USING AN EMOTION REGULATION FRAMEWORK TO ADVANCE CONCEPTUALIZATION OF BODY-FOCUSED REPETITIVE BEHAVIORS

A Thesis

by

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ABSTRACT

Relative to other areas of psychopathology, little is known about body-focused repetitive behaviors (BFRBs) and body-focused repetitive behavior disorders (BFRBDs). Given that emotion regulation theories have advanced the conceptualization and treatment of other psychiatric disorders, the purpose of the current study was to utilize an emotion regulation framework to advance the conceptualization of BFRBs and BFRBDs. Specifically, the current study examined whether emotion regulation deficits that are hypothesized to underlie emotion dysregulation (i.e., alexithymia, maladaptive emotional reactivity, experiential avoidance, and ineffectual response inhibition) are relevant to BFRB status and/or severity.

Participants were invited to enroll in the current study based on their responses to an online screening survey. Of the 2,722 Texas A&M University undergraduate students who completed the screening survey, 108 were officially enrolled as participants. Through a series of semi-structured interviews, it was determined that 32 of these participants were unaffected by BFRBs, 53 had subclinical BFRBs, and 23 had BFRBDs.

Results of the current study suggest that emotion regulation deficits are relevant to both BFRB severity and BFRBD status. Specifically, results of the current study indicated that BFRBD-affected individuals demonstrated higher levels of maladaptive emotional reactivity, experiential avoidance, and ineffectual response inhibition when distressed than did individuals without BFRBs and individuals with subclinical BFRBs.

Results also indicated that, individually, experiential avoidance and response inhibition abilities, when distressed, significantly predicted BFRB severity. Finally, results demonstrated that a linear combination of alexithymia, maladaptive emotional reactivity, experiential avoidance, and ineffectual response inhibition differentiated between individuals without BFRBs, individuals with subclinical BFRBs, and individuals with BFRBDs.

Consistent with previous research, findings from the current study suggest that emotion dysregulation contributes to rigid BFRB implementation by BFRBD-affected persons. Future research should continue to explore emotion dysregulation in BFRBDs and examine how this dysregulation compares to the emotion dysregulation characteristic of other psychiatric disorders.

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CHAPTER I

INTRODUCTION AND LITERATURE REVIEW

Introduction

Body-focused repetitive behaviors (BFRBs) are habitual, maladaptive behaviors directed towards one's body, such as hair pulling, skin picking, and nail biting (Snorrason et al., 2012; Stein et al., 2008; Teng, Woods, Marcks, & Twohig, 2004; Teng, Woods, Twohig, & Marcks, 2002). While many individuals engage in mild BFRBs and do so with little functional impairment, some individuals engage in body-focused repetitive behaviors disorders (BFRBDs), which are chronic and impairing BFRBs that persist despite attempts to stop (American Psychiatric Association [APA], 2013). In comparison to other areas of psychopathology and to the detriment of those suffering from the behaviors, little is conceptually known about BFRBs and BFRBDs. As research suggests that several psychiatric disorders are characterized by emotion dysregulation (Gratz & Roemer, 2004; Gross, 2013), incorporating emotion regulation theories into the conceptualization and examination of BFRB severity and status may lead to a deeper understanding of BFRBs and to treatment advancements.

For nearly two decades, conceptualizations of BFRBDs have included elements of emotion dysregulation (Diefenbach, Mouton-Odum, & Stanley, 2002; Diefenbach, Tolin, Menuinier, & Worhunsky, 2008; Mansueto, Stemberger, Thomas, & Golomb, 1997; Snorrason, Smari, & Olafsson, 2010). Further, researchers have noted a strong association between emotionality and BFRBDs. Indeed, several studies show that

individuals who perform BFRBs often report high levels of negative affect (Diefenbach, Tolin, Hannan, Crocetto, & Worhunsky, 2005; Hayes, Storch, & Berlanga, 2009; Shusterman, Feld, Baer, & Keuthen, 2009; Lewin et al., 2009; Stanley, Borden, Bell, & Wagner, 1994; Schlosser, Black, Blum, & Goldsten, 1994; Teng et al., 2004) and that BFRBs commonly co-occur with various disorders characterized by emotion dysregulation, including obsessive and compulsive related disorders (Lochner, Simeon, Niehaus, & Stein, 2002; Snorrason et al., 2010; Wilhelm et al., 1999), anxiety disorders (Wilhelm et al., 1999), and mood disorders (Lochner et al., 2002; Wilhelm et al., 1999). Yet, comprehensive empirical research on the association between emotion regulation and BFRBs has been limited.

In an attempt to advance conceptualization of BFRBs and BFRBDs, the current study first briefly outlines an emotion regulation model that can be used to examine BFRBs and BFRBDs and reviews previous research relevant to the association between emotion regulation and BFRBs/BFRBDs. Following this review, the current study utilizes the outlined emotion regulation model to (a) examine emotion regulation in individuals with BFRBs and BFRBDs and (b) examine whether emotion regulation abilities are related to BFRB severity and BFRB status.

Emotion Regulation

To outline a framework of emotion regulation that can be useful in examining emotion dysregulation in BFRBDs, it is first necessary to define and consider fundamental constructs. The following section defines emotions and emotion regulation, briefly reviews literature on the underlying neural process of emotion regulation, and

differentiates adaptive from maladaptive emotion regulation.

Definition of Emotion and Emotion Regulation

The concept and function of emotions are essential to understanding the construct of emotion regulation and how it can be adaptive or maladaptive (Gross, 1998b). Emotions can be conceptualized as the array of physiological, cognitive, and motoric systemic responses that are cued by perceptions of internal or external stimuli within the context of one's immediate goals (Gross, 2013; John & Gross, 2004; Levenson, 1999). For example, one will likely demonstrate a variety of responses upon concluding that a spider in his immediate vicinity presents a threat to his immediate self-preservation goals. Responses to this situation may include increased attention to the spider (cognitive), increased heartbeat (physiological), increased adrenaline (physiological), increased attention to potential escape routes (cognitive), and quick retreat from the scene (motoric). This pattern of systemic responses is descriptive of the emotion of fear.

As illustrated by the above example, emotions facilitate quick responses generally in the service of immediate goals (Ekman, 1992; Levenson, 1999). However, despite the general utility of emotions, emotional responses are not always advantageous or desirable. By their very nature, emotions often interrupt ongoing goal-directed action (Frijda, 1987). While this may not always be problematic, sometimes emotions interrupt goal-directed action that is necessary for long-term goal achievement (Gross, 1998b). Consequently, altering emotional responses is often advantageous.

Emotions are modulated through a secondary process referred to as emotion regulation. Like emotion, emotion regulation is a multi-systemic process that consists of

cognitive, physiological, and motoric responses (Gratz & Roemer, 2004; Gross, 1998b, 2013). Unlike emotion, emotion regulation is triggered by perceptions of emotional experiences in the context of one's immediate goals and the emotion provoking stimuli (Gross, 1998b, 2013). Returning to the spider example discussed earlier, determining that the spider in one's immediate vicinity presents less of a safety threat than originally thought may prompt engagement in emotion regulatory processes that will reduce initial fear-descriptive responses. Alternatively, determining that the spider presents more of a safety threat than initially recognized may prompt engagement in emotion regulatory processes that will increase fear responses. As illustrated, emotion regulation is a complex process that is based on interpretation of consolidated information regarding an emotional experience, the emotion-provoking stimulus, and the overall environment.

Components of Emotion Regulation

To better differentiate between adaptive and maladaptive emotion regulation, it may prove helpful to first consider emotion regulation as consisting of multiple components. Gross (2013) posits that emotion regulation consists of three primary components: (1) the emotion regulation goal, (2) the emotion regulation strategy, and (3) the emotion regulation outcome. The emotion regulation goal is the object of emotion regulation and is based on internal judgments about an elicited emotion (Gratz & Roemer, 2004; Gross, 2013). Typically, emotion regulation goals are elicited by perception that aspects of an emotional experience (e.g., emotion type, intensity, and duration) are incongruent with aspects of the emotion-provoking situation (e.g., the emotion-triggering stimuli, past experiences with the stimuli; Gratz & Roemer, 2004;

Gross, 2013). Based on this perceived incongruence, one's emotion regulation goal may be to increase, decrease, or maintain emotional experiences (Gratz & Roemer, 2004; Gross, 2013).

Highly dependent on the goal, the emotion regulation *strategy* is the behavior that is implemented to regulate the emotion (Gross, 2013). Emotion regulation strategies can be grouped into two-broad categories: antecedent-focused and response-focused strategies (Gross, 2002, 2013; Gross & John, 2003). Antecedent-focused strategies are strategies implemented prior to the onset of emotional responses and, thus, influence initial emotion responses to emotion triggering situations (Gross, 1998a, 2002, 2013; Gross & John, 2003). Examples of antecedent-focused strategies include "attentional deployment" (i.e., attending to specific aspects of an emotion-provoking situation and ignoring other aspects of that situation) and "cognitive change" (i.e., altering an initial interpretation or appraisal of a situation). In contrast to antecedent-focused strategies, response-focused strategies (i.e., response modulation) refer to strategies implemented following the onset of emotional responses (Gross, 2002, 2013; Gross & John, 2003). An example of response-focused strategies is "response modulation," which involves using motoric responses to alter experiences of emotions (Gross, 1998a, 2002, 2013; Gross & John, 2003). Smiling in an attempt to increase one's experience of a positive emotion is an example of "response modulation."

The success one has in achieving an emotion regulation *goal* with the implemented emotion regulation *strategy* is known as the emotion regulation *outcome* (Gross, 2013). Typically, the emotion regulation *outcome* provides some indication as to

the effectiveness of an emotion regulation *goal* and *strategy* combination in a given situation. Accordingly, people's perception of the effectiveness of past emotion regulation *outcomes* likely influence future implemented *goal* and *strategy* combinations.

Although the components of emotion regulation are highly interrelated, differentiating between them may facilitate a more detailed analysis of emotion regulation. This is particularly true when differentiating adaptive from maladaptive emotion regulation, as emotion regulation is most often thought of in terms of the emotion regulation strategy.

Neural Examination of Emotion Regulation

A growing body of research is dedicated to identifying the neural mechanisms underlying emotion regulation. Consideration of these neural mechanisms may clarify factors that contribute to emotion regulation difficulties.

