



Emotion-related cognitive processes in borderline personality disorder: A review of the empirical literature

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ABSTRACT

Maladaptive cognitive processes, including selective attention and memory, distorted beliefs and interpretations, and thinking processes such as rumination and thought suppression, are strongly associated with many emotional disorders. This paper reviews research that extends these findings to the emotional dysfunction characteristic of borderline personality disorder (BPD). Results suggest that people with BPD habitually attend to negative stimuli, have disproportionate access to negative memories, endorse a range of BPD-consistent negative beliefs about themselves, the world, and other people, and make negatively biased interpretations and evaluations of neutral or ambiguous stimuli. They also engage in thought suppression and rumination and these tendencies are significantly associated with the severity of their BPD symptoms. It remains unclear whether maladaptive cognitive processes play a causal role in the development and maintenance of BPD or are correlates or consequences of having the disorder. Continued study of emotion-related cognitive processing in BPD may improve understanding and treatment of this severe disorder.

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Contents

1. Introduction	360
2. Attentional bias	361
2.1. Attentional bias in BPD	361
2.1.1. Studies using the emotional Stroop task	361
2.1.2. Studies using visual probe tasks	361
2.2. Conclusions	362
3. Memory bias	362
3.1. Memory bias in BPD	362
3.1.1. Studies of selective memory for negative information	362
3.1.2. Studies of overgeneral autobiographical memory	362
3.2. Conclusions	363
4. Distortions in the content of thoughts and beliefs	363
4.1. Distorted beliefs in BPD	363
4.1.1. Studies using the Personality Belief Questionnaire	363
4.1.2. Studies using the Personality Disorder Belief Questionnaire	363
4.1.3. Studies using the Schema Questionnaire	363
4.2. Conclusions	364
5. Interpretation and evaluation bias	364
5.1. Interpretation and evaluation biases in BPD	364
5.1.1. Studies of emotion recognition	364
5.1.2. Studies of interpersonal evaluation bias and dichotomous thinking	364
5.2. Conclusions	365
6. Thought suppression	365
6.1. Thought suppression in BPD	365
6.1.1. Studies of thought suppression as a mediating variable	365

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6.2.	Conclusions	365
7.	Rumination	366
7.1.	Rumination in BPD	366
7.1.1.	Studies of depressive rumination	366
7.1.2.	Studies of anger rumination	366
7.1.3.	Studies of mixed forms of rumination	366
7.2.	Conclusions	366
8.	General conclusions	367
	References	368

1. Introduction

Borderline personality disorder (BPD) is characterized by a pervasive pattern of intense negative affect, maladaptive impulsive behavior, and interpersonal difficulties. Emotional dysregulation is often described as the central feature of BPD. Theoretical accounts generally suggest that people with BPD have a biologically based tendency to experience negative emotions that are easily triggered, intense, and long lasting (Linehan, 1993). This emotionally vulnerable temperament interacts with an invalidating childhood environment and stressful or traumatic events to produce adults with intense emotional pain and few constructive skills for managing it (Linehan, 1993; Zanarini & Frankenburg, 2007). Much of the dysfunctional, impulsive behavior seen in BPD, including self-harm, substance abuse, and angry behavior toward others, has been conceptualized as maladaptive attempts to reduce or avoid intense negative affect (Chapman, Gratz, & Brown, 2006; Nock & Prinstein, 2004). The empirical literature is largely consistent with these ideas. Specific negative emotions or mood states commonly elevated in BPD include anger, anxiety, shame, and depression (Koenigsberg et al., 2002; Rüscher et al., 2007; Skodol et al., 2002). The self-reported tendency to have intense and reactive emotions is correlated with the severity of other BPD symptoms in both clinical and nonclinical samples (Cheavens et al., 2005; Rosenthal, Cheavens, Lejuez, & Lynch, 2005; Sauer & Baer, 2010). A recent longitudinal study found that affective instability was the strongest and most consistent predictor of borderline symptoms over time (Tragesser, Solhan, Schwartz-Mette, & Trull, 2007). These findings support theoretical writings (Linehan, 1993) suggesting that emotional dysregulation is the core feature of the disorder and that the other symptoms follow from this central dysfunction.

A large theoretical and empirical literature suggests that emotional dysfunction is strongly associated with a variety of maladaptive cognitive processes—often described as biases or vulnerabilities—that favor information with negative personal meaning or emotional valence (Mathews & MacLeod, 2005; Wilson, MacLeod, & Campbell, 2007). These include attentional biases, such as selective attention to threatening stimuli; memory biases, such as selective memory for negative information; and distortions in the content of beliefs, assumptions, attributions, and interpretations. Repeated negative ideation in the form of rumination, and attempts to inhibit negative ideation through thought suppression, also have been extensively studied. Theoretical descriptions and empirical tests of cognitive processing models are now available for many Axis I disorders. For example, models of panic disorder emphasize catastrophic misinterpretation of bodily sensations, whereas models of social phobia emphasize self-focused attentional bias in social situations, and models of depression focus on attributional style and ruminative responses to depressive feelings (Mathews & MacLeod, 2005). While early studies showed significant concurrent relationships between maladaptive cognitive processes and mood and anxiety disorders, more recent work using longitudinal and experimental methods suggests that maladaptive cognitive processes often precede the onset of emotional distress and may play causal roles in the development and maintenance of emotional disorders (for reviews, see Alloy & Riskind, 2006; Mathews & MacLeod, 2005).

Most studies of emotion-related cognitive processes focus on a single disorder. However, striking similarities in the cognitive processes important in various disorders has led to increased recognition of the potential value of a transdiagnostic perspective, in which cognitive processes are studied across multiple disorders. In a comprehensive review, Harvey, Watkins, Mansell, and Shafran (2004) concluded that many cognitive processes, including selective attention and memory, biased and distorted reasoning, and maladaptive styles such as rumination and thought suppression, are related to numerous emotional disorders and contribute to their onset and maintenance. They suggest that there are more similarities than differences in the cognitive processes that characterize many psychological dysfunctions; however, they also note that people with different disorders have different current concerns that influence how the transdiagnostic processes are manifested. For example, people with eating disorders may show selective attention for weight-related cues and ruminative thoughts about body shape, whereas those with panic disorder may show attentional bias for changes in heart rate and distorted thoughts about the likelihood of a heart attack.

