Rejection sensitivity and executive control: Joint predictors of borderline personality features ☆

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Abstract

Two studies tested the hypothesis that rejection sensitivity (RS) and executive control (EC) jointly predict borderline personality (BP) features. We expected high RS to be related to increased vulnerability for BP features specifically in people who also had difficulties in executive control (EC). Study 1 tested this hypothesis using a sample of college students ($N = 379$) whereas Study 2 ($N = 104$) was conducted using a community sample of adults. Both studies operationalized EC by a self-report measure. For a subsample in Study 2 ($N = 80$), ability to delay gratification at age 4 was also used as an early behavioral precursor of EC in adulthood. In both studies, high RS was associated with increased BP features among people low in self-reported EC. Among those high in self-reported EC, the relationship between RS and BP features was attenuated. Study 2 found parallel findings using preschool delay ability as a behavioral index of EC. These findings suggest that EC may protect high RS people against BP features.
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1. Introduction

Borderline personality (BP) disorder presents a significant public health problem that is notoriously costly and challenging to treat, affecting 1–2% of the general population and occurring at 10 times that rate in clinical samples (Skodol et al., 2002). According to DSM-IV (American Psychiatric Association, 2000), BP disorder is characterized by impulsive and self-injurious behavior, extreme fluctuations in mood and sense of self, and volatile relationships involving both desperate efforts to connect to others and intense, inappropriate anger at them. The condition is virtually synonymous with chaos and crisis for the individual and others in his or her path. Not surprisingly, BP disorder also complicates the course of other disorders (Meyer, Pilkonis, Proietti, Heape, & Egan, 2001). Although much research on BP has focused on clinical populations there is now ample evidence that, in non-clinical samples, individuals who endorse significant levels of BP features subsequently show considerable impairments in occupational and social adjustment (e.g., Bagge et al., 2004; Daley, Burge, & Hammen, 2000; Trull, Useda, Conforti, & Doan, 1997). Therefore, increased understanding of the processes that give rise to overt features of this serious and costly disorder is a prerequisite to developing effective interventions.

Toward this goal, research on BP and other personality disorders has begun to draw productively on basic research in personality. Within this approach, our research focuses on two personality processing dispositions: (1) rejection sensitivity (RS) is the disposition to defensively or anxiously expect, readily perceive, and intensely react to rejection in situations where rejection is possible (Downey & Feldman, 1996). (2) Executive control (EC) is the ability to override prepotent, reflexive reactions in favor of less accessible, subdominant responses (Casey, Tottenham, & Fossella, 2002; Botvinick, Braver, Barch, Carter, & Cohen, 2001; Posner and Rothbart, 2000). In the present research, we propose that a combination of high RS and low EC can generate the constellation of features comprising the BP. Specifically, we propose that for high RS people, rejection cues activate anxious rejection expectations, leading to a readiness to perceive rejection and overreact in maladaptive ways that are characteristic of BP disorder, including intense hostility, depression, substance abuse, bulimia and other forms of impulsive self-harm. In contrast, high RS people who are also high in EC should be able to increase access to cognitive, "cool" processes that enable reflection and rational problem solving (see Metcalfe & Mischel, 1999, for review) and inhibit these reflexive, "hot" responses.

2. BP features and RS

Clinical accounts and research depict individuals with BP disorder as prone to amplifying minor disagreements and interpreting them as personal attacks, which then readily translate into impulsive, destructive behavior towards the self as well as others (e.g., Dutton, 1994, 1995). These dynamics of BP are strikingly similar to social–cognitive accounts of people who are high in RS (Downey & Feldman, 1996). The RS model draws from interpersonal theories of personality, attachment theory and attributional accounts of interpersonal cognition and affect in proposing an account of how early or repeated experiences of rejection, exclusion or neglect lead people to develop anxiety and fear about the possibility of future rejection as well as the expectation that such rejection is inevitable (Downey, Khouri, & Feldman, 1997; Feldman & Downey, 1994). These *anxious expectations of rejection* form the core component of the RS dynamic in both its conceptualization and operationalization (Downey & Feldman, 1996).

Our research to date has shown that people high in RS—those who anxiously expect interpersonal rejection—are hyper-vigilant for rejection cues and show a readiness to perceive intentional hurt in significant others' ambiguous or even innocuous behavior (see Pietrzak, Downey, & Ayduk, 2005, for review). For example, in laboratory situations, people high in RS feel more rejected if an interaction partner leaves the interaction prior to completing the study (Downey & Feldman, 1996, Study 2). High RS people are also more likely to see intentional rejection in the insensitive behavior of new romantic partners (Downey & Feldman, 1996, Study 3).

In addition to such a readiness to perceive rejection, high RS people show a tendency to respond to rejection with greater negativity. To illustrate, high RS people show a greater potentiation of their startle reflex than low RS people while viewing rejection-related stimuli, indicating an automatic elicitation of the fight-or-flight responses by rejection cues (Downey, Mougios, Ayduk, London, & Shoda, 2004). Consistently, high RS women are more likely to get into fights with their partners if they had felt highly rejected the day before (Ayduk, Downey, Testa, Yen, & Shoda, 1999; Study 3) and to engage in both verbal and non-verbal hostility towards their partners in conflict discussions (Downey, Freitas, Michaelis, & Khouri, 1998; Study 2). Similarly, high RS men report greater incidence of being physically violent towards their partners than low RS men if they are also high in intimacy seeking (Downey, Feldman, & Ayduk, 2000). The destructive reactions of high RS people lead to a self-fulfilling prophecy, undermining both their relationships and their own mental health (Ayduk, Downey, & Kim, 2001; Downey et al., 1998; Study 1).

