal thoughts and behaviors, the latter are often conceptualized and studied as time- and/or context-invariant. Though requiring additional empirical support, theory suggests that discrimination may strengthen the relation between rejection sensitivity and increases in negative affect as well as declines in problem-solving abilities following rejection. The aim of the current study was to test this claim using a social rejection paradigm (i.e., Cyberball) with young adults experiencing past-month suicidal ideation.

Methods: The sample consisted of 50 participants. Lifetime discrimination and rejection sensitivity were assessed prior to Cyberball. Negative affect and problem-solving abilities were assessed pre- and post-Cyberball. SPSS and the PROCESS macro were used to test relations among variables of interest.

Results: Rejection sensitivity predicted greater problem-solving decrements, but not negative affect, following rejection among individuals who had experienced higher (vs. lower) levels of lifetime discrimination.

Conclusion: Addressing rejection sensitivity and sources of discrimination within the context of treatment may reduce the impact of social rejection on problem-solving abilities among young adults at risk for suicide.

KEYWORDS

discrimination, negative affect, problem-solving, social rejection

INTRODUCTION

Problem-solving deficits (e.g., generation of fewer potential alternatives to problems) and negative affect (e.g.,

feelings of sadness, guilt, worry, etc.), have been linked to suicidal thoughts and behaviors (STB) across much of the lifespan (Armey et al., 2020; D'Zurilla et al., 2004; Molaie & Chong, 2020; Speckens & Hawton, 2005). When

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highly distressing problems arise, those who are unable to generate alternate solutions to these problems and/or effectively manage the resulting negative affect may view STB as the sole means to end their distress (Brereton & McGlinchey, 2019). Thus, many evidence-based treatments for STB incorporate problem-solving skills and affect regulation strategies to reduce acute suicide risk (see DeCou et al., 2019; Kazantzis et al., 2018). However, current understanding of risk factors for STB, such as problem-solving deficits, is limited (Franklin et al., 2017). For instance, unlike negative affect (see Arney et al., 2020), problem-solving abilities are often conceptualized and studied as time- and/or context-invariant (Franklin et al., 2017). Yet, a growing body of literature suggests that precipitating events, such as social rejection, may lead to temporary deficits in problem-solving abilities (e.g., Baumeister et al., 2002; Dixon-Gordon et al., 2011; Pollak et al., 2023; Williams et al., 2005), during which individuals may be particularly susceptible to STB. Thus, additional study in this area is sorely needed to save lives.

Problem-solving abilities and negative affect following social rejection

As suggested above, one precipitating event that has been shown to cause temporary declines in problem-solving abilities is social rejection (Baumeister et al., 2002; Dixon-Gordon et al., 2011). Given the importance of social inclusion for an individual's survival during human evolution, social *rejection* may prompt temporary problem-solving deficits in ways that other stressors do not (Baumeister et al., 2002; Baumeister & Leary, 1995; Cawley et al., 2019). In one of the first investigations examining problem-solving abilities following social rejection, Baumeister et al. (2002) exposed a total of 187 undergraduate students across three separate studies to instances of social rejection and inclusion. Specifically, participants completed a personality measure and were then provided false feedback based on their condition assignment. In the rejection condition, participants were told that the participants were the “sort of people who would end up alone in life” (Baumeister et al., 2002; p. 819). Conversely, participants in the inclusion condition were told that they would likely spend the rest of their lives “surrounded by people who care about them” (Baumeister et al., 2002; p. 819). The control group was designed to give participants negative feedback about non-social hardships that were unrelated to social belongingness. Specifically, participants were told they would become more “accident prone” as they got older, suffering physical injuries that would require significant medical treatment (Baumeister et al., 2002; p. 819). Across all three studies, participants in the social

rejection, but not the inclusion or control conditions, demonstrated significant declines in problem-solving, as well as effortful logic and reasoning (measured using an intelligence test and mathematics questions from the Graduate Record Examination), after receiving feedback (Baumeister et al., 2002). It was also demonstrated that problem-solving deficits were not the result of temporary impairments in various facets of executive functioning, such as encoding of information into memory or recall of simple information (Baumeister et al., 2002).

In another sample of undergraduate students, Dixon-Gordon et al. (2011) found that participants exposed to social rejection using an imaginal exposure procedure experienced declines in problem-solving abilities. Specifically, participants were asked to listen to a 5-minute audio recording of a narrator describing instances of rejections experienced by the protagonist. Following exposure to this procedure, participants experienced declines in problem-solving abilities measured using an adapted version of the Means-End Problem-Solving Procedure (MEPS; Platt & Spivack, 1975). However, these results were moderated by severity of borderline personality symptoms, which were assessed using the self-reported Personality Assessment Inventory-Borderline Features Scale (Morey, 1991). Specifically, individuals with high, but not low, levels of borderline personality symptoms, demonstrated declines in problem-solving abilities following social rejection (Dixon-Gordon et al., 2011). Taken together, this body of work suggests that individuals with pre-existing vulnerabilities may experience greater deficits in problem-solving following social rejection.

Similar to work on problem-solving abilities following rejection, research examining the impact of social rejection on negative affect is also rooted in evolutionary theory. Specifically, affect is believed to play a critical role in creating and/or maintaining social bonds (Baumeister & Leary, 1995). Negative affect following rejection may motivate individuals to engage in behaviors that address social rejection (e.g., seeking forgiveness for a perceived wrong-doing; Baumeister & Leary, 1995). Therefore, social rejection may prompt negative affect in ways other stressors may not. A large body of research generally supports this claim (e.g., Blackhart et al., 2007; Dixon-Gordon et al., 2011; Hartgerink et al., 2015; Williams et al., 2000). Importantly, pre-existing vulnerabilities, such as how sensitive an individual may be to social rejection (i.e., rejection sensitivity), may predict greater negative affect following social rejection (Downey et al., 2004; Downey & Feldman, 1996). Though existing work has supported the positive relation between rejection sensitivity and negative affect following rejection (e.g., Ayduk et al., 2001; Downey et al., 2004), no work to date has examined whether rejection sensitivity may make an individual vulnerable to

experiencing problem-solving deficits following rejection in *real time*. Preliminary, cross-sectional work does suggest that rejection sensitivity is associated with self-reported problem-solving deficits among undergraduates (Kraines & Wells, 2017). To further our understanding of the contextual and time-varying nature of problem-solving deficits, an aim of the present study is to examine whether rejection sensitivity predicts deficits in problem-solving deficits in real time following exposure to an experimental social rejection paradigm among a sample of young adults at heightened risk for suicide, those with recent (i.e., past-month) experiences of passive suicidal ideation (SI; Liu et al., 2020).