Transdiagnostic cognitive processes have been studied primarily in Axis I disorders. However, the centrality of emotional disturbance in BPD suggests that similar processes may contribute to the dysfunctions characteristic of this disorder. In this paper we review the growing empirical literature on maladaptive emotion-related cognitive processes in BPD. We include processes described in previous literature as cognitive vulnerabilities, cognitive biases, or transdiagnostic cognitive processes, if they have been studied in BPD. Thus, our review includes research on selective attention and memory; distorted beliefs, interpretations, and evaluations of oneself, the world, and other people; and maladaptive thinking processes such as thought suppression and rumination, as they occur in BPD. In each of the following sections, we describe a maladaptive cognitive process and its relationship to emotional disturbance. If the cognitive process has been operationalized as performance on particular tasks or tests, or as a way of responding to specific types of stimuli, we summarize the most commonly used methods. We then review the literature examining the relationship of the cognitive process to BPD. We consider whether the processes in question are manifested in ways that are common to many emotional disorders or in ways that are specific to BPD. We also examine whether these processes play causal roles in the development or maintenance of BPD symptoms or are better understood as correlates or consequences of having the disorder.

We do not provide a comprehensive review of neuropsychological functioning in BPD; a meta-analysis of this literature was provided by Ruocco (2005). Most of the studies in Ruocco (2005) used emotionally neutral stimuli, such as digits, symbols, arithmetic problems, and abstract figures or geometric designs. In contrast, we review studies that use emotionally valenced stimuli such as words, images, or film clips with themes related to general distress or to BPD symptoms. We also include cognitive processes not typically studied with neuropsychological methods, such as cognitive distortions, rumination, and thought suppression. Finally, the present review does not include studies of the nature of affective responding in BPD, such as emotional

intensity, reactivity, and lability. Research on these characteristics was reviewed by [Rosenthal et al. \(2008\)](#).

2. Attentional bias

Biases in allocation of attention have been extensively studied in emotional disorders. A large literature shows that people with anxiety and depression are likely to attend selectively to stimuli related to their emotional concerns. Those with anxiety attend selectively to threatening stimuli, whereas those with depression attend to stimuli with sad themes. An avoidant form of attentional bias is sometimes observed, in which threatening stimuli are quickly detected and attention is then shifted to neutral or safety-related stimuli. Prospective studies show that selective attention to threat-related stimuli predicts greater distress in response to stressful events at a later time ([MacLeod & Hagan, 1992](#)). Experimental studies suggest that participants can be trained to show attentional bias to negative stimuli and that those so trained are more distressed during subsequent stressful activities such as solving difficult anagrams ([MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002](#)). Comprehensive reviews have concluded that attentional biases for stimuli related to emotional concerns are common to many Axis I disorders and that they play a causal role in the development and maintenance of emotional dysfunction ([Harvey et al., 2004](#); [Mathews & MacLeod, 2005](#)).

2.1. Attentional bias in BPD

Cognitive formulations ([Beck & Freeman, 1990](#)) suggest that people with BPD are hypervigilant to signals of threat or danger. More generally, [Linehan \(1993\)](#) suggests that people with BPD have difficulty in controlling their attention and may be focused on the past, the future, or current pain rather than the task at hand. Empirical studies of attentional bias in BPD have operationalized attentional bias as performance on the emotional Stroop task or on visual probe tasks. Both of these methods require participants to perform a central attentional task as quickly as possible while ignoring emotional distracters.

2.1.1. Studies using the emotional Stroop task

In this task, respondents view emotional and neutral words in different colors of ink and are asked to name the color of the ink as quickly as possible. People with emotional concerns generally are slower to color-name emotional words than neutral words ([Mathews & MacLeod, 1985](#)), presumably because attentional bias toward the content or meaning of the emotional words interferes with the color-naming task. Some studies use a subliminal procedure, in which each word is presented very briefly and is followed immediately with a mask (jumbled letters) in the same color. Even when participants cannot identify the word, their latency to name the color of the mask is sometimes longer for emotional than for neutral words ([MacLeod & Hagan, 1992](#)). The subliminal procedure is believed to capture an automatic attentional process, whereas longer presentation times may assess a more controlled process ([Mathews, 1997](#)). We found six studies that use the emotional Stroop task to investigate attentional bias and BPD symptoms.

[Arntz, Appels, and Sieswerda \(2000\)](#) tested patients with BPD, patients with Cluster C personality disorders (PDs), and healthy controls using a Stroop task with five categories of words: malevolent (*cruel*), sexual abuse-related (*incest*), negative personal characteristics (*powerless*), negative events (*murder*), and neutral (*tactical*). Both subliminal and supraliminal tests were conducted. The clinical groups did not differ from each other, but both were slower than the healthy controls to color-name the negative words. No differences were observed between categories of negative words and no evidence of attentional bias was seen for subliminally presented words. Thus, attentional bias for negative stimuli was seen in BPD, but was not specific to the BPD group or to BPD-related stimuli.

[Sieswerda, Arntz, Mertens, and Vertommen \(2006\)](#) conducted a similar study with three groups of patients (BPD, Cluster C PDs, and Axis I disorders) and a healthy control group. Words for the Stroop task were consistent with three cognitive schemas described by [Pretzer \(1990\)](#) as characteristic of BPD: the self is powerless and vulnerable, the self is unacceptable and unworthy, and the world is dangerous and malevolent. General negative words (*stingy*) and neutral words (*abstract*) also were included. As in the previous study, patients with BPD were slower than healthy controls to color-name negative words. Effects were seen only for supraliminally presented words. However, the effect was significantly larger for the BPD patients than for the other clinical groups and was specific to BPD-related words (*vulnerable*, *unacceptable*), suggesting an attentional bias in BPD patients consistent with BPD-related cognitive themes.

[Sieswerda, Arntz, and Kindt \(2007\)](#) compared patients with BPD who were participating in a treatment outcome study to a healthy control group. Prior to treatment, the BPD group showed greater attentional bias than the control group for both BPD-related (*vulnerable*) and general negative words (*tumor*). No effect was seen for subliminally presented words. After a 3-year intensive treatment, the Stroop task was repeated. BPD patients who had recovered (had very low levels of BPD symptoms) showed a significant reduction in attentional bias, producing scores that did not differ from those of the healthy control group. In contrast, Stroop scores for BPD patients who had not recovered did not change. Results must be interpreted cautiously because the sample of recovered patients was quite small ($N=6$).

[Wingenfeld et al. \(2009\)](#) modified the emotional Stroop to include words chosen for each participant to represent negative events they had experienced. Four types of words were included: words associated with a currently distressing event, words associated with an event no longer causing distress, general negative words, and neutral words. Patients with BPD showed significantly slower response times than a healthy control group for the words representing currently distressing events, but not for the other categories of words. This effect was significant only for the subset of BPD patients who also met the criteria for PTSD.

Two studies found no significant differences between BPD patients and healthy controls on the emotional Stroop. [Domes et al. \(2006\)](#) studied patients with BPD but no comorbid mood or anxiety disorders. The Stroop task used only general negative words. Comorbid axis I disorders are very common in BPD; thus, this group may not have been representative of other BPD samples. [Sprock, Rader, Kendall, and Yoder \(2000\)](#) reported no differences between BPD patients, depressed patients, and healthy controls on a Stroop task using words related to anger and sadness. The authors speculate that the emotional words may not have been sufficiently emotion-inducing.