As noted earlier, emotion regulation is a process in which strategies are used to achieve specific emotion regulation goals. Research on the neural processes that underlie emotion regulation suggests that the prefrontal cortex (PFC), anterior cingulate cortex (ACC), and various other regions of the orbital frontal cortex (OFC) are heavily involved in emotion regulation (Etkin, Egner, & Kalisch, 2011; Ochsner & Gross, 2005; Ochsner, Silvers, & Buhle, 2012; Taylor & Liberzon, 2010; Wager, Davidson, Hughes, Lindquist, & Ochsner, 2008). Indeed, neuroimaging research highlights the role of frontal neural regions in the selection of emotion regulation goals, the implementation of emotion regulation strategies, and the monitoring of emotion regulation outcomes

(Ochsner et al., 2004; Ochsner & Gross, 2005, 2008; Wager et al., 2008). Neurocognitive research also suggests that executive functions (i.e., working memory, inhibition, and attention control; Miyake et al., 2000) play a central role in setting emotion regulation goals, implementing emotion regulation strategies, and monitoring emotion regulation outcomes (Gross, 1998a; Hofmann, Schmeichel, & Baddely, 2012; Schmeichel & Demaree, 2010). Collectively, these findings support a cognitive model of emotion regulation (Ochsner et al., 2012), suggesting that emotion regulation is a form of cognitive control (Ochsner et al., 2012; Taylor & Liberzon, 2010).

Given the central role of cognition in emotion regulation, it may be hypothesized that cognitive deficits contribute to maladaptive emotion regulation. Consistent with this hypothesis, evidence suggest that cognitive deficits are prominent in a variety of psychiatric disorders that are characterized by emotion dysregulation (Campbell-Sills, Ellard, & Barlow, 2013). As suggested by the definition of emotion regulation, cognitive deficits that negatively affect one's ability to consolidate information from multiple sources and make decisions based on that information may be particularly disruptive to the emotion regulation process.

Adaptive Versus Maladaptive Emotion Regulation

Currently, there is no widely-accepted definition of either adaptive or maladaptive emotion regulation. However, emotion regulation generally can be said to be adaptive when an emotion regulation strategy effectively (a) reduces maladaptive psychological distress, (b) reduces maladaptive physiological arousal, and (c) promotes behavior that is consistent with one's socially acceptable distal goals (Campbell-Sills et

al., 2013; Gross, 2013; Thompson, 1994). As the strategy needed to produce this outcome will vary based on the context of the emotional experience and the situation, long-term adaptive emotion regulation consists of the flexible application of emotion regulation strategies that correspond to emotional and situational contexts (Gratz & Roemer, 2004; Gross, 2013; Thompson, 1994).

In contrast to adaptive emotion regulation, emotion regulation may be considered maladaptive if the implemented strategy distally increases emotional and physiological distress (Campbell-Sills et al., 2013) or contributes to physical, personal, or psychosocial impairment. Long-term maladaptive emotion regulation generally involves the rigid implementation of regulatory strategies without regard to the emotional or situational context.

Although maladaptive emotion regulation may not necessarily constitute psychopathology, several psychiatric disorders are characterized by persistent maladaptive emotion regulation (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Gross, 2002; Gross & Jazaieri, 2014). Indeed, in several cases, the defining characteristics of various forms of psychopathology can be conceptualized as inflexibly applied emotion regulation strategies (Aldao, Nolen-Hoeksema, & Schweizer, 2010). For instance, generalized anxiety disorder (GAD) is characterized by excessive use of worry as an emotion regulation strategy (Mennin, Heimberg, Turk, & Fresco, 2005). Similarly, major depressive disorder (MDD) is characterized by rumination (Nolen-Hoeksema, Wisco, & Lyubomirksy, 2008), and Borderline Personality Disorder is often characterized by self-harm that is done to regulate emotional experience (Gratz &

Roemer, 2004). Given that emotion dysregulation appears to be a factor that underlies several psychiatric disorders, more research has been dedicated to examining emotion dysregulation in psychopathology.

While rigid implementation of emotion regulation strategies may be the central defining characteristic of maladaptive emotion regulation descriptive of psychopathology, other variables likely contribute to this rigid implementation. Accordingly, researchers have attempted to develop models that describe these other variables. Two particularly influential and well-validated models are the Gratz and Roemer (2004) and the Mennin et al. (2005) models. Gratz and Roemer (2004) suggest that emotion dysregulation is a multi-dimensional construct consisting of an inability to: (a) identify and understand emotions, (b) "accept" emotional experiences, and/or (c) continue to partake in behavior that is consistent with distal and adaptive goals when emotionally distressed. Similar components of emotion dysregulation are posited by Mennin and colleagues (2005), who suggest that emotion dysregulation consists of (a) maladaptive emotional reactivity, (b) poor emotional comprehension, (c) negative reactions to emotional experiences, and (d) continued use of ineffective emotion regulation strategies. Notably, whereas the Gratz and Roemer (2004) model was intended to describe emotion dysregulation generally, the Mennin et al. (2005) model was intended to describe emotion dysregulation in the context of GAD. However, the Mennin et al. (2005) model has since been extended to describe emotion dysregulation in other disorders (Aldao, Mennin, Linardatos, & Fresco, 2010; Liverant, Brown, Barlow, & Roemer, 2008).

Collectively, these emotion dysregulation models suggest that the following components contribute to emotion dysregulation in psychopathology (i.e., the continued use of maladaptive emotion regulation strategies): (1) alexithymia (i.e., inability to identify and understand emotions/poor emotional comprehension), (2) maladaptive emotional reactivity, (3) experiential avoidance (i.e., inability to "accept" emotional experiences/negative reactions to emotional experiences), and (4) ineffectual response inhibition during times of emotional distress (i.e., inability to refrain from actions with immediate rewards). Each of these components and their hypothesized influence on emotion regulation are described in more detail in the following sections.

Alexithymia

Alexithymia is a personality trait characterized by "an externally oriented cognitive style," as well as deficits in (a) identifying and labeling emotions, (b) differentiating between emotions and sensory phenomena, and (c) imagination (Taylor, 2000). The trait is particularly associated with psychosomatic disorders (Taylor, 2000), which is consistent with evidence suggesting that individuals with high levels of alexithymia have difficulty recognizing affect that accurately reflects autonomic activity level (Connelly & Denney, 2007). Overall, as suggested by the literature on alexithymia, individuals high in alexithymia tend to have poor understanding of their emotional experiences.

Deficits associated with alexithymia are inherently detrimental to one's capacity to set beneficial emotion regulation goals, choose appropriate regulatory strategies, and monitor emotion regulation outcomes. As suggested by the definition, a person high in

alexithymia may have trouble (a) recognizing when they should engage in regulatory processes, (b) determining which regulatory processes they should engage to effectively regulate their emotions, and (c) determining whether they were successful in regulating their emotion. Moreover, aspects of alexithymia may inhibit individuals' abilities to engage in adaptive emotion regulatory practices (Swart, Korekaas, & Aleman, 2009; Taylor, 2004). For instance, due to deficits in imagination, those high in alexithymia may have trouble thinking of adaptive strategies to apply, particularly in unfamiliar situations. Similarly, those high in the trait may ineffectively partake in some generally adaptive emotion regulation strategies, such as emotional labeling (Lieberman, Inagaki, Tabibnia & Crockett, 2011).

Maladaptive Emotional Reactivity

Emotional reactivity refers to the intensity and duration of one's emotions (Berenbaum, Raghavan, Le, Vernon, & Gomez, 2003; Nock, Wedig, Holmberg, & Hooley, 2008). Emotional hyperreactivity describes the tendency to be abnormally sensitive to certain emotions (Mennin, Heimberg, Turk, & Fresco, 2002). Thus, individuals who are emotionally hyperreactive tend to experience some emotions at abnormally high levels and for prolonged periods of time (Mennin et al., 2002). For instance, individuals with anxiety disorders are generally hyperreactive to feelings of anxiety. Accordingly, these individuals tend to experience chronic anxiety, as they may often feel intense anxiety even in situations that may not trigger strong feelings of anxiety in individuals without anxiety disorders (Campbell-Sill et al., 2013; Etkin & Wager, 2007; Mennin et al., 2005; Shin & Liberzon, 2010).

In contrast to emotional hyperreactivity, emotional hyporeactivity describes the tendency to be abnormally unsusceptible to experiencing certain emotions (Berenbaum et al., 2003). For instance, individuals with MDD are typically hyporeactive to positive emotions (Bylsma, Morris, & Rottenberg, 2008; Rottenberg, Kasch, Gross, & Gotlib, 2002). Accordingly, these individuals tend to experience positive emotions less intensely and less frequently than individuals who are not suffering from depression (Rottenberg et al., 2002).

As the emotion regulatory goal is partially based on valuation of certain aspects of an emotional experience (such as emotional intensity), emotional reactivity inherently influences the emotion regulatory goal (Nock et al., 2008). Indeed, one who is sensitive to certain emotions may frequently engage in emotion regulatory processes to modulate those emotions, even in situations that normally would not warrant regulation. Related, such individuals may have difficulty selecting regulatory strategies that are appropriate to a situation due to their abnormal emotional experiences (Hare et al., 2008; Mennin et al., 2005). Indeed, some research suggests that emotion intensity may impact selection of emotion regulation strategy. For instance, Sheppes, Scheibe, Suri, and Gross (2011) found that individuals typically prefer to use reappraisal strategies when experiencing less intense emotions and distraction strategies when experiencing more intense emotions.

Experiential Avoidance

Experiential avoidance is defined as the unwillingness to experience undesirable internal experiences (i.e., emotions, cognitions, and sensations; Hayes, Wilson, Gifford,

Follette, & Strosahl, 1996). Accordingly, individuals high in experiential avoidance display a greater tendency to engage in strategies to escape from or "control" unwanted internal experiences (Hayes et al., 1996). As those who are experientially avoidant place priority on altering experiences, the behaviors used to control these experiences may be incongruent with distal goals in some instances (Hayes et al., 1996).