The considerable overlap in the processes that underlie BP and RS is consistent with fear of abandonment being a core diagnostic feature of BP in the DSM-IV. It is also consistent with growing evidence documenting the high prevalence of insecure attachment style in BP patients (e.g., Fonagy, Target, Gergely, Allen, & Bateman, 2003; Holtzworth-Munroe & Stuart, 1994; Levy, 2005; Levy, Meehan, Weber, Reynoso, & Clarkin, 2005; Nickell, Waudby, & Trull, 2002). A recent review of existing studies on attachment and BP disorder concludes that there is a strong association between insecurity of attachment and BP with most patients showing disorganized, fearful, or preoccupied orientations (Agrawal, Gunderson, Holmes, & Lyons-Ruth, 2004). Finally, high RS and BP disorder may share a similar etiology in abusive, and rejecting family environments (e.g., Feldman & Downey, 1994; Downey et al., 1997; Rogosch & Cicchetti, 2005; Zanarini, Gunderson, Marino, & Schwartz, 1989). Feldman and Downey (1994) showed an association between childhood exposure to family violence (i.e., frequency and severity of parent-to-parent and parent-to-child physical aggression) and high RS in early adulthood. Similarly, childhood precursors of BP disorder are more common among maltreated children compared to controls (Rogosch & Cicchetti, 2005).

3. BP and EC

EC has been conceptualized as the ability to override habitual, automatic reactions in favor of less dominant but situation appropriate responses in a voluntary and effortful manner (e.g., Botvinick et al., 2001; Casey et al., 2002). Posner and colleagues' neurobiological model of attention (e.g., Posner & Rothbart, 2000; Posner & Dehaene, 1994) discusses a voluntary *anterior attentional system* that is thought to serve executive control function in overriding prepotent habitual thought patterns, inhibiting dominant behavioral tendencies, and monitoring conflicts and errors. This system is regulated by the neural circuitry of the prefrontal cortex and the basal ganglia (e.g., Casey et al.,

2002). Because EC involves effortful and voluntary modulation of attention, it has also been referred to as effortful control or attentional control (Derryberry & Reed, 2002).

Converging evidence from neuropsychological research suggests that impairments in EC may also be important markers for BP disorder (e.g., Clarkin & Posner, 2005; Lenzenweger, Clarkin, Fertuck, & Kernberg, 2004). BP patients (Posner et al., 2002) as well as children scoring high on BP precursors (Rogosch & Cicchetti, 2005) show deficits in conflict resolution, an ability associated with EC, compared to matched controls in the Attention Network Task (ANT). More specifically adults with BP disorder and children with BP precursors tend to be slower in correctly indicating the direction of a target arrow in incompatible trials (when the target and the distracter flankers go in the opposite direction) compared to compatible trials (when the target and distracter flankers go in the same direction). Furthermore, among BP patients, high self-reported EC is associated with a reduced susceptibility to cognitive conflict (Posner et al., 2002) and better self-reported interpersonal and personal functioning (Hoermann, Clarkin, Hull, & Levy, 2005).

Others have also found BP pathology to be related to deficits in the orienting response on the ANT task (Fertuck, Lenzenweger, & Clarkin, 2005) and to problems with behavioral response inhibition (Nigg, Silk, Stavro, & Miller, 2005). Adding to the evidence linking BP disorder to attentional problems, a recent review reports a systematic co-occurrence of BP disorder and ADHD in adulthood (Davids & Gastpar, 2005). Finally, research on personality traits shows BP features to be positively correlated with dispositional impulsivity (e.g., Critchfield, Levy, & Clarkin, 2004; Trull, 1992).

4. BP as a joint effect of RS and EC

The literature reviewed so far clearly indicates a similar processing dynamic between high RS and BP. Moreover, recent theoretical models and empirical evidence in cognitive and neurobiological approaches indicate a significant association between BP disorder and difficulties in the higher order frontal control of cognitive representation, emotion, and behavioral inhibition. No study to date, to our knowledge, however, has tested the hypothesis that high RS and problems in EC interactively predict increased risk for BP features. The goal of the current research was to test this moderation hypothesis. Specifically, we reasoned that despite the overlap in important characteristics of RS and BP, not everybody who fears and expects rejection should be equally vulnerable to developing BP features. We hypothesized that to the extent that RS individuals are high in EC, the link between RS and BP features should be attenuated. For these individuals, EC should enable them to override prepotent habitual thought patterns (e.g., interpreting ambiguous cues as intentional rejection) and to inhibit dominant and maladaptive behavioral tendencies (e.g., defensive reactions when they do perceive rejection).

Several lines of theorizing and evidence are consistent with this moderation hypothesis. In previous research (Ayduk et al., 2000), we examined children's ability to delay gratification (i.e., minutes waited for a larger, preferred delayed outcome in favor an immediately available but smaller, less preferred reward) in the classic preschool delay of gratification paradigm (see Mischel, Shoda, & Rodriguez, 1989; for review) as a protective factor against high RS. An extensive literature shows that performance in the classic delay task in preschool taps into a general competency to disengage attention from emotional information that typically induces a here-and-now mindset and to override automatic responses in favor of more contemplative behaviors that consider long-term consequences

(see Mischel & Ayduk, 2004 for review). Our findings indicated that high RS was related to low self-esteem and ineffective coping at age 28 only among participants who had difficulty delaying gratification at age 4 (Ayduk et al., 2000, Study 1). Likewise, we found that high RS middle school children showed lower self-esteem and more impaired social functioning (e.g., aggression, peer rejection) than low RS children to the extent that they were less able to delay gratification (Ayduk et al., 2000, Study 2).

Similar to the moderation hypothesis proposed here, Judd (2005) has also argued that neurocognitive impairment (either genetic or acquired abnormalities in brain functioning) exacerbates the negative effect of insecure attachment on metacognitive processes such as self-reflection and perspective taking, which are some of the key mechanisms impaired in BP disorder.

5. Present studies

We conducted two studies to examine the hypothesis that EC moderates the association between RS and BP features. Study 1 was conducted using a sample of college students whereas Study 2 was conducted using a sample of community adults in their mid to late 30s. Both studies operationalized EC by the Attentional Control Scale (Derryberry & Reed, 2002)—a self-report measure that was designed to tap into the voluntary control functions of the anterior attentional system and that has been validated against both behavioral and neural mechanisms of EC (see Study 1 measures for details).