2.1.2. Studies using visual probe tasks

In these tasks, participants briefly view two words (one emotional and one neutral) on a computer screen. The words then disappear and a dot appears in the space just occupied by one of the words. The participant presses a button as fast as possible after detecting the dot. Locations of words and dots are counter-balanced over many trials. People who habitually allocate more attention to the emotional words should be quicker to detect dots appearing in the space just occupied by the emotional word, whereas people with no attentional bias should show equivalent response times for dots appearing in either location ([Harvey et al., 2004](#)). Emotion-related and neutral images may be used instead of words. Two studies have used visual probe tasks to investigate attention bias and BPD features.

In a nonclinical sample, [Berenson et al. \(2009\)](#) used a visual probe task with pictures of threatening, pleasant, or neutral faces. On each trial, respondents briefly viewed two faces (one neutral, one pleasant or threatening). An arrow then appeared in the location just occupied by one of the faces and participants pushed a button according to whether the arrow pointed up or down. Participants higher in BPD

features showed a bias for neutral faces when they were paired with threatening ones, suggesting a tendency for people with BPD features to detect threatening stimuli quickly and then shift attention away from them. High levels of BPD pathology probably were not well represented in this study's sample.

Ceumern-Lindenstjerna et al. (2010) compared adolescents diagnosed with BPD to a group with other disorders and a healthy control group. The task used pictures of faces with positive, negative, or neutral expressions. On each trial, a neutral face was paired with either a positive or a negative one. The two clinical groups showed similar levels of attentional bias for negative over neutral faces. In contrast, the healthy controls showed a strong bias for neutral over negative faces.

2.2. Conclusions

Most of these studies suggest that people with BPD show attentional bias toward negative emotional stimuli. Most studies reported that attentional bias in the BPD group was not specific to BPD-related themes but occurred in response to general negative stimuli. In addition, most found similar levels of attentional bias in BPD and in various clinical control groups. This pattern of findings is consistent with research showing substantial commonality across disorders in the negative stimuli to which selective attention is shown (Harvey et al., 2004). People with BPD are subject to a wide range of negative emotions and stressful events and therefore have many current concerns that might influence their allocation of attention. No evidence of attentional bias for subliminally presented stimuli was reported, suggesting that attentional bias in people with BPD may be a controlled rather than an automatic process.

It remains unclear whether attentional bias in BPD occurs independently of comorbid Axis I disorders. Most studies have not examined this issue, perhaps because comorbidity is so common in BPD that participants without Axis I disorders are not typical of the BPD population. Prospective studies of the effects of attentional bias on later distress or dysfunction have not been conducted in people with BPD, nor have studies in which participants with BPD are trained to alter their attentional patterns. It is therefore unclear whether attentional bias plays a causal role in exacerbating emotional dysfunction in BPD (as has been seen in axis I disorders) or whether it is a correlate or a consequence of having BPD or a comorbid emotional disorder.

3. Memory bias

Several forms of memory bias are related to emotional disorders (Harvey et al., 2004). Some studies suggest that memory is biased toward increased accessibility of negative emotional information. For example, studies of selective memory, which ask participants to memorize lists of neutral and emotional words, report that people with emotional disorders remember more disorder-related words (e.g., *misery* and *sad* for depressed participants) than neutral words. Similar studies show that distressed people tend to remember pictures of distressed or threatening faces better than faces with positive or neutral expressions. Interview-based studies report that people with a variety of mood and anxiety disorders experience recurrent intrusive memories directly related to their emotional concerns. In contrast, other studies suggest that some emotional disorders are associated with reduced access to memories of distressing material. For example, people with depression and post-traumatic stress show impaired recall of specific memories of events from their own lives. This finding is attributed to an avoidant retrieval style that prevents the experience of negative affect that may arise when memory is searched for specific events.

3.1. Memory bias in BPD

We found no comprehensive theoretical accounts of memory functioning in BPD; however, Linehan (1993) notes that intense affective

states can impair memory and that people with BPD are probably susceptible to emotion-related memory dysfunctions. Two types of emotion-related memory bias shown to be related to Axis I disorders have been studied in BPD: selective memory for negative information and overgeneral autobiographical memory.

3.1.1. Studies of selective memory for negative information

We found two studies of selective memory in BPD. Both used the directed forgetting paradigm, in which participants are given lists of words to study with instructions to remember some words and forget others. A tendency to remember emotional words, even when told to forget them, is believed to indicate a memory bias for emotional information, whereas a tendency to forget emotional words is generally interpreted as evidence for an avoidant retrieval style (Gordon & Connolly, 2010).

Korfine and Hooley (2000) asked people with BPD and healthy controls to view a series of words, including positive words (*happy*), neutral words (*actually*), and negative BPD-related words (*abandon*). Each word was immediately followed by a cue (R or F) indicating whether the participant should remember or forget the word. As expected, both groups recalled more of the Remember words than the Forget words. For the Remember words, both groups recalled more BPD-related words than neutral or positive words, but there were no differences between groups, suggesting that BPD-related words were more memorable for all participants. Notably, the BPD group showed no memory deficits for words they were asked to remember. However, the BPD group recalled significantly more of the BPD-related Forget words than did the healthy controls, and this tendency was significantly correlated with severity of BPD symptoms. Findings suggest a memory bias for BPD-related themes in people with BPD. The authors speculated that participants with BPD were unable to inhibit rehearsal of the BPD-related Forget words even after seeing the Forget instruction. This failure to inhibit apparently did not occur for the positive or neutral words. Negative words unrelated to BPD were not included, making it impossible to conclude whether the effect is limited to BPD-specific negative words.

In a similar study, Domes et al. (2006) reported that participants with BPD recalled more negative words that they had been instructed to forget than did healthy controls. In this case, the negative words were not BPD-specific, suggesting a general memory bias for negative themes in BPD.

3.1.2. Studies of overgeneral autobiographical memory

This form of memory bias is seen when participants are asked to produce memories of events from their own lives. A specific memory involves an event that happened at a particular place and time and lasted less than 1 day (e.g., "I felt lonely while walking on the beach on Saturday morning") whereas a categoric (overgeneral) memory is a general summary of events (e.g., "I used to enjoy walking on the beach"). Overgeneral memory is typically studied with the autobiographical memory test (AMT; Williams & Broadbent, 1986), which asks respondents to recall specific memories of events from their own lives in response to cue words (*enjoy*, *lonely*, *tree*). The tendency to produce categoric rather than specific memories on the AMT is associated with depressive symptoms, suicidal behavior, posttraumatic stress, and poor problem-solving (Williams et al., 2007). Because these characteristics are common in BPD, several researchers have predicted that overgeneral autobiographical memory should be associated with BPD. Although an early study found this effect (Jones et al., 1999), several later studies found no difference between BPD and control groups or found the effect only in BPD patients who were also depressed or suicidal (Arntz, Meeren, & Wessel, 2002; Kremers, Spinhoven, & van der Does, 2004; Maurex et al., 2010).