Experiential avoidance has direct implications on the emotion regulation goal, given that the emotion regulation goal is largely based on one's judgments about an emotional experience. Individuals who are experientially avoidant will likely choose to engage in down-regulation upon experiencing "undesirable" emotions, whether warranted or not. Moreover, experiential avoidance may contribute to the selection of emotion regulatory strategies that meet immediate goals of altering unpleasant emotional experiences quickly at the expense of meeting other short or long-term goals (Hayes, Strosahl, Wilson, Bissett, Pistorello et al., 2004).

Ineffectual Response Inhibition

Related to the utilization of avoidance strategies, response inhibition refers to one's ability to inhibit a preponderant response (Oosterlaan, Logan, & Sergeant, 1998), as well as to forgo immediate goals that are detrimental to distal goals (Friedman & Miyake, 2004). Therefore, experiential avoidance and hyperreactivity are likely related to response inhibition abilities (Nock et al., 2008). Displayed response inhibition may also be highly influenced by one's perceptions about her ability to ignore irrelevant information and maintain attention on distal goals (Friedman & Miyake, 2004; Tice, Bratslavasky, & Baumeister, 2001). In other words, displayed response inhibition may

be highly related to working memory and attention control.

Unlike previously discussed variables of emotion dysregulation, response inhibition does not solely influence one's emotion regulation goal and strategy. Rather, response inhibition refers to one's ability to implement emotion regulation goals and strategies that are congruent with distal goals. Implementation of regulatory goals and strategies that prioritize the quick alteration of undesirable emotional experiences over other goals likely modulate undesirable emotional responses in the short-term, but lead to negative consequences in the long-run. Implementation of such goals and strategies is representative of maladaptive response inhibition.

Conclusion

Emotion regulation refers to the physiological, cognitive, and behavioral responses that are triggered by perceptions of the congruence between an emotional experience and the emotion-triggering stimuli. As a process, emotion regulation consists of the implementation of a regulatory strategy in service of a regulatory goal. While adaptive emotion regulation requires the ability to implement strategies that will reduce physical or psychosocial distress across a variety of situations, persistent maladaptive emotion regulation characteristic of psychopathology generally consists of the rigid application of an emotion regulation strategy without regard to the context of the situation. Various models of emotion dysregulation in psychopathology posit that four major components contribute to continued application of maladaptive emotion regulation strategies: alexithymia, maladaptive emotional reactivity, experiential avoidance, and ineffectual response inhibition. These components can be used as a framework for

understanding how emotional dysregulation may play a role in BFRBs and BFRBDs.

Emotion Regulation and BFRBs

Although a comprehensive emotion regulation framework has not been applied to the examination of BFRBs, the BFRB literature suggest that emotion regulation is relevant to BFRBs and BFRBDs. This section reviews literature relevant to the definition and conceptualization of BFRBs and BFRBDs.

Prominent Conceptualizations of BFRBDs

Prominent BFRBD conceptual models posit that emotions and emotion regulation are central to the etiology and maintenance of BFRBDs. In combination with the emotion regulation model outlined previously, these models may provide an indication as to which emotion regulation deficits are most relevant to BFRBDs.

The Comprehensive Behavioral (ComB) Model proposed by Mansueto et al. (1997), for instance, suggests that emotions play a vital role in the recurrent performance of BFRBs. Specifically, the ComB model posits that the urge to perform a BFRB becomes associated with various internal (i.e., emotional states, sensory variables, and cognitions) and/or external variables (i.e., settings and tools used to perform BFRBs) over time; this repeated pairing results in the external and internal variables cuing the urge to perform a BFRB. The ComB model also suggests that the emotions (e.g., reducing reported anxiety), sensations (e.g., achieving satiation or pleasure), and cognitions (e.g., achieving symmetry) one experiences after performing a BFRB function as negative reinforcement. Accordingly, this model suggests that BFRBs may operate as a regulatory strategy, suggesting that emotion dysregulation may be a

prominent feature of BFRBs.

Expanding on the ComB model, the Stimulus Regulation Model developed by Penzel (2003) also noted an association between BFRBs and emotion. The Stimulus Regulation Model suggests that BFRBs broadly function to balance internal stimulation levels. Further, the model posits that individuals with BFRBDs suffer from a biologically-based inability to achieve and maintain appropriate stimulation levels. This perpetual instability necessitates the continued performance of BFRBs, as these behaviors operate as temporarily effective regulatory strategies. In addition to suggesting that BFRBs are emotion regulatory strategies, the idea that individuals with BFBDs may suffer from an inability to sustain appropriate stimulation levels suggests that such individuals are emotionally hypo- and/or hyperreactive. Likewise, as the model posits that individuals with BFRBDs continually engage in BFRBs due to discomfort associated with being under- or over-stimulated, this model suggests that experiential avoidance is also important to the conceptualization of BFRBDs.

Researchers have since discussed a more specific emotion regulation model of BFRBDs (e.g., Diefenbach et al., 2008; Roberts, O'Connor, & Bélanger, 2013; Shusterman et al., 2009; Snorrason et al., 2010). Similar to the previously discussed BFRBD models, the emotion regulation model posits that BFRBs are cued by unwanted emotions and that BFRBs lead to reductions in unwanted emotional experiences (i.e., BFRBs are emotion regulation strategies). More specific than the general emotion regulation model, the Frustrated Action (FA) Model, a notable subsidiary model within the emotion regulation model, suggests that feelings of boredom and frustration, in

particular, trigger BFRBs and that BFRBs temporarily reduce these feelings and increase more positive feelings (Roberts, O'Connor, Aardema, & Bélanger, 2015). More generally, proponents of the emotion regulation model suggest that chronic performance of BFRBs is associated with alexithymia, experiential avoidance, maladaptive emotional reactivity, and ineffectual response inhibition (Shusterman et al., 2009; Snorrason et al., 2010).

Collectively, these models suggest that BFRBs are response-focused emotion regulation strategies. Further, these models suggest that all four of the emotion regulation deficits outlined in the previous section (i.e., alexithymia, maladaptive emotional reactivity, experiential avoidance, and ineffectual response inhibition) may be related to BFRB performance.

Do BFRBs Regulate Emotion?

As previously noted, emotion dysregulation manifests as the rigid implementation of an emotion regulation strategy without regard to context. One way of determining whether emotion dysregulation is relevant to the conceptualization of BFRBDs is to examine whether BFRBs (the defining symptoms of BFRBDs) operate as emotion regulation strategies. Currently, two sets of studies support the notion that BFRBs serve as emotion regulation strategies: (1) studies that have examined the effect of emotions on BFRBs and (2) studies that have examined the effect of BFRBs on emotions.

Effect of Emotions on BFRBs

To date, three experimental studies have demonstrated that emotions (particularly

anxiety and boredom) tend to evoke BFRBs. Each of these studies is described below.

Woods and Miltenberger (1996) examined the effect of emotions on five BFRBs: hair, face, and object manipulation as well as repetitive limb movement and "mouthing of objects." Rather than utilizing participants with BFRBDs, the Woods and Miltenberger (1996) study compared the effect of emotions on BFRB performance between a group of individuals who reported a high number of BFRBs (N = 21) and a group of individuals who reported a low number of BFRBs (N = 23). As part of the study, participants were exposed to three separate conditions (anxiety, boredom, and neutral) while being inconspicuously recorded throughout the entire experiment. Recordings were coded using the frequency within interval recording method (Harrop & Daniels, 1986). Results showed hair and face manipulation occurred most frequently in the anxiety condition across groups, whereas object manipulation occurred more frequently in the bored condition across groups. More generally, these results support the notion that specific emotions trigger BFRBs.

Based on the Woods and Miltenberger (1996) study, Teng and colleagues (2004) examined BFRBs (with the exception of hair pulling) across four emotional conditions (i.e., anxiety, depression, boredom, and neutral/control). Participants were split into groups (BFRB group: N = 18; control group: N = 14) based on their responses to a survey (i.e., the Habit Questionnaire; Teng et al., 2002). To examine the impact of emotions on BFRB performance, participants were recorded as they were exposed to all four of the emotion-manipulated conditions. Recordings were scored using the frequency within interval method (Harrop & Daniels, 1986). Results demonstrated that the BFRB

group exhibited more BFRBs than the control group. Furthermore, results demonstrated the BFRB group performed BFRBs most frequently in the boredom condition, but the frequency of BFRBs performed by BFRB group did not significantly differ between the anxiety, depression, and control conditions. This study further evidenced that specific emotions trigger BFRBs.

Finally, Roberts et al. (2015) examined frequency of hair pulling, skin picking, and nail picking across several emotional conditions (stress, relaxation, and boredom/frustration) in a sample of 48 community participants. Based on a pre-screening interview, participants were equally divided into a BFRB group and a control group. Participants were recorded throughout the entirety of the experiment, and recordings were scored using a duration measure. Results demonstrated that the longest duration of BFRBs was observed in the boredom/frustration conditions, further suggesting BFRBs are triggered by specific emotions.

Together, these studies suggest that specific emotions tend to cue BFRBs in persons with subclinical BFRBs. More specifically, these studies provide evidence suggesting that feelings of boredom are particularly adept at eliciting BFRBs.

Effect of BFRBs on Emotions

By themselves, the aforementioned studies do not prove that BFRBs serve an emotion regulating function. To conclude that BFRBs regulate emotion, it must also be shown that BFRBs impact emotional experiences. To this end, several separate studies have examined emotional experiences across BFRB episodes. These studies are summarized below.

Using participant responses to the Hair Pulling Survey (HPS; Stanley, Borden, Mouton, & Breckenridge, 1995), Stanley et al. (1995) examined ratings of average emotional experiences prior to, during, and after hair pulling episodes in a sample of nonclinical hair pullers. Results of this study showed that the act of hair pulling was associated with self-reported reductions of boredom, tension, sadness, and anger. Such findings show that BFRBs triggered by emotional states reduce those states, suggesting that BFRBs may be a temporarily effective response-focused emotion regulation strategy. Given the study used a nonclinical sample, these findings also suggest that BFRBs may operate as an emotion regulation strategy for individuals who do not have a BFRBD.