In each study we also examined secondary issues. Study 1 addressed the question of whether it is specifically fear and expectation of rejection that predicts BP features or whether general negative affect predicts BP. To achieve this goal, Study 1 assessed participants on trait neuroticism, which is conceptually and empirically related to RS (Downey & Feldman, 1996). However, whereas neuroticism captures a global tendency for negative affect and emotional instability, RS is narrower in its scope, tapping specifically into increased anxiety over anticipated rejection.

Study 2, in contrast, included additional behavioral data on EC. Because this study was part of an ongoing longitudinal project that had data on preschool delay of gratification behavior from age 4 (see Mischel & Ayduk, 2004 for review) we were able to test the interaction hypothesis in a subset of the participants with this behavioral index assessed approximately 30 years earlier. An extensive literature shows that children's ability to wait for preferred but delayed rewards in this paradigm reflects their ability to inhibit the use of "hot" strategies (e.g., fixing attention on the rewards or thinking about their motivational aspects such as their taste) while engaging in cool strategies (e.g., self-distraction) that reduce arousal and frustration. Therefore, we conceptualized preschool delay times as tapping into EC (i.e., attentional and inhibitory control). Not only is there strong evidence indicating a link between delay ability and EC, recent evidence also suggests effective attention management during delay (i.e., inhibition of hot strategies) predicts EC abilities years later in adolescence on a Go/No-go task, a standard paradigm tapping into EC (Eigsti et al., 2006).

Because participants in both studies were relatively high functioning, we did not expect to observe or to predict clinically significant levels of BP features. However, we reasoned that to the extent that personality disorders such as BP disorder are extremes of normally distributed personality dispositions (Rothschild, Cleland, Haslam, & Zimmerman, 2003), the hypothesized joint effect of RS and EC should be visible for BP features even in our non-clinical samples. In this regard, this study also aimed to add to the growing literature

on dimensional approaches to personality disorders that describe them in terms of levels of basic personality traits such as impulsivity, inhibition and negative affectivity (e.g., Siever & Davis, 1991; Trull, Widiger, Lynam, & Costa, 2003).

6. Study 1

6.1. Sample and procedure

Participants were 379 (64.6% women) Berkeley undergraduates who filled-out a series of background questionnaires during the first session of a larger study that is unrelated to the goals of the current research. The mean age was 21.21 ($SD = 3.57$). Participants completed the questionnaires individually using computers typically in sessions including 1–4 participants. The ethnic background of the sample was 54.50% Asian, 24.60% Caucasian, 7.41% Hispanic, 1.32% African-American and 12.17% other.

6.2. Measures

6.2.1. Rejection sensitivity

RS was measured by the Rejection Sensitivity Questionnaire (RSQ; see Downey & Feldman, 1996 for details), which includes 18 hypothetical scenarios in which an individual makes a request to a significant other that makes him/her vulnerable to rejection (e.g., asking someone out on a date; asking monetary help from one's parents). For each scenario, participants indicate (i) their degree of anxiety/concern over the possibility that the other person(s) will respond negatively to their request (anxiety over anticipated rejection; scale: 1, very unconcerned; 6, very concerned) and (ii) their subjective likelihood estimate that the person(s) in each scenario will actually respond positively to their request (expectations of acceptance; scale: 1, very unlikely; 6, very likely). After acceptance expectations are reversed to index rejection expectations, they are multiplied with anxiety ratings for each scenario. Ratings of anxious expectations of rejection are then averaged across the 18 scenarios to index people's overall RSQ scores (sample $\alpha = .84$). In this sample the mean RSQ score was 9.16 ($SD = 2.99$; range: 1.27–20.33), with no significant sex differences ($t < 1$).[1]

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[1] Because prior research shows no ethnicity differences in the RSQ (Mendoza-Denton, Purdie, Downey, Davis, & Pietrzak, 2002), and the PAI-BOR (Trull, 1995) scores in college students we had no a priori reason to include ethnicity in the main analyses. Nevertheless, exploratory analyses were conducted to examine the relationship between ethnicity and key variables of the study. Because there were only five African-American participants in the sample and ethnicities of other origin is a highly heterogeneous group on which we did not have specific information, we restricted these analyses to Asian-Americans ($n = 206$), Hispanics ($n = 28$), and Caucasians ($n = 93$). There were significant ethnicity differences in the mean scores for RS ($F(2, 324) = 6.73, p < .001$), EC ($F(2, 324) = 4.53, p = .01$) and Neuroticism ($F(2, 324) = 5.46, p = .005$) but not on BP features ($F < 1$). Asians ($M = 9.67, SD = 2.73$) were higher in RS than Hispanics ($M = 8.28, SD = 3.20; t = 2.39, p < .02$) and Caucasians ($M = 8.53, SD = 3.09; t = 3.19, p < .002$) whom did not differ from one another ($t < 1$). Hispanics ($M = 2.51, SD = .72$) were lower in Neuroticism than Asians ($M = 3.03, SD = .76; t = 3.28, p < .001$) and Caucasians ($M = 3.01, SD = .85; t = 2.93, p < .004$) whom did not differ from one another ($t < 1$). Finally, on EC Asians ($M = 2.56, SD = .44$) were significantly lower than Caucasians ($M = 2.72, SD = .43$) but Hispanics ($M = 2.70, SD = .41$) were not different from either group ($ts < 1.53, ps > .13$). Given these differences, we formally tested whether the RS × EC interaction stayed significant when participants' ethnicity was controlled and it did. Furthermore, ethnicity did not moderate the RS × EC interaction (RS × attention × ethnicity: $F < 1$). These results did not change when African-American and other ethnicity participants were also included. Therefore, ethnicity was not included in the main analyses reported.