Discrimination as a moderator of the relation between rejection sensitivity and negative affect

In addition to understanding the association between rejection sensitivity and correlates of suicide risk, such as problem-solving deficits and negative affect, an equally important question is for *whom* this relation may be particularly strong (see Nock et al., 2019). Individuals with marginalized identities, such as sexual, gender, and racial minorities, and individuals with physical disabilities, are at greater suicide risk relative to their non-marginalized peers (Busby et al., 2020; Khazem, 2018; Wang & Wong, 2021). For instance, while approximately 4% of the general population reports a history of suicide attempts, 11% of sexual minorities and 40% of gender minorities, report a suicide attempt history (Hottes et al., 2016; Marshall et al., 2016; Nock et al., 2008). Marginalized individuals commonly face social rejection in the form of discrimination, which in turn, increases their suicide risk (Busby et al., 2020; Khazem, 2018; Wang & Wong, 2021). Instances of past rejection by others has been theorized and shown to emotionally sensitize individuals to future instances of rejection (Downey et al., 2004; Downey & Feldman, 1996; Feinstein, 2020; Pachankis et al., 2008). As an example, Feinstein (2020) posits that LGBTQ individuals, because of the chronic rejection they face in the form of discrimination, become emotionally sensitized to future instances of social rejection. Thus, relative to heterosexual peers, LGBTQ individuals may experience greater negative affect after being acutely rejected, an effect that may generalize to other marginalized individuals (e.g., Latino/a/x individuals; see Page-Gould et al., 2014).

Indeed, prior research provides some preliminary support for the relation between rejection sensitivity, discrimination, and negative affect following future instances of rejection. Specifically, Livingston et al. (2020) recruited 50 sexual minority adults, from an undergraduate research

pool, to participate in a study that used ecological momentary assessment (EMA; Shiffman et al., 2008). Socio-demographic information and lifetime discrimination were assessed at baseline. Real-time data on instances of social rejection, in the form of discrimination, as well as depressed and anxious feelings, were collected six times per day for two weeks. Results suggested that individuals who experienced higher (vs. lower) lifetime discrimination had marginally greater momentary increases in depressed and anxious feelings following real-time rejection experiences ($\beta = .18, p = .053$; Livingston et al., 2020). The authors note that the modest sample size may have impacted the ability to detect a significant effect for this interaction (Livingston et al., 2020).

Discrimination as a moderator of the relation between rejection sensitivity and problem-solving deficits

Though not yet tested, discrimination may also moderate the relation between rejection sensitivity and problem-solving deficits following social rejection. According to D’Zurilla and Goldfried (1971), problem-solving consists of several components, including (1) defining a problem; (2) generating alternative solutions; (3) evaluating and selecting alternatives; and (4) evaluating the outcome. In an expansion of this model, Nezu et al. (2019) posit that humans have limited cognitive resources (e.g., working memory) and are only able to attend to a set amount of information at any one moment. These resources are often overtaxed or “overloaded” when an individual attempts to downregulate, or decrease emotional reactivity, using various strategies (e.g., shifting one’s perspective on of the stressor from a “threat” to a “challenge”, taking deep breaths, etc.; Nezu et al., 2019). Under these conditions, individuals have fewer cognitive resources available for problem-solving (e.g., decreased space in working memory for all potential solutions to a problem), which leads to less effective problem-solving (e.g., picking a less effective solution because another, more effective solution, was not at the forefront of one’s mind; Nezu et al., 2019). Thus, it stands to reason that those with greater rejection sensitivity, who may require more cognitive resources to downregulate emotional reactivity following a social stressor, may experience greater declines in problem-solving. This relation may be further strengthened among those with more (vs. less) experiences of discrimination, who may subsequently be emotionally sensitized to experiences of rejection (Pachankis et al., 2008). However, no studies to date have examined whether discrimination moderates the relation between rejection sensitivity and declines in problem-solving abilities following rejection.

Current study

In sum, research suggests that social rejection is associated with declines in problem-solving abilities and increases in negative affect. However, existing work has not examined whether rejection sensitivity, a well-studied predictor of negative affect following rejection, may also prompt temporary deficits in problem-solving abilities. Furthermore, declines in problem-solving abilities and increases in negative affect may be more pronounced among individuals who have experienced more (vs. less) discrimination in their life, and thus more susceptible to the psychological effects of future rejection. While existing research has documented the possible moderating role of minority stress, a form of discrimination, on negative affect following social rejection, no studies to date have examined whether rejection sensitivity and discrimination influence problem-solving post-rejection. As social rejection, negative affect, and problem-solving deficits are risk factors for STB, results of this research could be used to inform suicide prevention efforts, particularly for marginalized groups. Indeed, bolstering problem-solving abilities may be a particularly important intervention target for marginalized populations, who may not respond

as effectively to commonly used means restriction interventions, given differences in their means of attempt (e.g., hanging vs. firearms) (see Clark et al., 2022).

Using a laboratory-based, acute rejection paradigm, the present study sought to extend the current body of research by examining the relation between acute rejection and declines in problem-solving among a diverse sample of young adults at risk for suicidal behavior (i.e., with past-month SI). Young adults are at particular high risk for death by suicide (Centers for Disease Control and Prevention, 2023). Specifically, we hypothesized that rejection sensitivity would most strongly predict declines in problem-solving and increases in negative affect, respectively, following the experience of social rejection for individuals reporting high (vs. low) levels of discrimination (see Figure 1).