Renneberg, Theobald, Nobs, and Weisbrod (2005) reported that BPD patients did not differ from normal controls in the specificity of their memories or the latency to recall them. However, the emotional

tone of their memories was significantly more negative. When compared to a depressed group, the BPD group showed equally negative emotional tone but greater specificity and shorter latency. Results suggest that, relative to both healthy and depressed samples, BPD patients have quick and easy access to specific negative memories. The authors suggest that this memory style may be related to the emotional difficulties that typify BPD. Results are consistent with studies showing that overgeneral memory has different correlates in BPD than in depression. [Kremers, Spinhoven, Van der Does, and Van Dyck \(2006\)](#) found that overgeneral memory in BPD was *not* associated with social problem-solving deficits (unlike in depression). [Startup et al. \(2001\)](#) reported that, contrary to predictions, overgeneral memories in a BPD sample were associated with *less* frequent suicidal behavior. These findings suggest that overgeneral memory may serve a protective function in BPD by preventing some of the negative affect associated with painful memories. [Williams \(2006\)](#) suggested that lack of overgeneral memory in BPD may be related to a deficit in executive function that prevents avoidance or “gating out” of specific memories even when such avoidance would be adaptive. Additional research is necessary to test this idea.

3.2. Conclusions

The empirical literature suggests that people with BPD may have a memory bias for general negative or BPD-related material. People with BPD may not differ from healthy controls on specificity of autobiographical memory, but may have an inability to screen out negative memories when it would be adaptive to do so. Prospective studies of the effects of memory characteristics on later BPD symptoms have not been conducted. It is therefore unclear whether any form of memory bias precedes the development of BPD and contributes to its etiology, or whether memory characteristics are correlates or consequences of having the disorder. We also found no studies of the nature of recurrent and intrusive memories in BPD; this requires further study.

4. Distortions in the content of thoughts and beliefs

Distortions in the content of thoughts and beliefs are believed to play a central role in the etiology and maintenance of many emotional disorders ([Beck, 2005](#)). Cognitive theories of psychopathology generally postulate that a set of distorted core beliefs leads to biased thoughts and interpretations that arise automatically, leading in turn to emotional distress and behavioral impairment. Such content biases have been studied extensively in Axis I disorders. Depressive symptoms, for example, have been associated with the belief that negative events result from highly generalized and relatively permanent personal causes ([Abramson, Metalsky, & Alloy, 1989](#)), and with beliefs about personal inadequacy, failure, and worthlessness ([Beck, 1987](#)). Anxious symptoms, on the other hand, are associated with beliefs that negative events are very likely to occur and will have unmanageable consequences, and that worry is helpful for reducing the perceived imminent threat ([Borkovec, Hazlett-Stevens, & Diaz, 1999](#)). Cognitive formulations often focus on distress-inducing cognitive errors ([Beck, 1987](#)), such as overgeneralizing from isolated occurrences, discounting the importance of positive events, and all-or-nothing thinking (also known as dichotomous or black and white thinking), in which situations are interpreted in terms of extreme categories (e.g., total success or total failure) rather than on continua. Because such errors are usually made in response to events, circumstances, or other people, we discuss them in a later section on interpretation or evaluation bias. Here we focus on distortions in beliefs, attitudes, or assumptions.

4.1. Distorted beliefs in BPD

Like Axis I disorders, personality disorders have been linked both theoretically and empirically with characteristic sets of disordered beliefs or assumptions. Several models of biased beliefs in BPD have been proposed

and revolve around similar themes. [Beck and Freeman \(1990\)](#) suggest that people with BPD endorse beliefs that they are bad, powerless, and vulnerable and that the world is dangerous and malevolent. Similarly, [Pretzer \(1990\)](#) proposed that a set of three core beliefs underlies borderline pathology: the world and other people are dangerous and malevolent, the self is powerless and vulnerable, and the self is inherently unacceptable and deserving of punishment. According to Pretzer, these beliefs interact to produce hypervigilance, dichotomous thinking, and a weak sense of identity. [Young, Klosko, and Weishaar \(2003\)](#) suggested that several schema modes (sets of relatively distinct, specific patterns of thinking, feeling, and behaving that develop in early childhood) are important in BPD. The Abandoned and Abused Child mode is associated with beliefs that the self is vulnerable and unlovable. The Angry and Impulsive Child mode includes beliefs about the malevolence of others and the need for aggressive action in order to meet basic needs. The Punitive Parent mode is associated with beliefs that the self is inherently bad and deserves punishment. The Detached Protector mode includes beliefs that connecting to emotions or other people is intolerably painful and that being detached is the only way to be safe. These core beliefs are perpetuated by attentional biases that selectively filter out discrepant information.

No performance-based tasks or tests have been developed to assess BPD-related thoughts and beliefs; instead, they are generally studied with questionnaires.

4.1.1. Studies using the Personality Belief Questionnaire

The Personality Belief Questionnaire (PBQ; [Beck et al., 2001](#)) was developed to assess beliefs hypothesized to be associated with various PDs. [Butler, Brown, Beck, and Grisham \(2002\)](#) found that people with BPD scored higher than those with other PDs on most of the items; however, a set of 14 beliefs significantly discriminated patients with BPD from patients with other PDs. These items, which suggest themes of dependency, helplessness, distrust, fears of rejection and abandonment, and fear of losing emotional control, were combined to create a BPD subscale. In a sample of BPD patients, [Bhar, Brown, and Beck \(2008\)](#) found that items loaded on three underlying factors: distrust (other people are untrustworthy, exploitative, and potentially abusive), dependency (the self is helpless, needy, and requires constant support), and a protection factor, comprised of beliefs that preemptive steps are necessary to protect oneself from being ignored, rejected, or emotionally attacked. All three factors were significantly associated with depression, hopelessness, or suicidality. Severity of other BPD features (anger, identity disturbance, dysfunctional relationships, impulsivity) was not measured. However, the study used an unusually large sample of persons with BPD and provided strong evidence that beliefs about distrust, dependency, and difficulties of social interaction are common in this population.

4.1.2. Studies using the Personality Disorder Belief Questionnaire

[Dreessen and Arntz \(1995\)](#) developed the Personality Disorder Belief Questionnaire (PDBQ) to measure beliefs associated with avoidant, dependent, obsessive-compulsive, paranoid, histrionic, and borderline PDs. Items on the 20-item BPD subscale reflect themes of loneliness, unlovability, abandonment and rejection by others, lack of self-control, and the self as bad and deserving of punishment. [Arntz, Dietzel, and Dreessen \(1999\)](#) found that people with BPD had high scores on each of the six PDBQ subscales, suggesting that they hold a broad array of dysfunctional beliefs. The BPD group scored significantly higher than patients with Cluster C PDs and normal controls on the BPD subscale. Beliefs associated with BPD were shown to mediate the association between childhood traumatic experiences and number of BPD traits as assessed by structured interview, suggesting that traumatic experiences predict BPD symptoms only to the extent that they lead to the development of dysfunctional core beliefs.