6.2.2. Executive control

EC is a broad construct that encompasses multiple overlapping processes (i.e., attentional, representational, and motoric control). In this study, we operationalized EC in terms of attentional control because an adult questionnaire measure (the Attentional Control Scale—ACS, Derryberry & Reed, 2002) validated against behavioral and neural systems associated with EC was readily available. The original scale includes 20 items related to attention focusing (e.g., My concentration is good even if there is music in the room around me) and attention shifting (e.g., After being distracted or interrupted, I can easily shift my attention back to what I was doing) and flexible control of thought (e.g., I can become interested in a new topic very quickly if I need to). The scale has been shown to have good internal reliability (i.e., $\alpha = .88$) and to predict resistance to interference in Stroop-like spatial conflict tasks as well as attentional disengagement from threat stimuli among highly anxious people (Derryberry & Reed, 2002). Similarly, Gyurak and Ayduk (2007) showed that although rejection cues tend to automatically activate physiological threat (i.e., eye-blink startle response) in people with low self-esteem, this tendency was attenuated if they scored high on the ACS. Furthermore, Mathews, Yiend, and Lawrence (2004) reported that scores on the ACS were positively associated with activation in brain areas related to top–down regulation of emotion (i.e., rostral anterior cingulate) while looking at fear-related compared to neutral pictures.

To shorten the length of the questionnaire package participants were asked to complete in the current study, we included only 12 items with the highest item-total correlations with the 20-item full-scale scores based on data from a previous pilot study (Downey & Ayduk, 2002) with the 12-item short version correlating at $r(294) = .96$ with the full-scale scores.[2] Ratings were made on a 4-point scale (1, almost never; 2, sometimes; 3, often; 4, always) and scores were calculated by summing ratings across all items (after responses were reverse scored when appropriate; $\alpha = .77$). The mean in the current sample was 2.63 ($SD = .43$). There were no significant sex differences ($t < 1$). Scores on the ACS were negatively correlated with the RSQ scores ($r(377) = -.25$, $p < .0001$).

6.2.3. Neuroticism

Trait neuroticism was measured by the neuroticism subscale of the Big-Five Inventory—44 (BFI-44, John & Srivastava, 1999), a brief measure of the Big-5. The neuroticism subscale includes eight items that assess depression, anxiety, and emotional instability (e.g., "I am someone who is depressed", "I am someone who can be moody"). Ratings were done using a 5-point scale (1, disagree strongly; 3, neither agree nor disagree; 5, agree strongly). The mean score in this sample was 2.97 ($SD = .79$; $\alpha = .84$). Consistent with the literature (see John & Srivastava, 1999), women ($M = 3.08$, $SD = .78$) were significantly higher in neuroticism than men ($M = 2.76$, $SD = .76$; $t(377) = 3.94$, $p < .0001$).

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[2] In a pilot study (Downey & Ayduk, 2002) the 12-item version of the ACS used in Study 1, the 6-item version used in Study 2 and full-scale scores on the ACS were all significantly and similarly related to other constructs relevant to self control such as conscientiousness (John & Srivastava, 1999; all rs between .26 and .30) and ego-resiliency (Block & Kremen, 1996; all rs between .21 and .33). The three indices also related significantly and similarly with measures of emotional vulnerability such as neuroticism (all rs between $-.39$ and $-.37$), self-silencing (Jack & Dill, 1992; all rs between $-.39$ and $-.37$), and the use of destructive responses in accommodation dilemmas with romantic partners (Rusbult, Verette, Whitney, Slovik, & Lipkus, 1991; all rs between $-.24$ and $-.20$). These findings establish the construct validity of the short versions of the ACS used in the present research.

Neuroticism was significantly correlated both with RSQ ($r(377) = .31$, $p < .0001$) and ACS ($r(377) = -.38$, $p < .0001$) scores.

6.2.4. BP features

The Personality Assessment Inventory—Borderline Features Scale (PAI-BOR; Morey, 1991) was used to measure BP features. PAI-BOR consists of 24 items that assess the four core components of BP disorder: affective instability, negative interpersonal relationships, identity problems, and self-harm (primarily impulsivity rather than suicidality). The measure is internally reliable (e.g., $\alpha = .84$) and the scores on the full scale have been established as a valid measure of BP features in non-clinical samples (Trull, 1995). To the extent that college students score high on the measure, they show poorer academic achievement and more social maladjustment over a subsequent two-year period, independent of gender and initial Axis and Axis II psychopathology (Bagge et al., 2004).

Participants rated themselves on a 4-point scale (0, false; not at all true; 3, very true). In this sample, the scale had good internal reliability ($\alpha = .87$) with a mean total score of 26.02 ($SD = 10.70$; range: 4–60). There were no significant sex differences in BP features ($t < 1$). Fourteen and a half percent of the sample scored above 38, which has been used as cutoff for diagnosing the presence of clinically significant BP features in prior research (e.g., Trull, 1995).

6.3. Results

We first assessed the zero-order correlations between our predictors and BP features. As would be expected, BP features were positively associated with RS ($r(377) = .29$, $p < .0001$) and neuroticism ($r(377) = .57$, $p < .0001$) and negatively with EC ($r(377) = -.37$, $p < .0001$). When all predictors were entered into General Linear Models (GLM) analysis as main effects, each predictor continued to explain unique variance in BP features while controlling for the effect of the other two (all $Fs > 5.52$, all $ps < .02$).

Next, to examine our critical moderation hypothesis, we conducted GLM analysis on BP features with RS, EC and the interaction between them as predictors, while controlling for neuroticism. All predictors were centered on their grand mean following Aiken and West's (1991) recommendation. Fig. 1 illustrates the results from this analysis. Parameter estimates used to plot the results can be found in the notes section of Fig. 1.