Similarly, using the HPS in a follow-up study with a sample of clinical hair pullers, Diefenbach et al. (2002) found that self-reported levels of anxiety, tension, and boredom decreased during hair pulling episodes, further supporting the idea that BFRBs operate as emotion regulation strategies. Diefenbach et al. (2002) also found that clinical hair pullers reported increases in sadness, anger, and guilt after a hair pulling episode- a finding that has been replicated in several other studies (Neal-Barnett & Stadulis, 2006; Mansueto, Thomas, & Brice, 2007; Shusterman et al., 2009). Such a finding suggests that BFRBs may effectively reduce some target emotions, but may increase experiences of other "unpleasant" emotions. Moreover, this finding suggests that BFRBs are able to quickly reduce the emotions that trigger them, but tend to lead to distal negative outcomes (i.e., BFRBs tend to increase other "unpleasant" emotions after BFRB episodes). Accordingly, this study suggests that BFRBs may operate as a

maladaptive emotion regulation strategy among those with BFRBDs.

In a more recent study, Diefenbach et al. (2008) directly compared clinical hair pullers to nonclinical hair pullers (i.e., individuals who only pull their hair for grooming purposes). Using the HPS, Diefenbach et al. (2008) found that during the act of pulling hair, individuals with clinical hair pulling reported greater decreases in boredom, tension, sadness, and anger as well as greater increases in relief and calmness than those in the nonclinical group. After pulling, those with clinical hair pulling reported greater increases in guilt, sadness, and anger as well as greater decreases in happiness and calmness than those in the nonclinical group, suggesting that BFRBs of different severity differentially effect emotions. Similar findings were reported in a study that compared clinical skin pickers to nonclinical skin pickers (i.e., a sample that included both people with subclinical skin picking and people who did not pick their skin; Snorrason et al., 2010) and a more recent online study that compared clinical hair pullers to non-hair pullers (Weidt et al., 2016). Such results suggest that individuals with BFRDS may continue to engage in BFRBs due to the (actual or perceived) short-term effectiveness of the BFRB to regulate emotions relative to individuals without BFRBDs.

Collectively, these findings suggest that BFRBs impact emotional states of persons with and without BFRBDs. Moreover, these findings suggest that the degree to which BFRBs alter emotional states differ between those with subclinical BFRBs and those with BFRBDs. Individuals with BFRBDs may experience more intensely positive short-term benefits (i.e., greater reductions in emotions that precede the BFRBs), but also may experience more intensely negative long-term consequences (i.e., greater

increases in unpleasant emotions after BFRBs). Considering these findings and those of the three experimental studies previously discussed, it appears that BFRBs generally operate as an emotion regulation strategy. Further, these studies suggest that BFRBs may be a maladaptive emotion regulation strategy for individuals with BFRBDs, as performance of BFRBs by people with BFRBDs appears to lead to particularly negative outcomes. Accordingly, this research suggests that the previously outlined emotion dysregulation model may be relevant to the conceptualization of BFRBDs.

Emotion Dysregulation in BFRBDs

Although research supports the notion that BFRBs are maladaptive emotion regulation strategies for persons with BFRBDs, it is unclear how the emotion regulation deficits described previously (i.e., alexithymia, maladaptive emotional reactivity, experiential avoidance, and ineffectual response inhibition) may contribute to the continued performance of BFRBs and, thus, BFRB severity and status. At present, few studies have explored these deficits in the context of BFRBDs. These studies are summarized below.

Alexithymia

Three notable studies have examined whether alexithymia levels vary by BFRBD status. In a relatively recent study, Rufer et al. (2014) used the Toronto Alexithymia Scale (TAS-20; Bagby, Parker, & Taylor, 1994) to examine alexithymia in German adults diagnosed with clinical hair pulling. The study found that 15% of its participants demonstrated high levels of alexithymia, as defined by the suggested TAS-20 cutoff scores for high alexithymia (Taylor, Bagby, & Parker, 1997). In a separate study that

used subscales of the Difficulties in Emotion Regulation Scale (DERS; Gross & Roemer, 2004) to measure alexithymia, Snorrason et al. (2010) observed that clinical skin pickers demonstrated higher levels of alexithymia in comparison to a sample of non-clinical skin pickers (this sample included both subclinical skin pickers and people who did not pick their skin). Finally, in the third, using the TAS-20 to measure alexithymia, Çalikuşu, Yucel, Polat, and Baykal (2002) found that clinical skin pickers demonstrated higher levels of alexithymia in comparison to individuals with dermatological skin conditions that generally cause skin picking. Together, these three studies suggest that alexithymia levels may vary by BFRBD status.

Rufer et al. (2014) and Snorrason et al. (2010) also examined relationships between alexithymia and BFRB severity. Findings from Rufer et al. (2014) suggest that alexithymia (particularly the "difficulty in identifying feelings" subscale of the TAS-20) is positively associated with clinical hair pullers' hair pulling severity (as measured by the German version of the Massachusetts General Hospital Hair Pulling Scale, MGH-HPS; Keuthen et al., 1995). In contrast, findings from Snorrason et al. (2010) suggest that alexithymia is not related to clinical skin pickers' skin picking severity (as measured by the Skin Picking Scale, SPS; Keuthen et al., 2001. While it is ultimately unclear why these discrepant findings emerged, it is possible that Snorrason et al.'s (2010) sample size of 55 may have been underpowered to detect a relationship between alexithymia and skin picking severity.

Maladaptive Emotional Reactivity

Three studies have compared maladaptive emotional reactivity levels between

individuals with BFRBDs and individuals without BFRBDs. In one of these studies, Wetterneck, Lee, Flessner, Leonard, and Woods (2016) found that clinical hair pullers demonstrated higher levels of maladaptive emotional reactivity than healthy controls, as demonstrated by group differences on the Borderline Personality Features- Affective Instability scale on the Personality Assessment Inventory (PAI-BOR-A; Morey, 1991, 2007). In another study, using the Emotion Reactivity Scale (ERS; Nock et al., 2008) to measure emotional reactivity, Snorrason et al. (2010) found that clinical skin pickers were more emotionally reactive than a sample of nonclinical skin pickers (this sample included both subclinical skin pickers and people who did not pick their skin). In the third study, Hajcak, Franklin, Simons, & Keuthen (2006) found that hair pullers and skin pickers were more reactive to stress (as measured on the Stress subscale of the Depression, Anxiety, and Stress Scale, DASS-21; Henry & Crawford, 2005; Lovibond & Lovibond, 1995) than individuals in a large and diagnostically uncharacterized sample. Collectively, these studies suggest that individuals with BFRBDs demonstrate higher levels of emotional reactivity than individuals without BFRBDs. Consistent with this conclusion, research also suggests that emotional reactivity may predict BFRBD diagnosis- though this relationship was mediated by a combination of (a) the other outlined emotion regulation deficits (i.e., alexithymia, experiential avoidance, and response inhibition) and (b) a general inability to come up with different types of emotion regulation strategies as measured on the DERS (Snorrason et al., 2010).

These three studies also examined the relationship between emotional reactivity and BFRB severity among those with BFRBDs. Interestingly, only one of these studies

found evidence to suggest that there may be a relationship between emotional reactivity and BFRB severity (Hajcak et al., 2006). Yet, even the results of this study were mixed: while Hajcak et al. (2006) found evidence to suggest that stress reactivity was related to hair pulling severity (measured on the MGH-HPS), they were unable to establish a relationship between stress reactivity and skin picking severity (SPS).

Although research suggests that emotional reactivity is not related to BFRB severity (Hajcak et al., 2006; Snorrason et al., 2010; Wetterneck et al., 2016), it may be premature to conclude that this relationship does not exist. Indeed, both the Snorrason et al. (2010) and the Wetterneck et al. (2016) studies had relatively small sample sizes, which may have precluded observation of this relationship. Further, the mixed findings from Hajcak et al. (2006) are difficult to interpret, as the study's sample and methodology are not entirely clear. In particular, it is unclear whether Hajcak et al. (2006) only examined whether maladaptive emotional reactivity and skin picking severity was related in their sample of skin pickers. Alternatively, is unclear whether the relationship between maladaptive emotional reactivity and hair pulling severity was only examined in their sample of hair pullers. Moreover, it is unclear how many of the participants in Hajcak et al.'s BFRBD sample were skin pickers and how many were hair pullers.

Experiential Avoidance

Two studies suggest that individuals with BFRBDs have higher levels of experiential avoidance than do individuals without BFRBDs. In the first study, Wetterneck et al. (2016) found that clinical hair pullers demonstrated higher levels of

experiential avoidance than healthy controls. In the second, Snorrason et al. (2010) found that clinical hair pullers demonstrated higher levels of experiential avoidance than individuals in a sample of nonclinical skin pickers (this sample included both subclinical skin pickers and people who did not pick their skin).

Several studies have utilized samples of BFRBD-affected persons to examine whether experiential avoidance is related to BFRB severity. These studies suggest that experiential avoidance, as measured by the Acceptance and Action Questionnaire (Hayes, Strosahl, Wilson, & Bissett, 2004), is related to hair pulling severity as measured by the MGH-HPS (Begotka, Woods, & Wetterneck, 2004; Norberg, Wetterneck, Woods, & Conelea, 2007; Wetterneck et al., 2016) and skin picking severity as measured by the SPS (Flessner & Woods, 2006; Snorrason et al., 2010). Furthermore, research suggests that experiential avoidance may mediate the relationship between aversive internal experiences and BFRB severity (Flessner & Woods, 2006; Norberg et al., 2007; Houghton et al., 2014), indicating that levels of experiential avoidance may explain the relationship between aversive internal experiences (e.g., anxiety) and BFRB severity.

Ineffectual Response Inhibition

Research examining whether individuals with BFRBDs demonstrate different general response inhibition abilities than individuals without BFRBDs offer disparate conclusions. Various studies examining response inhibition in individuals with clinical hair pulling and skin picking have found that those with BFRBDs demonstrate response inhibition difficulties. For instance, in comparison to healthy controls, individuals with

clinical hair pulling appear to demonstrate response inhibition deficits on classic inhibition tasks, such as the stop-signal task (SST) and go/no-go task (Chamberlain, Fineberg, Blackwell, Robbins, & Sahakian, 2006; Odlaug, Chamberlain, Harvanko, & Grant, 2012). Similarly, in comparison to healthy controls, clinical skin pickers appear to demonstrate inhibitory deficits (as measured by the SST; Grant, Odlaug, & Chamberlain, 2011). In contrast, some research suggests that clinical hair pullers (Bohne, Savage, Deckersbach, Keuthen, & Wilhelm, 2008; Grant et al., 2011) and clinical skin pickers (Grant, Leppink, & Chamberlain, 2015) may not demonstrate inhibitory deficits. Consequently, it is unclear whether individuals with BFRBDs demonstrate general response inhibition deficits.

