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# Hypervigilance to rejecting stimuli in rejection sensitive individuals: Behavioral and neurocognitive evidence

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ABSTRACT

Individuals who are high in rejection sensitivity are vigilant toward social cues that signal rejection, and they exhibit attention biases towards information that confirms expectations of rejection. Little is known, however, about the neural correlates of rejection sensitivity. The present study examined whether rejection sensitivity is associated with individuals' neural responses to rejection-relevant information. Female participants, classified as high or average in rejection sensitivity, completed a modified dot-probe task in which a neutral face was paired with either another neutral face or a gaze-averted ("rejecting") face while EEG was collected and ERP components were computed. Behavioral results indicated that average rejection sensitive participants showed an attention bias away from rejecting faces, while high rejection sensitive participants were equally vigilant to neutral and rejecting faces. High rejection sensitivity was associated with ERP components signaling elevated attention and arousal to faces. These findings suggest that rejection sensitivity shapes behavioral and neurocognitive responses to faces.



## 1. Introduction

Although everyone experiences social rejection at some point in their lives, individuals vary in the extent to which they are sensitive to potentially rejecting cues. Individuals who are high in rejection sensitivity (RS) "anxiously expect, readily perceive, and overreact" to cues of possible rejection from people in their social environment (Downey & Feldman, 1996, p. 1327). RS is a relatively stable characteristic and is hypothesized to develop in response to a history of painful rejections from significant caregivers (Downey & Feldman, 1996). High RS individuals draw on past experiences of rejection when making predictions about future experiences with relationship partners, expecting partners to reject them in times of need.

This history of rejection in close relationships shapes cognitive processing and contributes to biases in *attention* to possible experiences of rejection, *expectations of* rejection in relationships, and *interpretations of* ambiguous information as evidence of rejection. Indeed, a number of studies have found support for connections between RS and biases in these cognitive processes. For example, in an experimental study of interpersonal relationships among college students, Downey and Feldman (1996) found that high RS individuals were more likely than low RS individuals to perceive an ambiguous social event (i.e., a research study partner who, without explanation, no longer wants to continue in the study after meeting) as a sign of rejection. In other studies, RS has been linked to individual differences in attention to rejecting stimuli (e.g., Downey, Freitas, Michaelis, & Khouri, 1998; Levy, Ayduk, & Downey, 2001). For example, using an Emotional Stroop task paradigm, Berenson and colleagues (Berenson et al., 2009) found that RS was associated with disrupted attentional processes in the presence of words associated with social rejection. Interestingly, this attentional disruption was limited to trials with rejection words (e.g., ignored, disliked) and not trials with negative words that were unrelated to social rejection (e.g., cancer, disaster). In addition, Berenson et al. (2009) found that RS predicted attentional avoidance of angry faces in a visual probe task, again suggesting that RS disrupts social information processing in the presence of potential threat, particularly when the threat is rejection.

Little is known, however, about the neural correlates of RS. To date, only a handful of studies have examined the extent to which individuals differing in RS vary in their physiological responses to rejection-relevant information (e.g., Downey, Mougios, Ayduk,

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London, & Shoda, 2004). Downey and colleagues (Downey et al., 2004) examined connections between RS and the eyeblink startle response, an indicator of autonomic nervous system activation in response to threat. In this study, high and low RS individuals viewed a series of paintings that had been rated as depicting one of four themes, including acceptance or rejection (RS related), and positive or negative valence (non-RS related). Relative to low RS participants, high RS participants had a potentiated eyeblink startle response for pictures that were rated as high on the rejecting dimension, but they did not differ from low RS individuals in their startle responses during the positive, negative, or accepting picture trials. Further, in an fMRI study, Burklund, Eisenberger, and Lieberman (2007) found that, relative to low RS individuals, high RS individuals had greater activity in the dorsal anterior cingulate cortex in response to viewing facial expressions that portrayed disapproval – a facial expression that could signal impending rejection. Interestingly, these individual differences in brain activity were limited to disapproval faces, and not anger or disgust faces, suggesting that rejection, and not negativity more broadly, contributed to the changes in brain activation. The findings from these two studies suggest that RS is associated with physiological responses to cues of possible rejection, which is consistent with evidence that rejection sensitivity shapes cognitive biases to threatening stimuli.

Event-related potentials (ERPs) provide an opportunity to examine brain activity corresponding to cognitive and affective processes occurring in the context of social information processing about rejection cues. ERPs measure *continuous* processing, have excellent temporal resolution, and reflect responses to distinct events or experiences (see Luck, 2006). In addition, because ERPs are sensitive to the chronometry of cognitive and affective processing, the amplitudes of a number of ERP components illustrate changes in cognitive processing associated with emotional experiences (Vogel & Luck, 2000). ERPs are time-locked to distinct events and can "pinpoint the time at which attention begins to influence processing" (Luck, 2006, p. 192). To date, no study of RS has incorporated the use of ERP methodology.