As expected the RS × EC interaction was significant ($b = -.89$, $F(1, 374) = 7.98$, $p = .005$; effect size $r = .14$). Simple slopes analyses (Aiken & West, 1991) indicated that among people low in EC (i.e., 1SD below the mean) RS was positively related to BP features ($b = .66$, $t(374) = 3.54$, $p = .005$) whereas among people high in EC (i.e., 1SD above the mean), RS was not significantly related to BP features ($b = -.11$, $t < 1$, $p > .60$). Furthermore, among high RS people (i.e., 1SD above the mean), EC was negatively associated with BP features ($b = -6.90$, $t(374) = 4.67$, $p < .0001$). In contrast, among low RS people (i.e., 1SD below the mean), EC was unrelated to BP features ($b = -1.59$, $t(374) = 1.12$, $p = .26$). These results did not differ by sex (sex × RS × EC interaction, $F < 1$).

7. Study 2

Study 1 found the expected interaction between RS and EC such that high RS individuals were higher in BP features than low RS people if they were also low in attentional
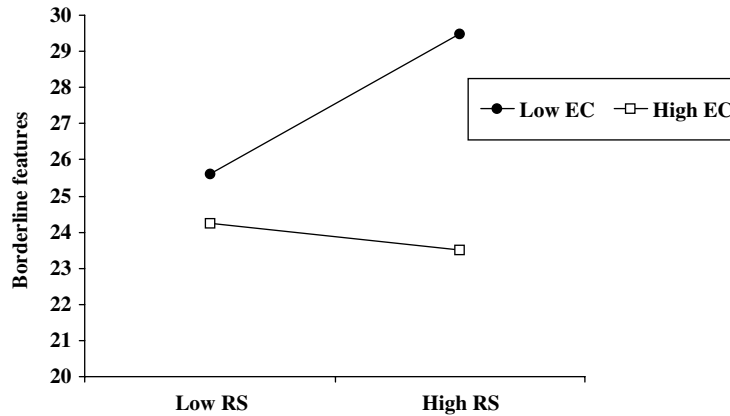
Fig. 1. Borderline personality (BP) features a function of rejection sensitivity (RS) and executive control (EC) in Study 1. *Notes.* Predicted values were computed using the following estimates from the GLM analysis. BP = $25.73 + 6.60$ (Neuroticism)*** $+ .27(RS)^{\dagger} - 4.24(EC)^{***} - .089(RS \times EC)^{**}$. *** $p \leqslant .001$, ** $p \leqslant .01$, * $p \leqslant .05$, $^{\dagger} p \leqslant .10$.

control but not if they were high in attentional control. Study 2's aims were to replicate this finding and examine its generalizability in a sample of community adults also low in demographic-risk for maladjustment. A second goal of Study 2 was to examine the critical moderation hypothesis using preschool delay ability as a behavioral measure of EC.

7.1. Sample and procedure

Participants were drawn from a population of subjects who participated in various psychological studies as toddlers and preschoolers while attending Stanford University's Bing Nursery School between 1968 and 1972 (see Mischel et al., 1989 for review). Sixty percent of the children from the Nursery School had completed Mischel's classic delay of gratification task at the age of 4. Children from this population have been continuously followed-up in the last 20 years in a longitudinal study on social and cognitive development across the lifespan (see Mischel & Ayduk, 2004 for review). As part of this ongoing longitudinal project, a new follow-up wave was initiated in 2003 and those whose current address was available ($N = 306$) were sent an initial invitation letter and a demographics form. Those who responded affirmatively to this invitation ($n = 205$) were then sent several questionnaire packages approximately 6 months to a year later that included the PAI-BOR, an adult version of the RSQ, and the ACQ. Participants who completed all three of these questionnaires form the focus of the current study ($N = 104$, 66 women, 38 men). Delay of gratification data from age 4 was available for 80 of these participants.

At the time of the initial mailing, the mean age in this sample was 38.88 years ($SD = 2.01$, range: 34–42.66). Of the sample, 76.70% was married or engaged and another 11.65% was in unmarried relationships, and 65.69% had at least one child. All but two had

college or graduate degrees (36.54% Bachelors, 34.62% Masters, 26.92% Ph.D., J.D. or M.D.). Majority of the participants were of Caucasian origin.[3]

7.2. Measures

7.2.1. Rejection sensitivity

The scenarios in the RSQ (Downey & Feldman, 1996) were developed to be relevant primarily to college students' rejection–acceptance concerns (e.g., asking friends for help with school work, asking parents for money). For the present sample of community adults, six of the items from the RSQ were edited to reflect age appropriate rejection–acceptance concerns in adults (i.e., You ask a friend to do you a favor; You ask your significant other if he/she really loves you; After a bitter argument, you tell your significant other that you want to talk to him/her; You ask someone at work or from your neighborhood to coffee; You approach a close friend to talk after doing or saying something that seriously upset him/her; You ask a family member for a loan to help you get through a difficult financial time). Participants were told to answer items involving romantic partners with respect to their current partner and if not currently involved, with respect to how they generally react in close relationships. Similar to the original RSQ, participants indicated their level of anxiety about the possibility of rejection (1, very unconcerned; 6, very concerned) and expectations of acceptance (1, very unlikely; 6, very likely). RSQ scores were computed by multiplying anxiety ratings and rejection expectations for each scenario and then averaging them across the six scenarios ($\alpha = .67$).

The mean RSQ score in this sample was 7.38 ($SD = 3.69$). RSQ scores were not related to any of the demographic variables (all $ps > .26$) including participants' sex (women = 0 vs. men = 1; $r(102) = -.05$), relationship status (uninvolved = 0 vs. involved = 1, $r(102) = .05$), parental status (without kids = 0 vs. with kids = 1, $r(102) = -.11$), and their age ($r(102) = -.04$).

7.2.2. Executive control

EC was again measured by selected items from the ACS (Derryberry & Reed, 2002). To reduce questionnaire load, we included only six items (four of which overlapped with the 12-item version used in Study 1) that had shown good item-total correlations with full-scale scores in a previous pilot with college students (Downey & Ayduk, 2002). In this pilot, the 6-item short version correlated at $r(294) = .83$ with the full-scale scores and at $r(294) = .85$ with the 12-item composite used in Study 1.