METHODS

Participants & procedures

Participants were recruited from a public university in the Mid-Atlantic region of the U.S. between 2021

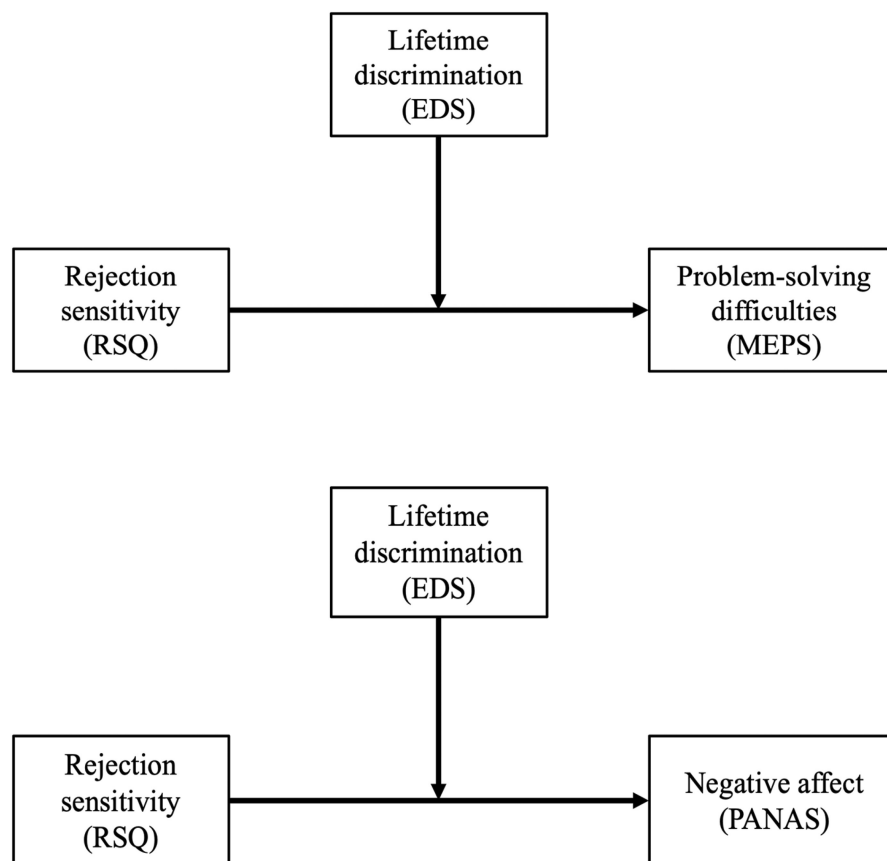


FIGURE 1 Path diagrams for study hypotheses. EDS, Everyday Discrimination Scale; MEPS, Means-End Problem-Solving Procedure; PANAS, Positive and Negative Affect Schedule; RSQ, Rejection Sensitivity Questionnaire.

and 2022. Inclusion criteria for the study included: (1) 18–24 years of age; (2) fluent in English; (3) enrollment at research site as an undergraduate student; and (4) current SI (i.e., self-reported presence of at least a wish to die within the past month). Exclusion criteria were: (1) cognitive impairment that would impede ability to understand study procedures as well as potential risks; and (2) self-reported presence of autism spectrum disorder (see Venturini & Parson, 2018).

Two separate recruitment strategies were used that involved distribution of a link to the study screener via an undergraduate research pool and flyers placed around campus (see Appendix S1 for more details). Upon completion of the screener, all students were contacted via email to inform them of their eligibility status for the current study. Those who met eligibility criteria were asked to schedule a virtual laboratory visit and offered the option to speak with a research team member via phone to answer any questions about the study prior to the virtual appointment. At the beginning of the laboratory visit, participants completed a second electronic consent form, which fully described study procedures. Consenting participants then completed a (1) a pre-paradigm assessment battery, (2) an acute rejection laboratory paradigm, (3) a post-paradigm assessment battery, and a (4) debrief of the true nature of the task and positive mood induction. Consistent with the (American Psychological Association (APA), 2017) code of conduct for research, procedures to manage participant risk concerns were developed. See Appendix S1 for a description of the safety protocol. The university's Institutional Review Board approved these study procedures.

Pre-paradigm assessment battery

After completing the informed consent process during the virtual laboratory visit, a trained member of the research team administered an interview of recent and lifetime STB as well as a brief measure of intelligence. Participants then completed well-validated, self-report measures of current depressive/anxiety symptoms and stress, current levels of positive and negative affect, and problem-solving abilities using Qualtrics (see Construct and Measures for detailed descriptions). To circumvent possible ordering effects, the sequence in which the affect and problem-solving measures were presented was randomized between participants.

Laboratory paradigm

Next, participants completed Cyberball, a 4-minute computerized, acute social rejection laboratory task via

Inquisit Web (Williams et al., 2000). Participants were led to believe that they would be passing a ball on screen with two other participants, though the avatars were, in fact, part of the computer program. To bolster the credibility of the game, two confederates briefly joined the virtual laboratory visit to introduce themselves to participants as the two other players and then exited the session.¹ Rejected participants were not passed the ball after two initial tosses and thus obtained fewer ball tosses than the players on screen (i.e., rejection condition). Included players were repeatedly passed the ball and obtained an equal number of ball tosses as the other players (i.e., inclusion condition). The most recent meta-analysis of existing research using this paradigm suggests that the average effect on psychological constructs such as negative affect is large, and generalizes across several demographic variables (i.e., gender, age, and country of origin; Hartgerink et al., 2015). Traditionally, participants are randomized into either the inclusion or exclusion condition (Williams et al., 2000). However, prior research has exposed participants to both conditions and/or not administered the inclusion condition (e.g., Tang & Richardson, 2013). Given the strong effects found using only the exclusion condition in Cyberball across a wide variety of participants from various cultural backgrounds, the decision was made to have all participants only complete the exclusion condition to maintain the feasibility of the present study.

Post-paradigm assessment battery

Though not yet conclusive, meta-analytic findings suggest that the effects of Cyberball are strongest 5–10 min after the completion of the paradigm (Hartgerink et al., 2015). Therefore, participants again completed the problem-solving task as well as the measure of current levels of negative and positive affect via Qualtrics immediately after completing Cyberball (see Construct and Measures for detailed descriptions). The order of the affect and problem-solving measures was randomized between participants to eliminate ordering effects.

Debrief & positive mood induction

Finally, participants were debriefed on the true nature of Cyberball and completed a positive mood induction, which included watching two comedic videos of pets. Prior to the end of the study, participants were re-administered an assessment of SI intensity to ensure that they were safe before terminating the virtual laboratory session.