To date, only one study (Snorrason et al., 2010) has examined BFRBD-affected individuals' abilities to demonstrate response inhibition when distressed, however. This study found that clinical skin pickers demonstrate greater response inhibition deficits when distressed than nonclinical skin pickers, suggesting that individuals with BFRBDs have more difficulties with response inhibition when distressed than individuals without BFRBDs.

Although some research suggests that response inhibition difficulties may be related to BFRB severity (Chamberlain et al., 2006), research more generally suggests that general response inhibition difficulties are related to BFRBD diagnosis rather than BFRB severity (Grant et al., 2011; Grant et al., 2015; Odlaug, Chamberlain, Derbyshire, Leppink, & Grant, 2014; Odlaug, Chamberlain, & Grant, 2010). Similarly, research suggests that abilities to demonstrate response inhibition when distressed is not related to

BFRB severity (Snorrason et al., 2010).

Conclusion

Consistent with prominent BFRBD conceptual models, which posit that BFRBDs are characterized by emotion dysregulation, several studies suggest that the central features of BFRBDs (i.e., BFRBs) operate as maladaptive response-focused emotion regulation strategies. Preliminary studies also suggest the components of emotion dysregulation outlined in the first section (i.e., alexithymia, maladaptive emotional reactivity, experiential avoidance, and ineffectual response inhibition) are related to aspects of BFRBs and BFRBDs. Specifically, preliminary evidence suggests that alexithymia may be associated with BFRB severity and BFRBD diagnosis, experiential avoidance may be associated with BFRB severity and BFRBD diagnosis, and maladaptive emotional reactivity and difficulties with response inhibition may be associated with BFRBD diagnosis.

Examining Emotion Regulation Deficits Across BFRB Severity Levels

While research suggests that BFRBs may operate as maladaptive emotion regulation strategies, relatively little is known about how the outlined emotion regulation deficits (i.e., alexithymia, maladaptive emotional reactivity, experiential avoidance, and ineffectual response inhibition) may contribute to BFRB status and severity. Indeed, previous studies on the topic are limited, as they have generally only considered the relationship between one aspect of emotion dysregulation and one type of BFRB (typically hair pulling or skin picking) at a time. Furthermore, previous studies have only compared emotion regulation tendencies between two severity groups (i.e., a BFRB

group and a control group).

As comprehensive examination of emotion dysregulation across BFRB types and multiple BFRB severity groups may advance the conceptualization of BFRBs and BFRBDs, the current study is intended to explore emotion dysregulation across multiple types of BFRBs and three BFRB severity classifications (i.e., BFRBD, subclinical BFRB, and control [no BFRB]). In particular, the current study considered three main questions. These questions and hypotheses relating to these questions are discussed below.

Question 1: Do Individuals with BFRBDs, Individuals with Subclinical BFRBs, and Individuals Without BFRBs Demonstrate Different Levels of Alexithymia, Maladaptive Emotional Reactivity, Experiential Avoidance, and/or Ineffectual Response Inhibition?

Research suggests that individuals with BFRBDs demonstrate higher levels of alexithymia (Çalikuşu et al., 2002; Rufer et al., 2014; Snorrason et al., 2010), higher levels of maladaptive emotional reactivity (Hajcak et al., 2006; Snorrason et al., 2010; Wetterneck et al., 2016), and higher levels of experiential avoidance (Snorrason et al., 2010; Wetterneck et al., 2016) than individuals without BFRBDs. Accordingly, it was hypothesized that individuals with BFRBDs will report higher levels of alexithymia, maladaptive emotional reactivity, and experiential avoidance than will individuals with subclinical BFRBs and individuals without BFRBs.

Research examining whether persons with BFRBDs demonstrate response inhibition deficits relative to persons without BFRBDs is less straightforward. Indeed,

while some studies suggest that individuals with BFRBDs demonstrate deficits in general response inhibition abilities (Chamberlain et al., 2006; Grant et al., 2011), others suggest that these individuals do not (Bohne et al., 2008; Grant et al., 2011). Accordingly, hypotheses were not made regarding whether individuals with BFRBDs would report deficits in general response inhibition. However, based on Snorrason et al.'s (2010) conclusion that clinical skin pickers have greater difficulty demonstrating response inhibition when distressed than do nonclinical skin pickers, it was hypothesized that individuals with BFRBDs would demonstrate higher levels of ineffectual response inhibition when distressed than would individuals without BFRBDs.

At present, no research has explicitly examined whether individuals with subclinical BFRBs demonstrate different levels of emotion regulation deficits than individuals without BFRBs. Accordingly, analysis of these differences was exploratory.

Question 2: Can Levels of Alexithymia, Maladaptive Emotional Reactivity, Experiential Avoidance, and/or Ineffectual Response Inhibition Individually Predict BFRB Severity Amongst Individuals with BFRBs (Whether Clinical or Subclinical)?

With the exception of research that suggests that experiential avoidance is positively related to BFRB severity (Begotka et al., 2004; Houghton et al., 2014; Wetterneck et al., 2016), previous research on the relationships between each of the emotion regulation deficits and BFRB severity offer divergent ideas about the absence/presence of these relationships. For instance, while some research suggests that components of alexithymia may be positively associated with BFRB severity (Rufer et al., 2014), research also suggests that alexithymia may not be related to BFRB severity

(Snorrason et al., 2010). Similarly, although some research suggests that maladaptive emotional reactivity may be related to BFRB severity (Hajcak et al., 2006), research more generally suggests that maladaptive emotional reactivity may not be related to BFRB severity (Hajcak et al., 2006; Snorrason et al., 2010; Wetterneck et al., 2016). Finally, while some evidence suggests that general response inhibition is positively associated with BFRB severity (Chamberlain et al., 2006), evidence also suggests that neither general response inhibition abilities (Grant et al., 2011; Odlaug et al., 2014) nor response inhibition abilities when distressed (Snorrason et al., 2010) are related to BFRB severity. In light of these conflicting conclusions, hypotheses were not made about whether levels of alexithymia, maladaptive emotional reactivity, and response inhibition would, individually, predict BFRB severity. In contrast, as previous research suggests that experiential avoidance is positively related to hair pulling severity (Begotka et al., 2004; Houghton et al., 2014; Wetterneck et al., 2016), it was hypothesized that experiential avoidance would positively predict BFRB severity.

Question 3: Can Levels of Alexithymia, Maladaptive Emotional Reactivity, Experiential Avoidance, and Ineffectual Response Inhibition Be Used to Differentiate Between Individuals with BFRBDs, Individuals with Subclinical BFRBs, and Individuals Without BFRBs?

Based on Snorrason et al.'s (2010) study, which found that participants' total DERS scores (which are a combination of participants' reported alexithymia levels, experiential avoidance levels, abilities to demonstrate response inhibition when distressed, and abilities to generate emotion regulation strategies) significantly predicted

BFRBD status, it was hypothesized that a linear combination of alexithymia, maladaptive emotional reactivity, experiential avoidance, and ineffectual response inhibition would differentiate individuals with BFRBDs from individuals without BFRBs. However, it is unclear whether emotion regulation deficits will be able to differentiate between individuals with subclinical BFRBs and individuals with BFRBDs or between individuals with subclinical BFRBs and individuals without BFRBs, as previous research has not examined these questions.

CHAPTER II

METHOD

Sample

Data for the current study were collected as part of a larger study. Participants were recruited for this larger study through the university's psychology department's subject pool. Participants received partial course credit for their participation. Inclusion criteria for this study required participants to be enrolled in a psychology course at the university, be able to receive course credit for their participation in the study, and be at least 18 years old.

Prior to enrolling in the study, participants were required to complete an online screening survey. In total, 2,722 undergraduate students completed the screening survey. Of these, 108 were officially enrolled as participants in the current study. Participants' ages ranged from 18 to 34 years (M = 18.76, SD = 1.73). Seventy-five participants identified as female and 33 identified as male. Moreover, 89 participants identified as Caucasian, 6 identified as African American, 5 identified as Asian, 6 identified as multi-racial, and 1 participant did not identify their ethnicity. Further, 18 participants identified as Hispanic or Latino/a.

Following data collection, each participant was categorized into one of three BFRB groups (i.e., BFRBD, subclinical BFRB, and control [no BFRBs]) based on the ratings participants received on the seven different semi-structured Habit Disorders Interviews (HDIs) that were administered as part of the current study. Created to mirror

DSM-5 criteria for BFRBDs, these HDIs were used to assess participants' diagnostic status (i.e., clinical, subclinical, or not affected) on seven types of BFRBs: hair pulling, skin picking, nail biting, skin biting, lip/mouth/cheek biting, teeth grinding, and "other." Participants were included in the BFRBD group if they had at least one clinical-level BFRB. Participants were included in the subclinical BFRB group if they had at least one subclinical-level BFRB and did not have any clinical-level BFRBs. Participants were included in the control group if they did not have any subclinical- or clinical-level BFRBs. Based on these classification criteria, 32 participants were categorized into the control group, 53 were categorized into the subclinical BFRB group, and 23 were categorized into the BFRBD group. Demographic information pertaining to each of these BFRB groups is presented in Table A-1 in Appendix A. In addition, information about the types of BFRBs endorsed by the subclinical BFRB and BFRBD groups are presented in Table A-2 in Appendix A.

Measures

Demographic Information

Participants' demographic information (e.g., age, sex, and racial/ethnic identity) was collected on a demographics form.

BFRB Severity

The Clinical Global Impressions- Severity (CGI-S; Guy, 1976) is a clinician rated measure of disorder severity with evidence supporting the validity of its use in in clinical populations (Guy, 1976; Zaider et al., 2013). Although the CGI-S has been used to assess the severity of several different psychiatric disorders, the CGI-S was solely

used to measure BFRB severity in this study. Specifically, the CGI-S assessed the severity of participants' hair pulling, skin picking, nail biting, skin biting, lip/mouth/cheek biting, teeth grinding, and other BFRBs. CGI-S ratings range from 1 to 7, with 1 indicating "not ill" (i.e., the participant was not affected by BFRBs and, thus, displayed no BFRB severity) and 7 indicating "extremely ill" (i.e., the participant's BFRB was extremely severe and impairing). Although participants received separate ratings for all of their BFRBs, participants' highest CGI-S rating was the value used to represent participants' BFRB severity in the current study's data analysis.