The goal of the present study was to explore the cognitive and psychophysiological correlates associated with RS. Specifically, we examined whether individuals high in RS differed from non-RS individuals in the extent to which they exhibited increased attention (i.e., attention bias) toward rejecting faces. In addition, we examined whether this attentional difference would be accompanied by differential ERP amplitudes in components that reflect early attentional processing of emotional stimuli.

We chose to focus on three ERP components that reflect early and relatively automatic attentional processes (for a review, see Luck, 2006). The first component, P1, is a positive-going component elicited within the first 100 ms of presentation of stimuli and largest at the occipital electrodes. Differences in P1 amplitudes reflect attentional and arousal differences in early-stage perceptual processing, rather than differences in complex cognitive processing (Luck, 2006). Thus, given evidence that high RS individuals exhibit attention biases for threatening stimuli (Berenson et al., 2009), we expected that increased attention to potentially threatening stimuli would be associated with greater P1 amplitude in the high RS group (relative to the average RS group). The second component, N1, is an early negative-going visual component appearing just after the P1 and also found at occipital sites. Greater amplitudes for this component have been linked to an ability to discriminate between stimuli (e.g., Mangun, 1995; Vogel & Luck, 2000). Given the N1's role in attention, we hypothesized that these two groups would differ in their mean N1 amplitude. Lastly, we examined the P2 component, which is associated with sensitivity and hypervigilance toward threatening stimuli (Bar-Haim, Lamy, & Glickman, 2005). Because individuals who are high in RS are hypervigilant for signs of possible rejection, we hypothesized that P2 amplitude would differ as a function of RS.

## 2. Method

### 2.1. Participants

Thirty female young adult participants ($M_{age}$ = 19.9, $SD$ = 2.7) participated in this study. In light of evidence that high RS women exhibit rejection-related cognitions and behaviors that differ from men (e.g., rumination, jealousy; Downey & Feldman, 1996), we focused on recruitment of females. University students who voluntarily enrolled in a participant database were pre-screened for RS using the *Rejection Sensitivity Questionnaire* (*RSQ*; Downey & Feldman, 1996). Individuals who scored in the top 20th percentile or in the 40–60th percentile were invited to participate and were identified as either *high rejection sensitive* ($N$ = 16; $M_{RSQ}$ = 13.56, $SD$ = 2.41) or *average rejection sensitive* ($N$ = 14; $M_{RSQ}$ = 8.55, $SD$ = .68), respectively. These two groups significantly differed in their RS, $t(28) = -7.51$, $p < .001$. Three participants from the average group were excluded from behavioral analyses due to problems successfully completing the task (e.g., inaccuracy and drowsiness), resulting in a sample of 27 participants for analysis of behavioral responses during the dot-probe task.

### 2.2. Measures

#### 2.2.1. Rejection sensitivity questionnaire

As noted above, participants were pre-screened using the widely used RSQ (Downey & Feldman, 1996). The RSQ ($\alpha$ = .86) consists of 18 items describing social situations where rejection by another person is possible (e.g., "*You approach a close friend to talk after doing or saying something that seriously upset him/her*"). Following each hypothetical situation, participants are asked to rate (a) how concerned or anxious they would be about the situation and (b) how likely or unlikely they think the chances are of obtaining a positive outcome or acceptance by the person. Scores are generated by multiplying participants' amount of concern by the reverse score of their expectations of acceptance for each item. Participant responses are averaged across the 18 situations, and possible scores range from 1 (*low RS*) to 36 (*high RS*) (scores over 18 are generally rare). As reported by Downey and Feldman (1996), this measure has excellent psychometric properties, including test–retest reliability and construct validity.

#### 2.2.2. Dot-probe experimental stimuli

The face stimuli included photographs of 34 individuals (17 female) maintaining a neutral facial expression (with closed mouth) and both facing and looking forward (*neutral*; these images served as our control) or facing forward with eyes averted to the left or right (*gaze-averted*; see Fig. 1). These stimuli were created for the present study because we predicted that gaze-averted faces would be a signal of potential rejection. In order to verify this hypothesis, 29 undergraduate students (who did not participate in the full study) completed the RSQ and rated how rejecting they viewed each face on a scale of 1 (*not at all rejecting*) to 7 (*very rejecting*). These students were blind to the hypothesis and did not know the individuals in the pictures. A repeated measures ANOVA with rejection sensitivity as a covariate revealed that averted gaze pictures were rated as more rejecting than neutral pictures, $F(1, 27) = 24.4$, $p < .001$, $\eta_p^2 = .48$, and this effect did not differ as a function of participants' rejection sensitivity, $F(1, 27) = .57$, $p = .46$.

Two faces were presented adjacent to each other on a 17" monitor placed approximately 0.5 m from the participant. All images