CONSTRUCTS AND MEASURES

Study eligibility

The eligibility screener consisted of a series of socio-demographic questions and a single item that assessed for thoughts of death and/or dying in the prior month. To assess frequency of passive SI in the past month, a question modeled after the first item on the Columbia-Suicide Severity Rating Scale-Screener-Recent-Self-Report (C-SSRS-Screener-Recent-Self-Report; Posner et al., 2011; Viguera et al., 2015) was embedded within the Patient-Reported Outcomes Measurement Information System (PROMIS) Emotional Distress – Depression Short Form (Cella et al., 2010). Participants who endorsed any response other than “Never” were considered to have experienced SI during the past month.ⁱⁱ During the screener, participants also completed a measure of rejection sensitivity (see below for details). All other measures were completed during the virtual laboratory visit.

Problem-solving ability

The Means-End Problem-Solving Procedure (MEPS; Platt & Spivack, 1975) was used to assess problem-solving abilities using 5 randomly selected (out of 10) stories pre-rejection. Post-rejection, participants completed the remaining 5 stories. Participants are asked a series of hypothetical social problems encountered by fictional individuals along with solutions to those problems and are asked to generate steps or means that lead to problem solutions. Participants were allowed to complete one practice story with the experimenter before beginning the task to ensure that they understood all instructions (adapted from Jing et al., 2016). Participants were allotted 5 min to type their responses for each story via Qualtrics, consistent with prior research (Jing et al., 2016). Previous research has utilized the MEPS to assess declines in problem-solving abilities following acute rejection among undergraduate samples (Dixon-Gordon et al., 2011).

In line with standardized scoring procedures and previous research (Dixon-Gordon et al., 2011; Platt & Spivack, 1975; Madore & Schacter, 2014; Jing et al., 2016), three coders, unaware of study hypotheses, assessment time point (i.e., pre- or post-rejection), and participant self-reported demographics, were trained to separately score MEPS responses using practice trial responses until good interrater reliability was obtained (intraclass correlations [ICC] ≥ 0.75 ; Koo & Li, 2016). Throughout the coding process for real participant data, all three coders completed consensus ratings for 18% of randomly selected cases (i.e.,

$n=9$) to calculate the ICC (Dixon-Gordon et al., 2011). MEPS responses were scored as a “relevant step,” “irrelevant step,” or “no step” (Platt & Spivack, 1975). A relevant step is a step or event that leads toward the outlined solution in the story while an irrelevant step is a step or event that leads toward a solution not outlined in the story. A “no step” is information that does not fit the step framework (e.g., thoughts and feelings about the task itself). Per more recent research (Madore & Schacter, 2014; Jing et al., 2016), scores for irrelevant and no steps were collapsed together. Thus, participants received two separate scores for “relevant steps” as well as “irrelevant/no steps” across the 5 MEPS stories pre-rejection and the other 5 MEPS stories post-rejection. Relevant (ICC = 0.85, $p < 0.001$) and irrelevant/no steps scores (ICC = 0.86; $p < 0.001$) demonstrated good reliability (Koo & Li, 2016).

Current positive and negative affect

The Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) is a 20-item, self-report measure that assesses current experiences of distress and/or unpleasant engagement with the environment (i.e., negative affect; NA) as well as pleasurable engagement with the environment (i.e., positive affect; PA). Items are rated on a 5-point scale ranging from 1 (“Very slightly or not at all”) to 5 (“Extremely”). Total scores can be obtained for each of the scales (i.e., PA and NA), with scores ranging from 10–50 for each scale. Greater scores indicate greater positive or negative affect. The PANAS is one of the most widely used affect measures and has good to excellent reliability and construct validity (Crawford & Henry, 2004; Medvedev et al., 2021). The PANAS has been shown to capture changes in affect following rejection paradigms, including Cyberball (Baumeister et al., 2002; Hartgerink et al., 2015). In the present study, PA scale scores demonstrated good reliability pre- ($\omega = 0.79$) and post- ($\omega = 0.89$) Cyberball (Groth-Marnat & Wright, 2016). NA scale scores ($\omega_{pre} = 0.88$; $\omega_{post} = 0.90$) also demonstrated good reliability.

Rejection sensitivity

The Rejection Sensitivity Questionnaire (RSQ; Downey & Feldman, 1996) is an 18-item, self-report measure of how individuals anxiously expect, readily perceive, and react to rejection by friends or significant others (i.e., rejection sensitivity). It consists of 18 hypothetical situations relevant to adult interactions (e.g., “You ask someone in one of your classes to coffee.”). Participants are then asked to indicate how concerned or anxious they

would feel about the way these hypothetical individuals might respond using a 6-point scale ranging from 1 (“Very unconcerned”) to 6 (“Very concerned”) (i.e., “rejection concern” item). Participants are also required to rate, on a 6-point scale ranging from 1 (“Very unlikely”) to 6 (“Very likely”), the likelihood that the hypothetical individual would respond positively (e.g., accept the invitation) (“acceptance expectancy” item). Reported low likelihood is suggestive of expectations of rejection while high likelihood is suggestive of expectations of acceptance. A score for each scenario is calculated by multiplying a participant’s response on the rejection concern item by the participant’s reverse scored response on the acceptance expectancy item. Then, a total rejection sensitivity score is calculated by taking the mean scores of the 18 items, with scores ranging from 1–36; higher scores indicate greater rejection sensitivity. The RSQ has adequate psychometric properties (Downey & Feldman, 1996), and the total score demonstrated acceptable reliability ($\omega = 0.76$) in the current sample (Groth-Marnat & Wright, 2016).

DISCRIMINATION

The nine-item Everyday Discrimination Scale (EDS; Williams et al., 1997) was used to assess self-reported experiences of discrimination. Participants are asked to reflect on how “often” discrimination-related experiences have occurred to them on a scale from 0 (i.e., “Never”) to 5 (i.e., “Almost every day”). Items are summed to create a total score, with greater scores indicating greater frequency of discrimination-related experiences in everyday life. The EDS is widely used in psychological and public health research and has demonstrated good psychometric properties among adults (Gonzales et al., 2016; Kim et al., 2014). The scale demonstrated adequate internal consistency in the present sample ($\omega = 0.75$; Groth-Marnat & Wright, 2016).