Participants rated themselves using the same 4-point scale as in Study 1 (1, almost never; 4, almost always). In this sample, the 6-item scale had acceptable reliability ($\alpha = .64$). The mean score was 3.09 ($SD = .47$). ACS scores were not significantly related to any of the demographic variables (all $ps > .31$) including participants' sex ($r(102) = -.10$), relationship status ($r(102) = -.05$), parental status ($r(102) = .04$), and

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[3] Because the population from which the sample of Study 2 has been drawn from was overwhelmingly Caucasian (i.e., children of Stanford University professors and staff in the 1960s and 1970s), systematic data on participants' ethnicity have not been collected either on the larger sample who have completed the delay studies at age 4 or in those participants who have been followed up since then. However, in a new follow-up just completed in a subsample of the population from which Study 2 participants were drawn ($n = 41$), all participants indicated to be of Caucasian origin.

their age ($r(102) = .07$). Scores on the ACS and RSQ were negatively correlated with each other ($r(103) = −.24, p = .01$).

7.2.3. Preschool delay of gratification ability

Details of this procedure and the computation of the scores can be found in Ayduk et al. (2000). Briefly, delay of gratification ability was assessed through the basic self-imposed waiting paradigm (see Mischel et al., 1989 and Mischel & Ayduk, 2004 for reviews). Seated at a table with a desk bell, each child was asked by an experimenter to choose between a small or large pile of rewards (e.g., cookies, pretzels, marshmallows). After having established a preference for the larger reward, children were told that the experimenter needed to leave for a while and that they can continue to wait for the larger reward until the experimenter comes back on his/her own, or they were free to ring a little bell to summon the adult at any time and immediately get the smaller treat at the expense of getting the larger preferred reward. After assessing the child's comprehension of the contingency, the experimenter left the room and returned in 15 min or earlier if the child rang the bell, left the seat, or began to eat the reward.

Most children participated in multiple delay experiments that differed in the type of instructions given to them and in whether the rewards were visible or covered. Because the meaning of the delay situation may change considerably for the second assessment, we followed guidelines established in previous research (Ayduk et al., 2000; Mischel, Shoda, & Peake, 1988) and used delay times at first assessment. Moreover, it has been shown that delay times are affected by the instructions given in each condition (e.g., think distracting thoughts; think about the rewards; Mischel et al., 1989). To remove the variance introduced by these experimental conditions, previous research has used deviation scores computed by centering delay times for each child around the group-mean of all the children in the same condition at first assessment using all available data (see Mischel et al., 1988 for details). By removing the main effect of experimental condition, this procedure yields scores more reflective of individual differences in delay ability and has been shown to be a meaningful predictor of later outcomes (Ayduk et al., 2000).

The mean of the centered delay times in the current sample was 71.11 seconds ($SD = 352.26$ s). This mean was not significantly different from that of those participants who did not participate in this follow-up ($M = −2.07, SD = 348.19; t < 1$). Delay times were not significantly related to any of the demographic variables (all ps $> .39$) including participants' sex ($r(76) = −.10$), age ($r(76) = .00$), relationship status ($r(76) = −.03$) and parental status ($r(76) = −.08$). Furthermore, delay times were not significantly correlated with scores either on the RSQ ($r(79) = .11, p = .31$) or the ACS ($r(77) = .05, p = .63$).

7.2.4. BP features

As in Study 1, the PAI-BOR (Morey, 1991) was used to measure BP features. In this study, participants rated themselves on a 5-point scale (0, strongly disagree; 1, somewhat disagree; 2, neither agree or disagree; 3, somewhat agree; 4, strongly agree), which was modified from the original rating scale (0, false to 3, very true; Morey, 1991) to be consistent with other measures included in the follow-up questionnaire package. To allow comparisons to Study 1, ratings were transformed to a 0–3 scale before overall PAI-BOR scores were computed.

In this sample, the scale had good internal reliability ($\alpha = .89$) with a mean total score of 19.08 ($SD = 11.24$; range: 2.25–53.25). Only 8 (7.70%) participants scored above the

clinical cutoff. Thus, the sample was low in clinically significant BP features. PAI-BOR scores were not significantly related to participants' sex ($r(102) = 04$), relationship status ($r(102) = -.09$), or age ($r(102) = -.15$; all $ps > .16$). There was a marginal trend for participants without children ($M = 21.82$, $SD = 10.35$) to be higher in BP features than those with children ($M = 17.57$, $SD = 11.52$; $F(1, 102) = 3.49$, $p = .065$).

7.3. Results

Correlation analyses indicated that BP features were positively correlated with RS ($r(103) = .43$, $p < .0001$) and negatively with EC ($r(103) = -.45$, $p < .0001$). However, delay times from age 4 had no relationship to BP features at age 38 ($r(79) = .00$, $p = 1.00$). When RS and EC were entered into GLM analysis as main effects, each continued to explain significant variance in BP features while controlling for the effect of the other ($Fs > 18.00$, $p < .0001$).

Next, we examined the critical moderation hypothesis between RS and EC by conducting GLM analysis on BP features with RS, EC and their interaction as predictors. All predictors were centered on their grand mean. Fig. 2a illustrates the results from this analysis. Parameter estimates used to plot the results can be found in the notes section of Fig. 2a.