Alexithymia

The Awareness subscale on the Difficulties in Emotion Regulation Scale (DERS-Awareness; Gratz & Roemer, 2004) is a six-item, self-report measure of individuals' propensity to be mindful of their emotional experiences. Total DERS-Awareness subscale scores range from 6-30, with higher scores indicating less emotional awareness.

The Clarity subscale on the DERS (DERS-Clarity; Gratz & Roemer, 2004) is a five-item, self-report measure of persons' abilities to understand and identify their emotional experiences as they occur. Total DERS-Clarity scores range from 5-25, with higher scores indicating a greater lack of emotional clarity.

Gratz and Roemer (2004) concluded that the DERS and each of its subscales demonstrated acceptable internal consistency, reliability, and validity in nonclinical samples. The DERS and each of its subscales have since been analyzed in studies conducted with BFRBD samples (e.g., Snorrason et al., 2010).

Maladaptive Emotional Reactivity

The Borderline Features- Affective Instability subscale on the Personality Assessment Inventory (PAI-BOR-A; Morey, 1991, 2007) is a six item self-report measure of emotional reactivity. On this scale, T scores of 50 represent the emotional reactivity levels reported by the average person in a large community sample, with low scores indicating hyporeactivity and higher scores indicating more hyperreactivity. The PAI-BOR-A has demonstrated acceptable reliability and validity (Morey, 1991, 2007; Stein, Pinsker-Aspen, & Hilsenroth, 2007).

Experiential Avoidance

The Nonacceptance subscale on the Difficulties in Emotion Regulation Scale (DERS-Nonacceptance; Gratz & Roemer, 2004) is a six-item, self-report measure of individuals' propensity to feel negatively about experiencing negative emotions. Total DERS-Nonacceptance subscale scores range from 6-30, with higher scores indicating greater rejection of emotional responses. As noted previously, the DERS-Nonacceptance subscale demonstrates acceptable internal consistency, reliability, and validity in nonclinical samples (Gratz & Roemer, 2004) and has since been used in BFRBD samples (Snorrason et al, 2010).

The Acceptance and Action Questionnaire-II (AAQ-II; Bond et al., 2011) is a 7-item self-report measure of experiential avoidance. Items are rated on a scale of 1 ("never true") to 7 ("always true"), resulting in total scores that range from 7 to 49. Higher scores are indicative of greater experiential avoidance. The AAQ-II has demonstrated acceptable validity in a community sample (Bond et al., 2011) and has

been frequently utilized in BFRBD samples (e.g., Houghton et al., 2014; Wetterneck et al., 2016).

Response Inhibition

General Response Inhibition Abilities

The Cambridge Neuropsychological Test Automated Battery (CANTAB) Stop Signal Task (SST) is a neurocognitive measure of general response inhibition abilities. Specifically, this task measures general abilities to inhibit preponderant responses. For this task, participants are asked to respond as fast as they can to the stimuli (i.e., arrows) presented on a screen. Specifically, participants are asked to press the left button when they see an arrow pointing to the left and a right arrow when they see an arrow pointing to the right. In addition, participants are asked to refrain from pressing either arrow if they hear a beep. It is emphasized that pressing the arrows as quickly as they can and refraining from pressing the arrows when they hear a beep is equally important.

As part of CANTAB, SST consists of 320 assessed trials (consisting of 5 blocks of 64 trials each) and 16 practice trials. Though the SST has many outcome measures, the Stop Signal Reaction Time (SSRT) is the gold standard (Oosterlaan et al., 1998; Verbruggen & Logan, 2008); accordingly, this study utilized SSRT as the measure of response inhibition. In particular, this study utilized participants' SSRT on their last 160 trials. Slower SSRTs indicate greater response inhibition deficits.

Response Inhibition Abilities when Distressed

The Goals subscale on the DERS (DERS-Goals; Gratz & Roemer, 2004) is a five-item, self-report measure of individuals' ability to concentrate on goals and

maintain goal-directed behavior when distressed. Total DERS-Goals scores range from 5-25, with higher scores indicating greater difficulties engaging in goal-oriented thoughts and behavior when distressed.

The Impulse subscale on the DERS (DERS-Impulse; Gratz & Roemer, 2004) is a six-item, self-report measure of persons' ability to govern their behavior when they are distressed. Total DERS-Impulse scores range from 6-30, with higher scores indicating greater difficulty ignoring impulses when distressed.

As alluded to previously, both the DERS-Goals and DERS-Impulse subscales demonstrate acceptable internal consistency, reliability, and validity in nonclinical samples (Gratz & Roemer, 2004). Further, both subscales have been utilized in BFRBD samples (e.g., Snorrason et al., 2010).

General Psychopathology

The Mini-International Neuropsychiatric Interview (MINI 6.0; Sheehan et al., 1998) is a structured diagnostic interview of psychopathology. The MINI has demonstrated acceptable reliability and validity (Sheehan et al., 1998).

Procedures

The current study consisted of three parts. Part I was an online screening survey. As part of this survey, participants completed a modified version of the Habits Questionnaire (Teng et al., 2002). This modified questionnaire included questions concerning the presence, frequency, duration, and associated impairment of each of the following BFRBs: hair pulling, skin picking, nail biting, nail picking, teeth grinding, lip/mouth/cheek chewing, and "other" BFRBs. For each BFRB a participant endorsed,

he or she was asked about the context in which those BFRBs occurred, the severity with which those BFRBs occurred, and the style with which those BFRBs were performed.

At the end of the screening survey, participants were informed that they may be eligible to participate in a two-part follow-up study (referred to in the current paper as Part II and Part III). Further, they were informed that both parts would take place in a Psychology lab on campus, that each part could require up to 3 hours of participation, and that they would receive course credit for participating in these studies. After receiving this information, participants indicated whether they were interested in completing the remaining two parts of the study. Based on participants' responses to the online screening survey and the number of participants already enrolled in the study, a clinical psychology doctoral student emailed select participants invitations to participate in Part II and Part III of the current study.

Part II of the study took place in a Psychology lab on campus. At the beginning of Part II, participants consented to participating in both Part II and Part III of the study. Following consent, participants were evaluated with the HDIs, the CGI-S, and the MINI by either a clinical psychology doctoral student or a master's level research coordinator. Next, participants completed several questionnaires. Of the questionnaires completed, those relevant to the current study were the demographics form, DERS, AAQ-II, and PAI.

After completing Part II, participants then returned to the lab to complete Part III. On average, participants completed Part III one week after completing Part II. During Part III, participants completed several Cambridge Neuropsychological Test Automated

Battery (CANTAB) assessments via a CANTAB tablet. Most relevant to the current study, participants completed the SST in this portion of the study.

CHAPTER III

RESULTS

Handling of Missing Data and Exclusion of Various Measures

One participant did not complete the SST due to errors with the CANTAB system. Thus, there were only 107 SSRT data points. Four participants failed to answer an item on the DERS, resulting in a total of four missing DERS item scores. Two of these items were on the DERS-Awareness subscale and two of these items were on the DERS-Clarity subscale. Only two of these participants skipped the same items. Accordingly, these items were considered to be missing completely at random, and item scores were imputed. Specifically, item scores were replaced with the subscale average.

With the exception of the DERS-Nonacceptance and DERS-Impulse subscales, q-q plots indicated that the distributions of the variables of interest were normal across all BFRB groups. Unfortunately, the distribution for the DERS-Nonacceptance and DERS-Impulse subscales were truncated (included as Figures B-1 and B-2 in Appendix B) and could not be corrected with transformation. Therefore, these subscales were not analyzed. Means, standard deviations, and correlations for the remaining variables of interest are presented in Table A-3 in Appendix A.

Preliminary Analysis

Preliminary analyses were conducted to examine whether age should be entered as a covariate in subsequent analyses. Results of a one-way ANOVA indicated the BFRB groups did not significantly differ on age, $F(2, 104) = .58$, $p = .56$. In addition,

Pearson Product-Moment Correlations indicated that age was not significantly related to any of the variables of interest (see Table A-3 in Appendix A). Accordingly, age was not included as a covariate in subsequent analyses.

Similarly, preliminary analyses were conducted to examine whether there were gender differences on any of the variables of interest. Results of chi-square analysis indicated that the BFRB groups did not have significantly different gender distributions, $\chi^2(2, N = 108) = .35$, $p = .84$. Further, results of several one-way ANOVAs indicated that male and female participants did not demonstrate significant differences on any of the variables of interest (see Table A-4 in Appendix A). Accordingly, gender was not considered in subsequent analyses.

Comparing the BFRB Groups' Emotion Regulation Deficit Levels (Hypothesis 1)

Alexithymia

A MANOVA was conducted to examine whether participants in the control, subclinical BFRB, and BFRBD groups reported distinct levels of alexithymia (measured with the DERS-Awareness and DERS-Clarity subscales). Results indicated that the BFRB groups reported significantly different alexithymia levels, $F(4, 208) = 3.18$, $p = .01$; Wilk's $\Lambda = .89$; partial $\eta^2 = .06$. Follow-up univariate analyses indicated that BFRB groups significantly differed on the DERS-Awareness subscale ($F(2, 105) = 5.93$, $p = .004$, partial $\eta^2 = .10$), but not on the DERS-Clarity subscale ($F(2, 105) = 2.26$, $p = .11$, partial $\eta^2 = .04$), suggesting that the BFRB groups differed in terms of emotional awareness but not in terms of emotional clarity.

Bonferroni post-hoc tests were used to further examine differences on the DERS-

Awareness subscale. Surprisingly, while the BFRBD group scored significantly higher on the DERS-Awareness subscale than did the subclinical BFRB group, $p = .003$, the BFRBD group did not score significantly higher than the control group, $p = .18$. Further, the subclinical BFRB group did not significantly differ from the control group, $p = .42$. BFRB group means on both the DERS-Awareness and DERS-Clarity subscales are presented and compared in Figure B-3 in Appendix B.