Lifetime/past-month suicidal thoughts and behavior

The Columbia-Suicide Severity Rating Scale (C-SSRS; Posner et al., 2009) is a well-validated measure of a broad spectrum of STB. Specifically, the C-SSRS assesses four constructs: intensity of SI; severity of SI; suicide attempt (aborted, interrupted, actual); and lethality of any attempts (Posner et al., 2011). Research has supported its reliability and predictive utility in research and clinical settings (Interian et al., 2018). The Baseline/Screening version was administered to each participant by trained

research staff, which accounts for lifetime and current (i.e., past-month) experiences of STB.

General intelligence

The Matrix Matching Test (MMT; Pluck, 2019) is a brief, researcher-administered assessment of general intelligence. The MMT is divided into two sections. In the first, participants are asked to complete a visuospatial matrix reasoning task (12-items), during which participants are asked to look at a set of geometric patterns (e.g., a set of purple triangles) and determine which of the responses (labeled 1–6) complete the pattern. During the second section (i.e., semantic understanding task; 12-items), participants are asked to look at pictures on a top row (e.g., a red balloon and red cherries), and select one of the items that completes the set based on some shared characteristic (i.e., color). Participants are provided with example items to help them understand directives. Total scores, which range from 0 to 24, are calculated by adding up each of the items that the participant answered correctly (i.e., 1 point for each correct answer). Total scores show adequate psychometric properties, strong concurrent validity with established measures of general intelligence, and good predictive validity (Pluck, 2019). Greater scores indicate greater general intelligence.

Depressive symptom severity

The Depression and Anxiety Stress Scales (DASS-21; Antony et al., 1998; Lovibond & Lovibond, 1995) is a 21-item, self-report measure that assesses past week severity of depressive (e.g., “I felt down-hearted and blue”) and anxiety symptoms (e.g., “I was aware of dryness of my mouth”) as well as stress (e.g., “I found it hard to wind down”). Items are rated on a 4-point scale ranging from 0 (“Did not apply to me at all”) to 3 (“Applied to me very much, or most of the time”). The scale consists of three subscales assessing depression, anxiety, and stress, as well as a total score which is calculated by adding all item responses together and multiplying the sum by 2 (range: 0–126), with greater scores indicating greater depressive/anxiety symptoms and stress (Lovibond & Lovibond, 1995). The DASS-21 has demonstrated satisfactory to good reliability and adequate construct validity across clinical and non-clinical samples (Antony et al., 1998; Henry & Crawford, 2005). In the current sample, depressive symptom subscale scores ($\omega = 0.91$) demonstrated excellent reliability (Groth-Marnat & Wright, 2016).

Data analysis plan

To determine the required sample size, power estimates were conducted in *G*Power* version 3.1 (Faul et al., 2009; see Appendix S1). All subsequent analyses were conducted using SPSS 28. Distributional properties and descriptive statistics of sample characteristics were conducted. Degree of data missingness was also assessed (Little & Rubin, 2019). Correlations were then examined between outcomes (i.e., negative affect and problem-solving abilities) and potential covariates, including general intelligence, depressive symptoms, and history of suicide attempts (see Baumeister et al., 2002; Jollant et al., 2005; Molaie & Chong, 2020; Murphy et al., 2001).ⁱⁱⁱ Changes in self-reported positive affect ratings were examined using paired samples *t*-tests to determine if Cyberball worked as intended (Hartgerink et al., 2015). Variance inflation factors (VIF) and tolerance were calculated to determine if high multicollinearity biased regression coefficients. VIF and tolerance values > 10 and < 0.10, respectively, often signify high multicollinearity (Cohen et al., 2003). The Durbin-Watson statistic was used to assess whether autocorrelations existed among residuals. Finally, the distribution of residuals was inspected using histograms and *q-q* plots (Cohen et al., 2003).

Two hierarchical linear regressions via the PROCESS macro (i.e., Model 1; Hayes, 2017) were conducted to examine the impact of social rejection among individuals with varying levels of rejection sensitivity and discrimination on outcomes (i.e., negative affect and problem-solving abilities) following Cyberball. Baseline levels of both outcomes were included as covariates. Additional covariates for both models included history of suicide attempts, depressive symptom severity, and general intelligence, which were selected a priori based on studies noted above.^{iv} Rejection sensitivity was added as the “*X* variable” and discrimination as the “moderator variable *W*” for both models. All continuous covariates and predictors were mean centered to facilitate interpretability of results (Cohen et al., 2003). Simple slopes were calculated at low (i.e., -1 SD), average, and high ($+1$ SD) levels of the moderator (Hayes, 2017).

RESULTS

A total of 393 students completed the eligibility screener between Fall 2021 and Spring 2022. Of those 393, 100 were eligible based on criteria outlined above. Of those 100, 50 enrolled in the current study. After correcting for multiple comparisons (Benjamini & Hochberg, 1995), analyses did not reveal demographic (i.e., age, sex, sexual identity, education level, race, ethnicity, recruitment method, employment

level) or psychosocial differences (i.e., lifetime discrimination, rejection sensitivity levels, frequency of passive SI in past month) between eligible individuals who did enroll (vs. did not) in the current study (p 's > 0.05). Table 1 provides an overview of participant demographics and descriptive statistics of variables of interest. No demographic or psychosocial differences were found between participants recruited from the undergraduate research pool ($n=21$) versus those recruited via flyers ($n=29$) on study variables in the current sample (p 's > 0.05). All participants provided data for the variables of interest in the current study.

As expected, correlations (see Table 2) between study variables revealed that pre-rejection problem-solving abilities and negative affect were positively associated with post-rejection levels of both outcomes. Positive affect declined significantly following Cyberball ($M_{\text{pre-rejection}} = 22.20$, $SD = 6.03$; $M_{\text{post-rejection}} = 20.22$, $SD = 7.40$; $t(49) = 2.17$, $p = 0.035$), suggesting that the social rejection paradigm worked as intended. VIF (range = 1.02–1.94) and tolerance (range = 0.52–0.98) values for both regression models did not cross established thresholds for high multicollinearity. The Durbin-Watson statistic did not indicate significant autocorrelation among residuals in either regression model (values = 1.67 & 2.45). Residuals were approximately normally distributed in both models.