Consistent with Study 1 results, the RS × EC interaction was significant ($b = -.84$, $F(1, 100) = 4.68$, $p = .03$, effect size $r = .21$). Simple slopes analyses indicated that among people low in EC (i.e., 1SD below the mean) RS was positively related to BP features ($b = 1.43$, $t(100) = 4.81$, $p < .0001$) whereas among people high in EC (i.e., 1SD above the mean), the effect of RS was attenuated to marginal significance ($b = .63$, $t(100) = 1.94$, $p = .055$). Furthermore, among high RS people (i.e., 1SD above the mean), EC was negatively associated with BP features ($b = -9.92$, $t(100) = 4.85$, $p < .0001$). In contrast, among low RS people (i.e., 1SD below the mean), EC was unrelated to BP features ($b = -3.70$, $t(100) = 1.23$, $p = .22$). These findings did not change as a function of sex (sex × RS × EC interaction, $F < 1$).
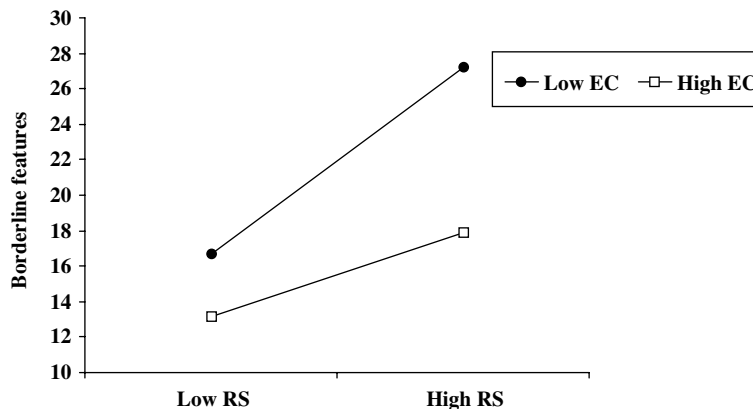

Fig. 2a. Borderline personality (BP) features a function of rejection sensitivity (RS) and executive control (EC) in Study 2. *Notes.* Predicted values were computed using the following estimates from the GLM analysis. BP = $18.73 + 1.03(RS)^{***} - 6.81(EC)^{**} - .084(RS \times EC)^{*}$. $^{***}p \leqslant .001$, $^{**}p \leqslant .01$, $^{*}p \leqslant .05$, $^{\dagger}p \leqslant .10$.
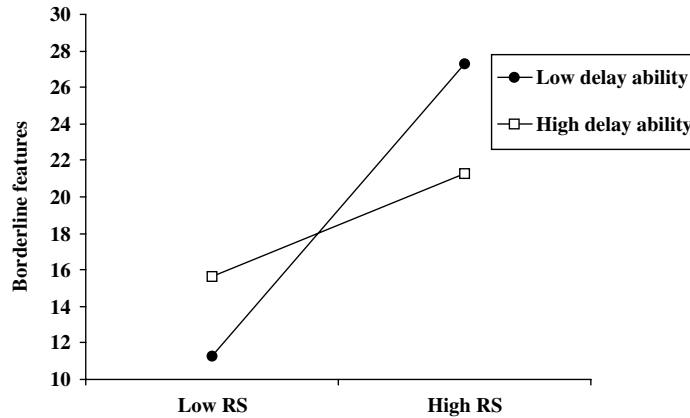
Fig. 2b. Borderline personality (BP) features a function of rejection sensitivity (RS) and delay of gratification (DG) Ability in Study 2. *Notes.* Predicted values were computed using the following estimates from the GLM analysis. $BP = 18.87 + 1.48(RS)^{***} - .0012(DG) - .002(RS \times DG)^*$. $^{***}p \leqslant .001$, $^{**}p \leqslant .01$, $^{*}p \leqslant .05$, $^{\dagger}p \leqslant .10$.

The next set of analyses examined whether delay times at age 4 also moderated the positive relationship between RS and BP features. GLM analysis yielded a significant RS × delay times interaction ($b = -.002$, $F(1,76) = 4.01$, $p < .05$, effect size $r = .22$). Paralleling our findings with self-reported EC, among low delay participants ($1SD$ below the mean on delay), RS was positively related to BP features ($b = 2.16$, $t(76) = 4.06$, $p < .0001$). Among high delay participants ($1SD$ above the mean on delay), the association between RS and BP was attenuated but still significant ($b = .78$, $t(76) = 2.08$, $p = .04$). Moreover, among high RS people, delay ability was negatively associated with BP features ($b = -.0085$, $t(76) = 4.83$, $p < .0001$) whereas among low RS people delay times were unrelated to BP features ($b = .006$, $t(76) = 1.20$, $p = .23$). Fig. 2b illustrates these findings, which were not moderated by participants' sex (sex × RS × delay interaction, $F(1,70) = 1.20$, $p = .28$).[4]

7.4. Discussion

In two studies, we found support for the hypothesis that BP features are predicted by an interaction between RS and EC. Both in a sample of college students and community adults, RS was positively related to BP features among those low in EC. In contrast, the relationship between RS and BP was attenuated among those high in EC. The pattern of findings in Study 2 was similar when EC was operationalized either by a self-report

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[4] To explore whether the effect of RS × EC interaction in predicting BP features differed among the four subscales of the PAI-BOR, the moderation analyses were rerun in both studies where scores on the subscales of the PAI-BOR were entered as a within-subjects factor. The interaction between RS × EC × subscale was not significant in Study 1 ($F < 1$) suggesting that the results were similar across the 4 subscales. In Study 2, this interaction was significant when EC was operationalized by scores on the ACS ($F(3, 300) = 3.64$, $p = .01$) but not by delay times from age 4 ($F < 1$). A closer examination of the former revealed that the RS × EC interaction was significant for all subscales except the self-harm scale ($F < 1$) in the community sample. This could be due to the low base-rate of self-harm behavior. In fact, scores on the self-harm scale was significantly lower than scores on all 3 of the other scales ($Fs > 13.61$, $ps < .0004$).

measure of attentional control or a behavioral measure of delay of gratification from early childhood.