Maladaptive Emotional Reactivity

A one-way ANOVA was conducted to examine whether participants in the control, subclinical BFRB, and BFRBD groups demonstrated distinct levels of maladaptive emotional reactivity (measured with the PAI-BOR-A). Results indicated that the BFRB groups reported significantly different levels of maladaptive emotional reactivity ($F(2, 105) = 6.53$, $p = .002$, partial $\eta^2 = .11$). Bonferroni post-hoc tests indicated that the BFRBD group reported higher levels of maladaptive emotional reactivity than both the subclinical BFRB group, $p = .01$, and the control group, $p = .004$. However, the subclinical BFRB group did not significantly differ from the control group, $p = 1.00$. BFRB group means on the PAI-BOR-A are presented in Figure B-4 in Appendix B.

Experiential Avoidance

A one-way ANOVA was conducted to examine whether participants in the control, subclinical BFRB, and BFRBD groups demonstrated distinct levels of experiential avoidance (measured with the AAQ-II). Results indicated that the BFRB groups reported significantly different experiential avoidance levels, ($F(2, 105) = 12.86$,

$p < .001$, partial $\eta^2 = .20$). Bonferroni post-hoc tests indicated that the BFRBD group reported higher levels of experiential avoidance than both the subclinical BFRB group, $p < .001$, and the control group, $p < .001$. However, the subclinical BFRB group did not significantly differ from the control group, $p = .48$. BFRB group means on the AAQ-II are presented in Figure B-5 in Appendix B.

Response Inhibition

A MANOVA was conducted to examine whether participants in the control, subclinical BFRB, and BFRBD groups differed on response inhibition (measured with the SSRT and DERS-Goals subscale). Results indicated that the BFRB groups reported significantly different response inhibition ability levels, $F(4, 206) = 4.08$, $p = .003$; Wilk's $\Lambda = .86$; partial $\eta^2 = .07$. Follow-up univariate analyses indicated that the BFRB groups reported significantly different response inhibition abilities on the DERS-Goals subscale ($F(2, 104) = 7.08$, $p = .001$, partial $\eta^2 = .12$), but did not demonstrate significantly different response inhibition abilities as measured by SSRT ($F(2, 104) = .56$, $p = .57$, partial $\eta^2 = .01$), suggesting that the BFRB groups differed on ability to demonstrate response inhibition when distressed but not on general response inhibition abilities.

Bonferroni post-hoc tests were used to further examine differences on the DERS-Goals subscale. These analyses indicated that the BFRBD group's scores on the DERS-Goals subscale were significantly higher than both the subclinical BFRB group, $p = .02$, and the control group, $p = .01$. However, the subclinical BFRB group and the control group did not significantly differ from each other, $p = .42$. BFRB group means and

standard deviations on both the SSRT and DERS-Goals subscale are presented in Table A-5 in Appendix A.

Exploring the Predictive Relationships Between the Emotion Regulation Deficits and BFRB Severity (Hypothesis 2)

Several regressions were conducted to examine whether each of the outlined emotion regulation deficits predicts BFRB severity. Although the dependent variable used in these regressions (participants' highest CGI-S ratings) was an ordinal variable, linear regressions were conducted because assumptions of ordinal regression were not met. Further, because all participants who were included in the control group received CGI-S ratings of 1 (i.e., "not ill") on all of the assessed BFRBs, only participants in the subclinical group and BFRBD group were included in this analysis. Accordingly, the means of the alexithymia, emotional reactivity, experiential avoidance, and response inhibition measures were calculated in this subsample of participants. These measures were then centered at their subsample means.

Due to the number of regressions calculated, a Bonferroni correction was used. As four tests total were calculated, a *p* value of .01 was used to indicate significance.

Alexithymia and BFRB Severity

Participants' highest CGI-S ratings were regressed on their scores on the DERS-Awareness and DERS-Clarity subscales to examine whether alexithymia predicts BFRB severity. As multicollinearity tests indicated that multicollinearity was not prominent within the model (DERS-Awareness subscale, *VIF* = 1.40; DERS-Clarity subscale, *VIF* = 1.40), this model was considered interpretable. The regression model did not

significantly predict BFRB severity variance, R^2 = .09, $F(2, 73) = 3.52$, p = .04. Within the model, neither scores on the DERS-Awareness subscale (b = .06, $t(73)$ =2.16, p = .03) nor scores on the DERS-Clarity subscale (b = .01, $t(73)$ = .15, p = .88) significantly predicted BFRB severity.

Maladaptive Emotional Reactivity and BFRB Severity

To examine whether maladaptive emotional reactivity predicts BFRB severity, participants' highest CGI-S ratings were regressed on their PAI-BOR-A scores. Results indicated that PAI-BOR-A scores did not significantly predict CGI-S ratings (b = .02, $t(74) = 2.31$, p = .02, R^2 = .07).

Experiential Avoidance and BFRB Severity

To examine whether experiential avoidance predicts BFRB severity, participants' highest CGI-S ratings were regressed on their AAQ-II scores. Results indicated that AAQ-II scores positively predicted CGI-S ratings (b = .04, $t(74) = 3.42$, p = .001, R^2 = .14), suggesting that the BFRBs of individuals with higher levels of experiential avoidance tended to be more severe.

Response Inhibition and BFRB Severity

To examine whether response inhibition predicts BFRB severity, a multiple regression model in which SSRT and the DERS-Goals subscale were used to predict highest CGI-S ratings was conducted. This model explained variance in BFRB severity at a level that approached, but did not achieve, significance (R^2 = .12, $F(2, 72) = 4.47$, p = .02). However, within the model, DERS-Goals significantly predicted BFRB severity (b = .06, $t(72)$ =2.58, p = .01), suggesting that individuals who have greater difficulty

maintaining goal-directed thoughts and behavior when they are distressed tended to have more severe BFRBs. However, SSRT did not significantly predict BFRB severity (b = .01, $t(72) = 1.82$, $p = .08$).

Differentiating Between the BFRB Groups Using Emotion Regulation Deficit Levels (Hypotheses 3)

Predictive discriminant analysis was used to examine whether linear combinations of the alexithymia (DERS-Awareness and DERS-Clarity subscales), maladaptive emotional reactivity (PAI-BOR-A), experiential avoidance (AAQ-II), and response inhibition (SSRT and DERS-Goals subscale) measures could be used to differentiate between the three BFRB categories (i.e., BFRBD, subclinical BFRB, and control). The two functions that emerged from this analysis significantly differentiated between the categories (Wilks $\Lambda = .68$, $\chi^2(12) = 38.73$, Canonical correlation = .53, $p < .001$) and accounted for 32% of the variance in BFRB status. Further, these functions correctly reclassified 51.4% of the cases into their original categories, which is higher than what would be expected by chance (i.e., 33%). More specifically, these functions correctly reclassified 53% of those in the control group, 44% of those in the subclinical BFRB group, and 65% of those in the BFRBD group.

Standardized canonical discriminant function coefficients and group centroids are presented in Tables A-6 and A-7 in Appendix A, respectively. As expressed in Table A-7 in Appendix A, all of the emotion regulation deficit measures, with the exception of the DERS-Clarity subscale, were positively correlated with function 1. However, experiential avoidance, emotional awareness, and response inhibition when distressed

were the most strongly correlated with function 1. Emotional awareness was also strongly and positively correlated with function 2, but emotional clarity, experiential avoidance, general response inhibition, and ability to maintain goal-direction when distressed were negatively correlated with function 2.

CHAPTER IV

CONCLUSION

Although emotion dysregulation has long been thought to be relevant to BFRBD conceptualization, few studies have examined maladaptive emotion regulation components in individuals with BFRBDs. Those that have are generally limited by their focus on the relationship between one aspect of emotion dysregulation and one type of BFRB. The current study sought to address these limitations by examining several aspects of emotion dysregulation across various BFRB types and severity classifications. Utilizing data collected from a sample of undergraduate students, the current study examined the relationship between maladaptive emotion regulation components hypothesized to underlie emotion dysregulation (i.e., alexithymia, maladaptive emotional reactivity, experiential avoidance, and ineffectual response inhibition) and (a) BFRB status and (b) BFRB severity.

Question 1: Do People with Different BFRB Statuses Demonstrate Different Levels of Emotion Regulation Deficits?

The first aim of the study was to examine whether people with BFRBDs, people with subclinical BFRBs, and people without BFRBs demonstrate different levels of maladaptive emotion regulation components (i.e., alexithymia, maladaptive emotional reactivity, experiential avoidance, and ineffectual response inhibition). In examining these differences, it was hypothesized that people with BFRBDs would demonstrate higher levels of alexithymia, maladaptive emotional reactivity, experiential avoidance,

and ineffectual response inhibition when distressed than would people with subclinical BFRBs and people without BFRBs. Results were generally consistent with hypotheses. Specifically, in comparison to both individuals with subclinical BFRBs and individuals without BFRBs, individuals with BFRBDs reported more maladaptive emotional reactivity, experiential avoidance, and difficulties maintaining goal-directed behaviors when distressed. These observed differences mirror previous studies, which have concluded that persons with BFRBDs demonstrate higher levels of maladaptive emotional reactivity (Hajcak et al., 2006; Snorrason et al., 2010; Wetterneck et al., 2016), experiential avoidance (Snorrason et al., 2010; Wetterneck et al., 2016), and ineffectual response inhibition when distressed (Snorrason et al., 2010) than persons with subclinical BFRBs and persons without BFRBs.

Results pertaining to alexithymia, however, were mixed. Consistent with hypotheses, individuals with BFRBDs reported higher levels of emotional unawareness (a component of alexithymia) than did individuals with subclinical BFRBs. Inconsistent with hypotheses, individuals with BFRBDs and individuals without BFRBs did not demonstrate differences on emotional awareness. Also inconsistent with hypotheses, the BFRB groups did not demonstrate differences on emotional clarity (another component of alexithymia). These unexpected findings conflict with previous findings from Çalikuşu et al. (2002) and Snorrason et al. (2010). As both Çalikuşu et al. (2002) and Snorasson et al.'s (2010) BFRBD samples solely consisted of clinical skin pickers, which contrasts the current study's BFRBD sample composition, it may be that alexithymia deficits are only associated with clinical skin picking rather than with all

types of BFRBDs. Future should continue to examine alexithymia differences between individuals with BFRBDs and individuals without BFRBs.