Problem-solving ability

Table 3 provides an overview of the multivariate relations between rejection sensitivity, discrimination, and problem-solving abilities following social rejection. Overall, the model accounted for 44% of the variance in post-rejection problem-solving ability, which is considered a large effect ($f^2 = 0.78$; Cohen, 1992). After accounting for covariates, neither rejection sensitivity nor lifetime discrimination predicted post-rejection levels of problem-solving ability (p 's > 0.05). However, their interaction negatively predicted post-rejection levels of problem-solving ability ($b = -0.06$, $p = 0.034$, 95% CI [-0.12 , -0.01]). Specifically, as rejection sensitivity levels increased, problem-solving abilities declined following rejection among participants who reported high levels ($b = -0.49$, $p = 0.006$, 95% CI [-0.83 , -0.15]), but not low ($b = 0.39$, $p = 0.278$, 95% CI [-0.32 , 1.11]) or mean levels ($b = -0.05$, $p = 0.829$, 95% CI [-0.51 , 0.41]) of discrimination (Figure 2).

Negative affect

Table 4 provides an overview of the multivariate relations between rejection sensitivity, discrimination, and

TABLE 1 Descriptive statistics for study sample and variables of interest ($N=50$).

Continuous variables	<i>M</i> (<i>SD</i>)	Skewness	Kurtosis
T2 Relevant means	12.80 (7.21)	0.59	0.44
T1 Relevant means	12.90 (7.41)	−0.01	−0.96
T2 Negative affect	15.94 (6.57)	1.44	1.46
T1 Negative affect	17.58 (7.02)	1.36	1.71
Lifetime discrimination	25.86 (7.09)	0.36	0.04
Rejection sensitivity	14.31 (3.97)	0.08	−0.84
Depressive symptoms	14.44 (10.18)	0.54	−0.32
Age	19.76 (1.62)	1.21	0.86
General intelligence	17.98 (2.54)	−0.02	−0.87
Nominal variables	<i>n</i>	% of total <i>N</i>	
Race			
White	23	46%	
Asian	11	22%	
Black/African American	6	12%	
Other	6	12%	
Biracial/Multiracial	4	8%	
Hispanic or Latino/a/x:			
Yes	13	26%	
No	36	72%	
Currently employed (full- or part-time)			
Yes	25	50%	
No	25	50%	
Sex			
Female	36	72%	
Male	14	28%	
Gender identity:			
Cisgender	42	84%	
Transgender/gender diverse	6	12%	
Sexual identity			
Heterosexual	27	54%	
LGBQ	23	46%	
Lifetime history of suicidal behavior			
Present	18	36%	
Absent	32	64%	
Recruitment strategy			
Undergraduate research pool	21	42%	
Campus flyers	29	58%	

Note: T2, Post-social rejection paradigm; T1, Pre-social rejection paradigm. :One participant declined to provide information on whether they identified as Hispanic or Latino/a/x; two participants declined to provide their gender identity.

Abbreviation: LGBQ, lesbian, gay, bisexual, queer, or questioning.

negative affect following social rejection. Overall, the model accounted for 81% of the variance in post-rejection negative affect, which is considered a large effect ($f^2 = 4.26$; Cohen, 1992). After accounting for covariates,

greater rejection sensitivity, but not discrimination, predicted greater negative affect post-rejection ($b = 0.26$, $p = 0.034$, 95% CI [0.02, 0.50]). However, rejection sensitivity did not predict a significant amount of variance

TABLE 2 Bivariate correlations for study variables ($N = 50$).

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. T2 Relevant means	–											
2. T1 Relevant means	0.62***	–										
3. T2 Negative affect	0.08	–0.12	–									
4. T1 Negative affect	0.15	–0.06	0.88***	–								
5. Lifetime discrimination	0.14	0.04	0.20	0.19	–							
6. Rejection sensitivity	–0.08	–0.16	0.35*	0.25	0.27	–						
7. Depressive symptoms	0.14	–0.12	0.51***	0.60***	0.37**	0.34*	–					
8. Lifetime history of suicidal behavior	–0.04	–0.08	0.43**	0.27	0.05	0.20	0.19	–				
9. Age	0.04	–0.02	0.03	–0.02	0.35*	–0.02	0.03	–0.02	–			
10. General intelligence	0.17	0.01	–0.01	0.07	0.16	0.33*	0.10	–0.08	0.07	–		
11. Sexual identity	–0.03	0.05	–0.04	0.06	–0.01	0.18	0.18	0.06	0.01	0.01	–	
12. Sex	–0.11	–0.20	–0.04	0.01	0.09	0.12	0.05	–0.19	0.01	0.16	0.14	–

Note: T1, Pre-social rejection paradigm; T2, Post-social rejection paradigm. Lifetime suicidal behavior: 0 = absent; 1 = present. Sexual identity: 0 = heterosexual; 1 = lesbian, gay, bisexual, queer, or questioning. Sex: 0 = female; 1 = male.

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

in the model ($\Delta R^2 = 0.02$, $p = 0.073$). Additionally, the interaction between discrimination and rejection sensitivity did not predict post-rejection levels of negative affect ($p > 0.05$).

DISCUSSION

Problem-solving deficits are associated with increased STB risk. However, problem-solving deficits are often conceptualized and studied as time- and/or context-invariant. Though not explicitly tested in prior studies, a nascent body of work suggests that social rejection may lead to temporary declines in problem-solving and greater negative affect, and that this relation may be stronger among individuals with experiences of discrimination and greater (vs. lower) rejection sensitivity. The present study used an experimental design to examine the relation between discrimination, rejection sensitivity, negative affect, and declines in problem-solving following social rejection.

Consistent with study hypotheses, rejection sensitivity and lifetime discrimination interacted to predict declines in problem-solving ability following social rejection. Specifically, individuals who reported rejection sensitivity *and* more (vs. less) lifetime discrimination experienced greater declines in problem-solving following Cyberball. To the author's knowledge, this study is among the first to examine these relations and adds uniquely to empirical work which suggests that pre-existing vulnerabilities may increase problem-solving declines following social rejection (Dixon-Gordon et al., 2011). These results are also consistent with theories that speak to the relation between discrimination, rejection sensitivity, and problem-solving (see Downey & Feldman, 1996; Feinstein, 2020; Nezu et al., 2019). Specifically, it is theorized that individuals with pre-existing vulnerabilities (i.e., greater rejection sensitivity and lifetime experiences discrimination) may need to utilize greater cognitive resources to downregulate their emotional response to future instances of rejection. However, under these conditions, individuals are temporarily unable to devote cognitive resources to problem-solving, leading to problem-solving deficits.