4.1.3. Studies using the Schema Questionnaire

The Schema Questionnaire ([Schmidt, Joiner, Young, & Telch, 1995](#)) measures schema modes hypothesized by [Young \(1990\)](#) to be associated

with various PDs. Arntz, Klokman, and Sieswerda (2005) administered the Schema Questionnaire to people with BPD, people with cluster-C PDs, and normal controls. As theorized, the BPD patients had stronger schema modes in the categories of Abandoned/Abused Child, Angry/Impulsive Child, Punitive Parent, and Detached Protector. Participants also completed two experimental conditions in counterbalanced order: they watched an emotional film clip or a neutral film clip, and then completed a state version of the Schema Questionnaire. People with BPD scored higher on the Detached Protector subscale after the emotional film clip than after the neutral film clip, whereas people with cluster-C showed the opposite pattern and normal controls showed no difference between the two conditions. The BPD-specific increase in Detached Protector schema mode was associated with a greater increase in fear following the emotional film clip in those with BPD, suggesting a tendency for those with BPD to endorse emotional detachment in response to fear.

4.2. Conclusions

BPD is associated with negatively biased cognitive content that appears to differentiate people with BPD from people with other Axis II disorders. Specifically, evidence suggests that BPD is characterized by beliefs that the world and other people are hostile, untrustworthy, and dangerous; that others will reject and abandon; and that protective action is necessary to prevent negative interpersonal events. People with BPD also tend to believe that the self is vulnerable, helpless, unlucky, and needs constant support from others; that it is best to respond to emotion by detaching from one's experience; and that the self is bad, inadequate, unlovable, and should be punished. Most of the research reviewed here compares people with BPD to people with other PDs but not Axis I disorders. Differences in content of beliefs between BPD and Axis I disorders need further study. Prospective studies of the relationship between distorted beliefs and later development of BPD have not been conducted, making it unclear whether any of the beliefs typical of BPD precede the onset of the disorder and contribute to its development, or whether they are better understood as correlates or symptoms of the disorder.

5. Interpretation and evaluation bias

According to the cognitive theory, an important consequence of holding negatively distorted beliefs is that they lead to biased interpretation and evaluation of ambiguous or neutral stimuli. Many studies have shown that people with emotional disorders are more likely to choose negative over positive or neutral interpretations (see Harvey et al., 2004; Wilson et al., 2007, for reviews). For example, when asked how they would interpret ambiguous situations (e.g., waking suddenly in the night thinking you heard a noise), people with emotional disorders are more likely to choose a threatening interpretation (it was a burglar) over a benign interpretation (it was the cat). Homophone spelling tasks, in which people write down words read aloud, show that those with emotional concerns are more likely to choose a threatening version of words with two possible interpretations (die vs dye, weight vs wait). In the scrambled sentences test (SST; Wenzlaff & Bates, 1998), participants are given strings of six words in nonsensical order and asked to re-order them to make five-word sentences (leaving one word out). Each string can form a positive or a negative sentence, depending on which word is omitted. For example, "looks the future bright very dismal" can be "the future looks very bright" or "the future looks very dismal." The proportion of negative sentences created is a significant predictor of concurrent and future symptoms of depression (e.g., Rude, Durham-Fowler, Baum, Rooney, & Maestas, 2010).

5.1. Interpretation and evaluation biases in BPD

Relationship disturbances are central to BPD pathology; therefore, interpretation and evaluation bias in BPD have been studied primarily

in the context of social cognition, or the general capacity to understand other people (Arntz, Bernstein, Oorschot, & Schobre, 2009). Some studies focus on emotion recognition by asking participants to interpret facial expressions in photographs. In other studies, participants evaluate the characteristics of people viewed in film clips. Some of these studies focus specifically on dichotomous or black and white thinking (the tendency to describe other people in extreme, mutually exclusive terms).

5.1.1. Studies of emotion recognition

Although conflicting findings have been reported, some studies suggest that participants with BPD are as accurate as healthy control groups in their identification of facial emotions in photographs (Preissler, Dziobek, Ritter, Heekeren, & Roepke, 2010). A few studies suggest that people with BPD may show better detection of subtle or partial expressions than nonclinical comparison groups (Lynch et al., 2006; Wagner & Linehan, 1999). However, evidence suggests a negative bias in interpretation of neutral or ambiguous faces. Wagner and Linehan (1999) found that participants with BPD over-reported fear on neutral faces. Dyck et al. (2008) found that people with BPD tended to classify neutral facial expressions as negative, but only in a task with a 2-second time limit for each picture. Domes et al. (2008) found that people with BPD over-reported angry expressions in faces that had been electronically altered to form ambiguous combinations of emotional features (anger and sadness, anger and happiness). Findings were interpreted as consistent with the anticipation of rejection or threat that is common in BPD (Domes, Schulze, & Herpertz, 2009).

5.1.2. Studies of interpersonal evaluation bias and dichotomous thinking

A general tendency to evaluate other people in negative terms was examined by Barnow et al. (2009), who showed a series of six silent, 10-second film clips in which an adult enters a room, walks to a chair, and sits down. Participants rated each person on many personality characteristics. Compared to a healthy control group, the BPD group rated the people in the films as significantly more negative on all variables. Compared to a depressed group, the BPD group gave more negative ratings for traits consistent with aggression and threat (*brutal, exploitative*). Findings are consistent with an interpersonal evaluation bias in BPD for judging others as aggressive or hostile.

Dichotomous thinking (also known as all-or-nothing or black and white thinking) is the tendency to evaluate experiences in extreme, mutually exclusive terms (all good vs all bad), rather than as falling on continua (Beck & Freeman, 1990). It is similar to the psychoanalytic concept of splitting (Kernberg, 1967). In the BPD literature, dichotomous thinking has been studied in the context of interpersonal evaluation. Veen and Arntz (2000) showed six 10-minute film clips to participants with BPD, Cluster C PDs, or no disorder. Four of the clips showed negative scenes representing BPD-specific concerns, such as relationship crises or mistreatment of a child. One showed a negative scene nonspecific to BPD (an argument between a businessman and a banker) and one showed an emotionally neutral scene. Most clips included characters clearly identifiable as victim, perpetrator, or helpful supporter of the victim. Participants rated numerous traits of each character using 100 mm visual analog scales (VASS) anchored at each end (e.g., passive–active, reliable–unreliable). Dichotomous thinking was defined as the mean distance in millimeters of the trait ratings from the midpoint of the VASS. Participants who rated the film characters as more extreme in either direction (farther from the midpoint) obtained higher scores for dichotomous thinking.