In Study 2, self-reported EC and delay of gratification ability were not significantly correlated with each other and yet they affected the link between RS and BP similarly. EC involves the ability to inhibit task-irrelevant responses that may occur at different stages of processing (Casey et al., 2002) (e.g., motoric/inhibitory control, attentional control, representational/cognitive control) and it is possible that the two measures we used tap into EC at different levels of processing. Whereas the ACS measures effective management of attention, delay of gratification ability likely is a more heterogeneous construct, requiring not only attentional control (e.g., not deploying attention to the rewards one is waiting for), but also tapping into inhibitory control (e.g., inhibiting the impulse to touch the rewards) and representational/cognitive control (e.g., being able to keep one's long-term goals in sight). Nevertheless, the similarity of findings across these two measures illustrates the robustness of the role EC plays in buffering against the maladaptive consequences of the high RS dynamics.

In Study 1 RS was not significantly related to BP in the high EC group. In Study 2, this relationship showed a marginally significant positive trend. Additional analysis showed however, that the slope of RS in predicting BP features among high EC participants in the two studies was not statistically different from one other underscoring the similarity of findings across the studies.[5]

7.4.1. Implications and future research

An interesting theoretical question raised by our research is the degree to which RS and EC are distinct mechanisms in the development and expression of BP features. On the one hand, high RS and regulatory difficulties emerge out of similar early child-caregiver relationships. It is through responsive and sensitive caregiving experiences that children learn to trust others and come to believe in their likeability and self-worth (Bowlby, 1969). Early in life, caregivers also serve as external regulators of the child's needs and distress. A child who is repeatedly exposed to responsive caregiving may become increasingly able to tolerate frustration as self-regulatory skills become internalized and underlying neural mechanisms that support such competencies get stabilized (e.g., Eisenberg, Zhou, Spinrad, Valiente, & Fabes, 2005; Gunnar & Vazquez, 2006). On the other hand, there are theoretical and empirical grounds to believe that the EC and RS reflect distinct regulatory systems. Individual differences in self-regulation (e.g., in executive control and attention management) have biologically based temperamental components that are visible early in life (e.g., Derryberry & Rothbart, 1997; Field, 1981) and that can modulate even the impact of early negative parenting on the child's long-term outcomes (Sethi, Mischel, Aber, Shoda, & Rodriguez, 2000). Thus, overall, we believe that although these

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[5] To examine whether the differences in the findings of Study 1 and 2 were empirically reliable, we standardized all predictors within each sample and then ran a regression analyses on BP features with RS, EC (scores on the ACS), Study (1 vs. 2) and their interactions as predictors. The RS × EC × study interaction was not significant ($F < 1$). We also tested whether the simple slope of RS among the high attention group was statistically different between the 2 studies and they were not (RS × study interaction among participants $+1SD$ above the mean on EC: $F < 1$). When standardized delay scores were used as an index of EC in Study 2 and the results were compared to Study 1 using the standardized ACS scores as an index of EC, neither the overall RS × EC × study interaction ($F(1,449) = 2.45$, $p = .12$), nor the RS × study interaction among the high EC group were significant ($F(1, 449) = 1.16$, $p = .28$).

mechanisms may share their etiology in similar social experiences and therefore, have overlapping components, they are nevertheless distinct mechanisms that can moderate each other's relationship to life outcomes and adjustment as illustrated by the current research.

Although the present findings only show that the combination of high RS and low attentional control predict negative outcomes at the dispositional level, the extensive programs of research that already exist on RS and EC can provide clues into the mediating processes that can explain this interaction. Attentional processes in high RS people may be disrupted both in the form of defensive avoidance in situations when avoidance is an option, and excessive focus on rejection (e.g., an inability to disengage) in situations when avoidance is not a viable option. Disruptions in attention in either of these directions should have costs. Avoidance as a general coping strategy can serve to perpetuate preexisting expectations about rejection as it prevents people from opportunities to confront schema-inconsistent information (e.g., acceptance) that may ultimately alter those schemas. Clinical research in coping with stress also indicates that it is necessary to focus, think about and face negative experiences to effectively work through them (e.g., Pennebaker & Graybeal, 2001); therefore, attentional avoidance of rejection may be an impediment to resolving interpersonal problems. On the other hand, in situations where avoidance is not possible, high RS people may show an inability to disengage from rejection–relevant cues, which would make intentional rejection highly accessible as an explanation for a partner's behavior (Dodge, 1980), eliciting impulsive and destructive reactions in high RS individuals—a behavioral profile that undermines relationships and is characteristic of BP disorder. EC may disrupt the high RS dynamics in several ways. For example, EC may help individuals effectively direct their attention so that they inhibit automatic avoidance and vigilance for rejection. Effective EC may also serve to disrupt RS dynamics at a representational level, enabling high RS people to activate relationship-enhancing cognitions such as partner-perspective taking (Rusbult et al., 1991) and the attribution of partner's current behavior to transitory external states (e.g., partner stress), all of which should help them override automatic defensive reactions in favor of more reflective and constructive behaviors.

7.4.2. Closing comments

In closing, across two studies and different measures of EC, we observed that the relationship between RS and BP features was attenuated by EC. Given the low efficiency of finding moderator effects in non-experimental studies (McClelland & Judd, 1993) as well as reduced power due to the significant correlations between RS and EC, the replicability of the findings speak to the robustness of the phenomenon we hypothesized. Nonetheless, the size of the effects in both studies was small. This may be due to the fact that participants in both studies were high functioning with low rates of BP features. The conclusions we can draw from the present set of findings would be strengthened if they were replicated in clinical samples. In addition, the present research used a self-report measure of BP and attentional control. Although the measure of BP features has been validated in a number of studies and the ACS has been linked to behavioral and neurophysiological indicators of EC, our findings should be replicated using diagnostic interview measures of BP and established behavioral measures of attentional control such as the ANT task or the Go/No-go task. Finally, given the correlational nature of the research, our studies cannot make strong inferences about EC being a causal mechanism that buffers high RS people from

developing BP features. Future research will be able to specifically address the causality question through the use of longitudinal designs or in experimental research that for example, manipulates the availability of resources for EC.

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