Contrary to study hypotheses, rejection sensitivity and lifetime discrimination did not interact to predict increases in self-reported negative affect following social rejection. This is seemingly inconsistent with existing research documenting the possible moderating role of lifetime discrimination on the relation between real-time rejection and negative affect (Livingston et al., 2020). However, Livingston et al. (2020) note the preliminary nature of this work, as findings were not significant due

TABLE 3 Hierarchical linear regression analysis summary for rejection sensitivity, lifetime discrimination, and the interaction predicting problem-solving ability following social rejection.

Step & predictor variables	β	$b(se)$	p	95% CI	R^2	ΔR^2	p
<i>Step 1</i>							
T1 Relevant means	0.64	0.62 (0.11)	<0.001	0.40, 0.84	0.40	–	<0.001
Depressive symptom severity	0.21	0.15 (0.09)	0.075	–0.02, 0.31			
Lifetime suicidal behavior	–0.03	–0.36 (1.69)	0.831	–3.76, 3.03			
General intelligence	0.14	0.39 (0.32)	0.224	–0.25, 1.03			
<i>Step 2</i>							
Rejection sensitivity	–0.13	–0.23 (0.24)	0.333	–0.71, 0.25	0.39	0.012	0.615
Lifetime discrimination	0.04	0.04 (0.13)	0.768	–0.22, 0.29			
<i>Step 3</i>							
Rejection sensitivity x lifetime discrimination	–0.27	–0.06 (0.03)	0.034	–0.12, –0.01	0.44	0.055	0.034

Note: Adjusted R^2 is presented. T1, pre-social rejection. Lifetime suicidal behavior: 0 = absent; 1 = present.

Abbreviation: CI, confidence interval for unstandardized regression coefficient.

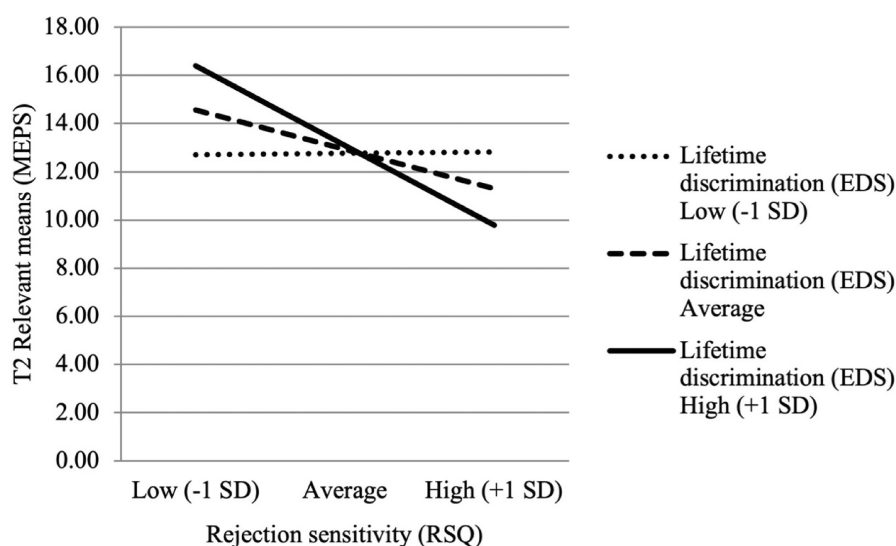


FIGURE 2 Simple slopes analysis for the relation between rejection sensitivity, lifetime discrimination, and problem-solving ability following social rejection. EDS, Everyday Discrimination Scale; MEPS, Means-End Problem-Solving Procedure; RSQ, Rejection Sensitivity Questionnaire; T2, post-social rejection. Slope of solid line is statistically significant. Slope of dashed lines are not statistically significant.

to a modest sample size. It is possible that the relatively ambiguous nature of the social rejection task and broad measure of negative affect employed may play a role in these null findings. Indeed, other research examining the relation between social rejection and negative affect found differing patterns in *types* of negative affect following exposure to an explicitly discriminatory rejection paradigm among minoritized individuals. For example, McGarrity et al. (2020) exposed sexual minority adults to two different social situations. In one condition, individuals were exposed to an “interviewer” (in reality, a pre-recorded voice) that was affirming of their sexual identity (i.e., the “pro-gay condition”). In the other condition, individuals were

exposed to an interviewer that was rejecting of their sexual identity (i.e., the “anti-gay condition”). Ratings of state anger and anxiety were gathered before and after exposure to the interview. After controlling for baseline levels of anger and anxiety, participants in the anti-gay condition experienced significantly greater anger, but not anxiety, relative to individuals in the pro-gay condition. Unlike the paradigm used by McGarrity et al. (2020), Cyberball does not provide implicit or explicit context for *why* a participant is being rejected (Williams et al., 2000). Thus, it is possible that participants in the current study may have attributed the rejection to factors other than a marginalized identity (or identities). Subsequently, the rejection

TABLE 4 Hierarchical linear regression analysis summary for rejection sensitivity, lifetime discrimination, and the interaction predicting negative affect following social rejection.

Step & predictor variables	β	<i>b</i> (<i>se</i>)	<i>p</i>	95% CI	R^2	ΔR^2	<i>p</i>
<i>Step 1</i>							
T1 Negative affect	0.85	0.79 (0.07)	<0.001	0.64, 0.95	0.79	–	<0.001
Depressive symptom severity	–0.04	–0.02 (0.05)	0.657	–0.13, 0.08			
Lifetime suicidal behavior	0.20	2.73 (0.91)	0.005	0.89, 4.57			
General intelligence	–0.05	–0.13 (0.17)	0.456	–0.47, 0.21			
<i>Step 2</i>							
Rejection sensitivity	0.16	0.26 (0.12)	0.034	0.02, 0.50	0.81	0.021	0.073
Lifetime discrimination	0.04	0.04 (0.06)	0.559	–0.09, 0.16			
<i>Step 3</i>							
Rejection sensitivity x lifetime discrimination	0.08	0.02 (0.02)	0.289	–0.01, 0.05	0.81	0.004	0.289

Note: Adjusted R^2 is presented. T1, pre-social rejection. Lifetime suicidal behavior: 0 = absent; 1 = present.