The authors distinguish between unidimensional dichotomous thinking, in which ratings for all traits for a single character are in the same direction (positive or negative) and multidimensional dichotomous thinking, in which ratings for a single character are extreme but in both directions; e.g., a character might be rated as both highly reliable (good) and completely lacking in self-confidence (bad). The former (extreme ratings that are all good or all bad) is described as consistent with the concept of splitting, whereas the latter (extreme ratings,

some good and some bad) is not. Patients with BPD made more extreme ratings of characters from the BPD-specific film clips, but not the control clips, regardless of character type (perpetrator, victim). Although their ratings were more extreme, they were in both directions within characters, suggesting that the BPD group viewed the characters in mixed, though extreme, terms. The extreme ratings could not be attributed to stronger emotional reactions to the films in the BPD group because reactions were equally strong in the Cluster C group. The authors concluded that BPD is associated with multidimensional dichotomous thinking (rather than splitting) in situations related to BPD concerns but not general negative situations. They acknowledged that the format of the task, which required participants to consider multiple traits for each character, may not be typical of daily life functioning, when people with BPD may think only of a few global, negative traits when evaluating others.

In a follow-up study using non-interpersonal situations, [Sieswerda, Arntz, and Wolfis \(2005\)](#) asked patients with BPD and several control groups to play frustrating computer games and to rate aspects of themselves and the games. Although the BPD patients rated themselves and the games somewhat more negatively than did the other groups, their scores were not extreme, nor were they “all bad.” The authors concluded that in a frustrating but non-interpersonal situation, dichotomous thinking is not prominent in people with BPD.

5.2. Conclusions

Studies of interpretation and evaluation bias suggest that people with BPD tend to rate neutral or ambiguous interpersonal stimuli more negatively than do several other populations. They also tend to rate film characters in identifiable roles (victim, perpetrator) in more negative and more extreme terms. Little evidence for “all good or all bad” thinking has been observed; instead, people with BPD tended to give mixed evaluations of others. However, the tasks used to measure dichotomous thinking did not assess the abrupt shifts in evaluations of people (e.g., from very good to very bad) that are often described as characteristic of BPD. Prospective longitudinal studies of relationships between interpretation bias and BPD symptoms have not been conducted. Thus, it is unclear whether a consistent tendency to make negatively biased interpretations contributes to the etiology of BPD or whether it is a correlate or consequence of having the disorder. Experimental studies in which participants are trained to show particular types of interpretations also have not been conducted in BPD samples.

6. Thought suppression

Thought suppression is the deliberate attempt to push unpleasant or unwanted cognitions out of awareness. Experimental studies show that participants instructed to suppress particular thoughts experience paradoxical rebound effects in which the thoughts return with greater frequency or intensity during a later monitoring period (for review, see [Abramowitz, Tolin, & Street, 2001](#)). Although many studies use non-clinical samples, a few have asked participants with emotional disorders either to suppress thoughts about an emotionally troubling topic or to think about anything that comes to mind. Reviews have concluded that thought suppression leads to rebound effects in several disorders, including acute and post-traumatic stress disorders and alcohol abuse ([Abramowitz et al., 2001](#); [Purdon, 1999](#)). Studies of the self-reported tendency to suppress thoughts show significant relationships with depression ([Watkins & Moulds, 2009](#)), post-traumatic stress ([Ehlers, Mayou, & Bryant, 1998](#)), and bulimic symptoms ([Lavender, Jardin, & Anderson, 2009](#)). In a prospective study, [Pettit et al. \(2009\)](#) found that self-reported thought suppression predicted suicidal ideation several weeks later, after controlling for general depressive symptoms. Thought suppression also has been shown to mediate the relationship between negative affect and PTSD in rape victims ([Rosenthal, Cheavens, Lynch, & Follette, 2006](#)) and between emotional reactivity and self-injurious

behavior in adolescents ([Najmi, Wegner, & Nock, 2007](#)), suggesting that negative affect and emotional reactivity are more likely to lead to psychopathology if attempts are made to suppress emotion-inducing thoughts.

In a comprehensive review, [Najmi and Wegner \(2008\)](#) concluded that thought suppression is “a general human response to distress that may seriously complicate any disorder that arises” (p. 448). Although occasionally effective in the short term, thought suppression is almost never perfectly successful and is associated with increased negative affect when suppressed thoughts inevitably recur ([Najmi, Riemann, & Wegner, 2009](#); [Purdon, Rowa, & Antony, 2005](#)). For people who believe specific thoughts to be repugnant, dangerous, or a reflection of personal worth, failure to suppress them may be seen as unacceptable and will lead to increased emotional reactivity to the unwanted thoughts and increased yet unsuccessful efforts to suppress them.

6.1. Thought suppression in BPD

Many of the symptoms associated with thought suppression are common in BPD, including post-traumatic stress, substance abuse, disordered eating, depression, and self-harm. People with BPD have strong tendencies to try to avoid negative emotions and stress ([Bijttebier & Vertommen, 1999](#); [Gratz, Rosenthal, Tull, Lejuez, & Gunderson, 2006](#)). Given the ubiquity of thought suppression as a strategy for avoiding emotion-eliciting cognitions ([Najmi & Wegner, 2008](#)), it would be surprising if BPD were not associated with thought suppression. Indeed, the first study to examine this relationship ([Chapman, Specht, & Cellucci, 2005](#)) found a significant correlation ($r = .50$) between BPD severity and self-reported thought suppression as measured by the White Bear Suppression Inventory (WBSI; [Wegner & Zanakos, 1994](#)).

6.1.1. Studies of thought suppression as a mediating variable

Several studies have examined thought suppression as a mediator between theorized risk factors for BPD and current BPD symptom severity. [Linehan \(1993\)](#) described two risk factors for the development of BPD: emotional vulnerability (a biological predisposition for emotional intensity and reactivity) and an invalidating childhood environment (persistent minimization, trivialization, and punishment of the child's expression of thoughts and emotions). In a cross-sectional study with a student sample, [Cheavens et al. \(2005\)](#) found that relationships between these risk factors and current BPD symptoms were fully or partially mediated by the self-reported use of thought suppression as an emotion regulation strategy. [Rosenthal et al. \(2005\)](#) reported similar results in a community sample. The authors suggest that although suppression of thoughts may lead to temporary reductions in negative affect, rebound effects may lead to heightened emotional arousal, culminating in the extreme behavioral forms of avoidant coping that characterize BPD (i.e. self injury, substance abuse, etc.).

[Sauer and Baer \(2009\)](#) extended this line of research by examining the role of fear of emotion in accounting for the relationship between Linehan's risk factors and thought suppression. They hypothesized that an intense emotional temperament combined with invalidation by caregivers could lead to the belief that emotions are dangerous, which in turn would encourage the tendency to suppress emotion-inducing thoughts. Findings supported this hypothesis. Self-reported fear of emotions fully or partially mediated the relationships between the risk factors for BPD and thought suppression.

6.2. Conclusions

This small body of literature shows that thought suppression is significantly associated with BPD and may mediate relationships between risk factors for the disorder and symptom severity. People with BPD are likely to be fearful of their own negative emotions and may turn to suppression of emotion-inducing thoughts in a misguided attempt to

manage their emotional states. This literature has several notable limitations. Thought suppression in BPD has been measured only with self-report questionnaires. No studies have included experimental procedures in which participants with BPD are randomly assigned to engage in thought suppression or an alternate strategy. Many studies have used student or community samples with few participants who meet full diagnostic criteria for BPD, and the studies of mediation have been cross-sectional. On balance, however, the literature clearly suggests that thought suppression may exacerbate the symptoms of BPD and warrants additional study.

7. Rumination

Rumination is a form of repetitive thought (Watkins, 2008) that has been extensively studied in the context of depression. Response styles theory (Nolen-Hoeksema, 1991; 2004) defines rumination as repetitively and passively focusing on symptoms of depression and the possible causes, meanings, and consequences of these symptoms. Although many dysphoric people believe that rumination is necessary to gain insight and solve problems, depressive rumination maintains and intensifies negative mood, impairs concentration, memory, and problem solving, reduces motivation for instrumental behavior, and predicts the onset of future depressive episodes. It also contributes to the etiology and maintenance of post-traumatic stress, self-injurious behavior, disordered eating, and substance abuse symptoms (see Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Watkins, 2008, for reviews). Depressive rumination mediates the relationship between neuroticism and both anxiety and depression and the relationship between childhood sexual abuse and the use of food, alcohol, or drugs to cope with negative affect (Muris, Roelofs, Rassin, Franken, & Mayer, 2005; Roberts, Gilboa, & Gotlib, 1998; Sarin & Nolen-Hoeksema, 2010), suggesting that rumination may be a mechanism through which trait-level neuroticism and traumatic events lead to psychological symptoms.

Although depressive rumination has received the most attention, other forms of rumination have maladaptive consequences. Stress-reactive rumination involves repetitively dwelling on negative inferences (e.g., “it was all my fault”) after stressful events and was shown to predict the onset and duration of depressive episodes in a student sample (Robinson & Alloy, 2003). Peled and Moretti (2010) found that anger rumination and depressive rumination are distinct constructs, with anger rumination predicting aggression and depressive rumination predicting depressed mood. Anger rumination also leads to increases in angry feelings and negative interpretations of ambiguous events (Bushman, Bonacci, Pederson, Vasquez, & Miller, 2005; Rusting & Nolen-Hoeksema, 1998). Ruminating about uncomfortable social interactions or interpersonal offenses is related to social anxiety, negative self-judgment (Brozovich & Heimberg, 2008), cortisol levels (McCullough, Orsulak, Brandon, & Akers, 2007) and vengefulness (McCullough, Bellah, Kilpatrick, & Johnson, 2001).

7.1. Rumination in BPD

People with BPD experience a wide range of negative emotions, stressful events, and uncomfortable interactions about which they might ruminate. Many negative outcomes of rumination are common in BPD, including self-harm, disordered eating, substance abuse, impaired relationships, aggressive behavior, negative self-judgment, and post-traumatic stress. The emotional cascade model (Selby, Anestis, & Joiner, 2008) suggests that in people with BPD, negative affect triggers rumination, which intensifies the affect, which leads to more rumination. This vicious cycle creates an intensely unpleasant experience of negative emotion and ruminative thought (the emotional cascade), which leads to extreme dysregulated behavior, such as self-harm or substance abuse. The dysregulated behavior functions to distract attention from the negative affect and ruminative thoughts.

7.1.1. Studies of depressive rumination

Abela, Payne, and Moussaly (2003) found that adults with both BPD and major depressive disorder (MDD) reported higher levels of depressive rumination than those with MDD only. Watkins (2009) found significant relationships between depressive rumination and BPD features in patients with unipolar mood disorders, even after controlling for current depression. Smith, Grandin, Alloy, and Abramson (2006) examined longitudinal relationships between cognitive vulnerability to depression and personality pathology in a large sample of undergraduates and found that depressive rumination predicted later BPD symptoms even after controlling for current and past levels of depression, depressogenic attributions, and dysfunctional attitudes. These studies suggest that depressive rumination plays an important role in BPD pathology that is not accounted for by comorbid depressive symptoms or negative cognitive content.

7.1.2. Studies of anger rumination

In an undergraduate sample including many with high levels of BPD features, Baer and Sauer (2011) found that anger rumination was a stronger predictor of BPD features than was depressive rumination, after accounting for current distress and trait-level negative affect. In cross-sectional analyses, anger rumination mediated the relationship between negative affectivity and BPD features, whereas depressive rumination did not. Results suggest that rumination accounts for variance in BPD symptoms that is not explained by general negative affect and highlight the important role of anger rumination in particular. In a laboratory experiment, Sauer and Baer (in press) induced an angry mood in outpatients with BPD and then randomly assigned them to 8 min of guided rumination or mindful awareness of their current feelings. Participants then completed a computer-based distress tolerance task requiring rapid mental arithmetic under stressful conditions. Participants who had practiced mindfulness persisted much longer on this unpleasant task than those who had ruminated, suggesting that anger rumination has detrimental effects on distress tolerance, as compared to practicing mindfulness, in people with BPD.

7.1.3. Studies of mixed forms of rumination

Selby, Anestis, Bender, and Joiner (2009) studied the emotional cascade model in a large student sample that included many meeting criteria for BPD. They found a significant association between severity of BPD symptoms and a composite rumination variable that included depressive brooding, anger rumination, and catastrophizing. The rumination variable mediated the relationship between BPD symptoms and dysregulated behavior, such as self-harm and binge-eating. Ruminating for 5 min about a troubling problem led to greater increases in negative mood for those with BPD, after controlling for current depression. Results support the importance of rumination in contributing to the emotional intensity and behavioral dysregulation that characterize BPD.

In a student sample that included many with high levels of BPD features, Upton, Peters, Eisenlohr-Moul, and Baer (2011) found that several forms of self-reported rumination, including angry, depressive, stress-reactive, and interpersonal rumination, showed incremental validity over general distress in predicting severity of BPD features. Results suggest that multiple forms of rumination are important in understanding BPD pathology. Analyses of a 10-minute writing task in which participants wrote about their repetitive thoughts showed that BPD features were associated with thoughts that are negatively valenced, prolonged, difficult to control, unhelpful, and unresolved. BPD features also were associated with other-focus (rather than self-focus) in the writing samples, suggesting that people with BPD symptoms are likely to ruminate about interpersonal issues.