Abbreviation, CI, confidence interval for unstandardized regression coefficient.

may not have prompted significant shifts in *overall* NA. Unfortunately, participants in the current study were not asked about why they may have been rejected, precluding examination of this possibility. Future research with qualitative (i.e., asking participants why they believe they were rejected) and quantitative (i.e., measures of differing types of negative affect) components may help shed light on these null findings.

Clinical implications

Findings can be used to inform treatment practices with young adults at risk for suicide. Assessment of lifetime discrimination and rejection sensitivity may inform treatment planning. Indeed, existing research with minoritized young adults suggests that rejection sensitivity may be an important target of treatment (Pachankis et al., 2015). For instance, in a randomized controlled intervention trial, rejection sensitivity was found to concurrently decline along with depressive symptoms, alcohol use, and risky sexual behavior suggesting that it may play a role in mental health outcomes (Pachankis et al., 2015). Marginalized individuals may also benefit from psychoeducation on the interaction between discrimination and rejection sensitivity, and the impact that these constructs have on cognitive processes following social rejection. Specifically, it will be important to explain that social rejection may have an immediate negative impact on problem-solving abilities, particularly for those who tend to be more sensitive to rejection and have faced significant discrimination. Thus, it may be beneficial to avoid making decisions in the immediate aftermath of social rejection and instead to seek support or engage

in self-soothing activities until grounded. Additionally, if discrimination is conceptualized as a form of invalidation (see Cardona et al., 2021), dialectical behavior therapy skills, such as self-validation, may help marginalized individuals “recover” from such experiences (see Linehan, 1993/Linehan, 2015). Importantly, mental health treatments should not maintain a sole focus on helping minoritized individuals internally cope with social stressors (e.g., reappraise the stressor so it does not influence their self-worth). This approach risks faulting marginalized individuals for being too sensitive to discrimination (Meyer, 2020). Instead, treatments should balance work around responding to social stressors (e.g., seeking support, evaluating unhelpful beliefs that arise after discriminatory experiences, using self-validation skills) with open acknowledgement of discriminatory experiences and actions oriented toward reducing or eliminating sources of discrimination (Meyer, 2020).

Strengths, limitations, and future directions

The current study has significant strengths, including the use of well-validated measures, use of a diverse sample, and experimental design. Nevertheless, limitations exist that warrant discussion. First, though the current sample size provided enough power to detect study hypotheses, it did not allow for examination of the impact of intersectionality (e.g., holding a sexual and racial minority identity) on the relation between variables of interest. Specifically, some research suggests that minoritized individuals with more than one marginalized identity (vs. individuals with only one marginalized

identity) may experience greater risk for negative mental health outcomes, though findings are inconsistent (cf. Fox et al., 2020; Sattler & Zeyen, 2021; Wiglesworth et al., 2022). Relatedly, the current study focused solely on young adults. Research with adolescents or older adults suggests that social rejection may have a differential impact (cf. Blakemore, 2012; Liao et al., 2023). Second, while all participants were at elevated risk of suicidal behavior (i.e., experienced passive SI; see Liu et al., 2020), this was not a clinical sample and participants were all college students. Furthermore, this study was completed about 1.5 years into the COVID-19 pandemic, which necessitated significant use of teleconferencing technology in everyday life. These unique circumstances may have altered how individuals reacted to Cyberball. Thus, while existing work suggests that results from samples similar to one used in the present study may generalize to other populations (see Coppock et al., 2018), future in-person research with larger, clinical samples that include different age groups is needed to examine study questions and test the generalizability of study results. Third, negative affect was exclusively assessed using self-report. It is possible that psychophysiological measures (e.g., electrodermal activity) may have produced a differing pattern of results (see Gratz et al., 2019). Fourth, as we employed an experimental study design, we could not examine changes in SI in relation to the study variables. Thus, use of multimethod assessments of negative affect and SI in future studies that incorporate EMA, which facilitate study of SI in a naturalistic setting (Nock, 2016), may be of benefit. Last, while the current study used changes in positive affect as a manipulation check (Hartgerink et al., 2015), we did not examine the degree to which participants believed that study confederates were peers in the context of the experiment. Manipulation checks of this nature may have unintended consequences on study outcomes (e.g., increases skepticism about the stated purpose of the study; Hauser et al., 2018). Nevertheless, novel guidelines have been offered to increase the effectiveness of manipulation checks (see Ejelöv & Luke, 2020) and should be considered in future studies with similar designs.

Limitations notwithstanding, this study is among the first to examine how discrimination and rejection sensitivity interact to hinder problem-solving abilities following social rejection. Results suggest that addressing rejection sensitivity and discrimination within a therapeutic context may help reduce the negative impact of social rejection on problem-solving abilities among young adults at risk for suicide.

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CONFLICT OF INTEREST STATEMENT

None.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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ENDNOTES

ⁱ Due to technological issues or emergency scheduling conflicts, 9 of the 50 participants met only 1 confederate instead of 2. Sensitivity analyses (i.e., including a covariate that differentiated these participants from the rest of the sample) provided a similar pattern of results as those presented here. For parsimony, the results presented here do not include this covariate.

ⁱⁱ To explore the validity of this modified item, a correlation between this item and the item assessing frequency of suicidal ideation on the interview version of the C-SSRS was calculated. Results ($r=0.42$, $p=0.003$) parallel existing psychometric research on interview versus self-report measures of suicidal ideation (see Viguera et al., 2015).

ⁱⁱⁱ Though related, SI and suicide attempts are distinct constructs (Klonsky et al., 2016). Post hoc sensitivity analyses were run to determine if inclusion of SI as a covariate altered results. As the pattern of results remained unchanged, results presented here are with suicide attempts as a covariate for parsimony.

^{iv} Post hoc sensitivity analyses without depressive symptom severity, lifetime history of suicide attempts, and general intelligence as covariates in the two linear regression models were conducted to determine if our a priori approach significantly limited study power. An equivalent pattern of results was obtained, so the original analyses and results are presented here for transparency.

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