7.2. Conclusions

This small but growing literature suggests that several forms of rumination are common in people with BPD and that rumination is

significantly correlated with severity of BPD symptoms, even after controlling for current distress and trait-level negative affect. Rumination may mediate the relationship between trait-level negative affect and BPD features, although longitudinal tests of this theory have not been reported. Laboratory studies suggest that ruminating for a few minutes has significant detrimental effects on mood and distress tolerance in persons with BPD. Findings also suggest that repetitive thought in BPD tends to be negative, prolonged, difficult to control, unhelpful, and unresolved, as has been seen in depression. However, rumination in BPD appears to be more focused on anger and interpersonal concerns than is typical of depression. Only one study used longitudinal methods; thus, it remains unclear whether rumination contributes to the development of BPD.

8. General conclusions

The empirical literature suggests that people with BPD habitually attend to negative stimuli, have disproportionate access to negative memories, endorse a variety of BPD-consistent beliefs about themselves and the world, and make negatively biased interpretations and evaluations of neutral or ambiguous stimuli. They also engage in high levels of thought suppression and rumination and these tendencies are correlated with the severity of their symptoms.

The literature on cognitive biases in BPD is much less extensive than for Axis I disorders and many important questions have not been addressed. For example, it is not clear whether any of the cognitive processes reviewed here are true vulnerabilities; i.e., factors that are present before the onset of BPD and contribute to its development, rather than correlates, manifestations, or consequences of having the disorder (Riskind & Alloy, 2006). Some of the cognitive processes reviewed here may be vulnerabilities for BPD, perhaps in combination with other characteristics, such as invalidation or abuse in childhood and an emotionally intense and reactive temperament (Linehan, 1993). However, the longitudinal research necessary to study this question has not been conducted.

Findings are mixed on whether any of the cognitive processes reviewed here occur in ways that are specific to BPD. In the area of attentional bias, only one study found evidence that people with BPD attend selectively to BPD-specific stimuli (rather than general negative stimuli); thus, attentional bias in BPD may be similar to the bias observed in other emotional disorders. For memory bias, a somewhat different pattern was observed. A bias for remembering negative information appears to occur in BPD, as in other disorders. However, it appears that a specific form of avoidant memory bias (overgeneral autobiographical memory) is not a characteristic of BPD, though it is consistently seen in people with depression, suicidality, and posttraumatic stress. Moreover, overgeneral memory scores are *negatively* correlated with several forms of dysfunction in BPD, suggesting that overgeneral memory may be protective in BPD. The inability to screen out specific distressing memories, when it would be adaptive to do so, may reflect an executive function deficit in BPD that is not seen in depression, suicidality, or PTSD. The precise nature of this executive function deficit, and whether it occurs in other disorders, require further study.

The literature suggests that people with BPD endorse a wide range of dysfunctional beliefs, but that a combination of beliefs about the self (unacceptable, vulnerable, powerless), other people (rejecting, abandoning), and the world (dangerous, malevolent) distinguishes people with BPD from those with other PDs. Many of these distortions are also common in Axis I disorders. Differences in dysfunctional beliefs between BPD and Axis I disorders have not been thoroughly investigated. Studies of interpretation biases in BPD suggest a tendency to evaluate other people in extreme, negative terms. However, it is not clear whether this pattern is distinct to BPD or overlaps with other emotional disorders. Thought suppression and rumination are strongly associated with BPD and may exacerbate BPD symptoms through processes similar to those seen in Axis I disorders. Although the content of suppressed

thoughts in BPD may differ from other disorders, this question has not been studied. Similarly, the process of ruminative thinking may be similar across disorders; however, the content of ruminative thoughts may distinguish BPD from other conditions. The literature suggests that rumination on anger and interpersonal situations may be especially important in BPD.

Another important question requiring further study is whether explicit training in modification of cognitive biases has beneficial effects for people with BPD. Studies of cognitive bias modification typically use laboratory-based tasks to train participants to exhibit a particular processing bias. Effects on subsequent behavior then are noted. For example, using a dot-probe task in which the probes always appeared in the same location as either the threatening or the nonthreatening stimulus, MacLeod et al. (2002) trained participants consistently to direct their attention either toward or away from threatening information. Those who had learned to direct their attention away from threatening stimuli showed lower emotional reactivity to a subsequent laboratory stressor. Similarly, Schmidt, Richey, Buckner, and Timpano (2009) used a dot-probe task to train adults with social anxiety disorder to attend to neutral rather than disgusted faces. Training occurred in 20-minute sessions held twice weekly for 4 weeks. After training, most participants no longer met the criteria for social anxiety disorder and gains were maintained over a 4-month follow-up period. These studies suggest that cognitive biases can be changed with training and that beneficial outcomes may occur in people with emotional disorders (Koster, Fox, & MacLeod, 2009). Applications to BPD should be investigated.

Existing treatments for BPD include strategies that may address some of the cognitive processes reviewed here. Cognitive therapy targets the content of dysfunctional beliefs and attitudes. Brown, Newman, Charlesworth, Crits-Cristoph, and Beck (2004) reported that cognitive therapy led to significant reductions in borderline symptoms and dysfunctional beliefs in patients with BPD. Dialectical behavior therapy (DBT; Linehan, 1993) includes mindfulness training, which may have beneficial effects on many cognitive processes, including rumination (Kingston, Dooley, Bates, Lawlor, & Malone, 2007), thought suppression (Wenzlaff, 2005) and attentional capacities (Jha, Krompinger, & Baime, 2007). However, the effects of mindfulness training on cognitive processes in people with BPD require further study.

Riskind and Alloy (2006) suggest that the simultaneous presence of multiple cognitive vulnerabilities may lead to more severe symptoms and comorbid disorders. Similarly, Mathews and MacLeod (2005) and Wenzlaff (2004) note that cognitive biases may interact. Distorted beliefs can influence the stimuli to which people attend and the events they remember. Access to negative memories may increase negative attributions and rumination. Rumination and thought suppression appear to exacerbate each other in a maladaptive cycle. Given the severity and heterogeneity of BPD symptoms and the frequency of comorbidity with other disorders, it seems likely that most people with BPD will have multiple cognitive biases and maladaptive processing styles. If any of these are shown to be vulnerabilities that precede and contribute to the development of BPD, then it will be important to determine how they interact to lead specifically to BPD rather than to other disorders and how they interact with biological and environmental variables. No studies have investigated the presence of multiple cognitive biases and their relationships to biological and environmental risk factors for BPD.

The study of maladaptive cognitive processes in BPD is potentially very useful. Although it is unclear whether a specific pattern of cognitive processing uniquely characterizes BPD, the evidence suggests that many of the cognitive processes seen in other emotional disorders are also present in BPD and that they are associated with the severity of BPD symptoms. Although many of these processes have previously been described as transdiagnostic (Harvey et al., 2004), discussion of transdiagnostic processes often is limited to Axis I disorders. However, the central importance of emotional dysfunction in BPD suggests that continued study of maladaptive cognitive processes may prove helpful

in understanding how BPD develops and in designing effective treatment strategies for this severe and prevalent disorder.

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