Given the variability amongst previous findings on response inhibition deficits in individuals with BFRBDs, hypotheses were not made about whether the BFRB groups would differ on general response inhibition. Current results indicated that the BFRB groups did not demonstrate differences on general response inhibition abilities, giving further credence to the idea that individuals with BFRBDs do not have deficits in general response inhibition abilities. However, it remains unclear why some previous investigations have observed response inhibition deficits in individuals with BFRBDs (e.g., Chamberlain et al., 2006; Grant et al., 2011; Odlaug et al., 2014) and others have not (e.g., Bohne et al., 2008; Grant et al., 2011). As a possible explanation for these variable findings, Grant et al. (2011) suggested that perhaps only subgroups of BFRBD-affected persons demonstrate general response inhibition deficits. Accordingly, it may be that only individuals with certain BFRB types (e.g., skin picking) or individuals with certain characteristics (e.g., high on impulsivity) exhibit deficits on response inhibition. Therefore, the current study may not have observed any differences on response inhibition between the BFRB groups because specific BFRB types and characteristics like impulsivity were not considered. Regardless, future research should continue to explore general response inhibition abilities in individuals with BFRBDs.

Unlike previous studies on emotion regulation in BFRBs, the current study also examined whether individuals with subclinical BFRBs demonstrated different levels of emotion regulation deficits than did individuals with BFRBDs and individuals without

BFRBs. As noted previously, relative to individuals with BFRBDs, individuals with subclinical BFRBs reported lower levels of emotional unawareness, maladaptive emotional reactivity, experiential avoidance, and ineffectual response inhibition when distressed. In contrast, individuals with subclinical BFRBs and individuals without BFRBs did not significantly differ on any of the examined emotion regulation deficits. These results suggest that simply having a BFRB may not be an indication of emotion dysregulation. That is, levels of emotion dysregulation vary by BFRBD status (i.e., BFRBD vs. no BFRBD) not by BFRB status (i.e., BFRBD, subclinical BFRB, and no BFRBs). Accordingly, emotion dysregulation may be a factor that differentiates people who perform frequent yet non-impairing BFRBs from people who perform BFRBs so frequently that they lead to impairment.

Question 2: Can Each of the Emotion Regulation Deficits Predict BFRB Severity Amongst People with BFRBs?

The current study also examined whether levels of alexithymia, maladaptive emotional reactivity, experiential avoidance, and response inhibition independently predict BFRB severity among persons with subclinical and clinical BFRBs. It was hypothesized experiential avoidance would positively predict BFRB severity; in contrast, hypotheses were not made about whether alexithymia, maladaptive emotional reactivity, and response inhibition would, individually, predict BFRB severity. Consistent with hypotheses, results indicated that higher levels of experiential avoidance significantly predicted greater BFRB severity. Such results are not only consistent with previous research, which has found that experiential avoidance is related to hair pulling

severity (Begotka et al., 2004; Flessner & Woods, 2006; Houghton et al., 2014; Norberg et al., 2007; Wetterneck et al., 2016), but also suggest that experiential avoidance is generally associated with BFRB severity regardless of BFRB type.

In addition, results indicated that neither alexithymia nor maladaptive emotional reactivity predicted BFRB severity. Although these findings are consistent with Snorrason et al. (2010) and Wetterneck et al.'s (2016) findings, it may be premature to conclude that these predictive relationships do not exist. Indeed, although neither alexithymia nor maladaptive emotional reactivity significantly predicted BFRB severity in the current analysis, these predictive relationships approached significance (p = .03 and p = .02, respectively). It is possible that these predictive relationships exist, but that the Bonferroni correction utilized in the current study may have been too conservative and, thus, obscured these relationships.

Further, it should also be noted that the current study's finding that alexithymia does not significantly predict BFRB severity is inconsistent with Rufer et al.'s (2014) conclusion that clinical hair pullers' alexithymia levels (measured by the TAS-20) are significantly related to their hair pulling severity. Given that Rufer et al. (2014) utilized different measures of alexithymia (i.e., the TAS-20) and BFRB severity (i.e., the MGH-HPS), it is possible that the current study did not observe a predictive relationship between alexithymia and BFRB severity because of the alexithymia and/or BFRB severity measures utilized in the current study. In addition, given that Rufer et al. (2014) only examined the alexithymia-BFRB severity relationship in a sample of clinical hair pullers measurement differences, it is possible that the current study did not observe a

predictive relationship between alexithymia and BFRB severity due to sample differences. That is, it may be that the alexithymia-BFRB severity relationship only exists among individuals with specific types of BFRBs (i.e., hair pulling). Alternatively, it may be that the alexithymia-BFRB severity predictive relationship is only observable in samples that are entirely composed of individuals with BFRBDs. In any case, future research should continue to explore the relationship between alexithymia and BFRB severity.

Finally, the current results also suggest that greater difficulty demonstrating inhibition when distressed significantly predict greater BFRB severity, but that general response inhibition abilities do not predict BFRB severity. The significant predictive relationship between response inhibition when distressed and BFRB severity opposes findings from Snorrason et al. (2010), who found that clinical skin pickers' response inhibition abilities when distressed were not related to their skin picking severity. Given that Snorrason et al.'s (2010) sample size was much smaller than the current study's sample size, it is possible that a significant predictive relationship between response inhibition abilities when distressed and BFRB severity does indeed exist, but Snorrason et al.'s (2010) study was underpowered to detect a relationship between the two constructs.

The current study's finding that general response inhibition abilities does not significantly predict BFRB severity mirrors many earlier findings (Grant et al., 2011; Grant et al., 2015; Odlaug et al., 2014), but opposes findings Chamberlain et al. (2006). It is unclear why Chamberlain et al. (2006) observed a relationship between general

response inhibition and BFRB severity while others have not. In comparing the current study to Chamberlain et al. (2006), however, it is notable that Chamberlain et al. (2006) only examined the relationship between general response inhibition and BFRB severity in a sample of individuals with BFRBDs. Based on this difference, it is possible that there is a relationship between response inhibition abilities and BFRB severity, but that this relationship is moderated by BFRBD status. In other words, perhaps this relationship is only observable among individuals with BFRBDs.

Question 3: Can Emotion Regulation Deficit Levels Differentiate Between People with Different BFRB Statuses?

Finally, the current study examined the hypothesis that linear combinations of the outlined emotion regulation deficits (i.e., alexithymia, maladaptive emotional reactivity, experiential avoidance, and ineffectual response inhibition) could be used to differentiate between people with BFRBDs, people with subclinical BFRBs, and people without BFRBs. Results of the current study supported this hypothesis. Indeed, a linear combination of alexithymia, maladaptive emotional reactivity, experiential avoidance, and ineffectual response inhibition differentiated individuals with BFRBDs from those with subclinical BFRBs and those without BFRBs fairly consistently (i.e., at a rate higher than chance). However, these combinations were less consistently able to differentiate between individuals with subclinical BFRBs and individuals without BFRBs.

Results also indicated that emotional awareness (a facet of alexithymia), emotional clarity (another facet of alexithymia), and experiential avoidance were the

deficits that were best at differentiating between individuals with BFRBDs and individuals without BFRBDs. Therefore, these deficits may be the most central to BFRBD status. Future research should continue to explore this idea.

Implications, Limitations, and Future Directions

Ultimately, the current study further clarifies the relationship between maladaptive emotion regulation and BFRBs. Accordingly, the current results may be useful for extending the emotion regulation model of BFRBDs.

Based on previous research, the BFRBD emotion regulation model posits that (a) BFRBs are negatively reinforced emotion regulation strategies and (b) individuals with BFRBDs perform BFRBs despite the adverse emotional and physical consequences associated with the behaviors (Diefenbach et al., 2002, 2008; Roberts et al., 2013; Shusterman et al., 2009; Snorrason et al., 2010; Weidt et al., 2016). Using the definition of emotion dysregulation discussed in the first chapter (i.e., emotion dysregulation is the rigid implementation of emotion regulation strategies without regard to context; Campbell-Sills et al., 2013; Gross, 2013), this understanding of BFRBDs implies that BFRBDs are characterized by emotion dysregulation. However, as noted by the emotion dysregulation framework outlined in the first chapter, rigid implementation of emotion regulation strategies is only one aspect of emotion dysregulation (Gratz & Roemer, 2004; Mennin et al., 2005). In reality, there are several variables that likely underlie the rigid implementation of emotion regulation strategies- prominent models of emotion dysregulation posit that these variables consist of alexithymia, maladaptive emotional reactivity, experiential avoidance, and ineffectual response inhibition (Gratz & Roemer,

2004; Mennin et al., 2005). As the current study examined these variables and their relation to BFRB status and severity, the current results may provide some insight into the mechanisms that underlie the continued implementation of BFRBs.

The current results suggest that individuals with BFRBDs demonstrate difficulties with alexithymia, maladaptive emotional reactivity, experiential avoidance, and response inhibition when distressed and that these difficulties may lead to the continued implementation of BFRBs as emotion regulation strategies. Using the emotion dysregulation framework outlined in the first chapter as a lens to interpret the current results, it may be hypothesized that individuals with BFRBDs frequently implement BFRBs in response to undesirable emotions because their unwillingness to experience undesirable emotions (i.e., experiential avoidance) as well as their inability to maintain goal-directed behavior when they experience these emotions (i.e., ineffectual response inhibition when distressed) predisposes them to prioritize the immediate downregulation of these emotions via application of BFRBs. In addition, affected persons' inattentiveness to their emotional experiences (i.e., alexithymia) may make it difficult for them to match emotion regulation strategies with emotional and situation contexts; therefore, such individuals may frequently utilize BFRBs because they believe that these behaviors will help them achieve their desired emotion regulation outcome.

Further, as previous research suggests that BFRBD-affected persons frequently perform BFRBs in response to undesirable emotions (e.g., anxiety and boredom; Roberts et al., 2015; Teng et al., 2004) and the current results suggests that affected persons are particularly sensitive to experiencing certain emotions (i.e., maladaptive emotional

reactivity), it may be that affected persons frequently experience undesirable emotions; thus, leading to frequent BFRB performance. Independent of maladaptive emotional reactivity, it is also possible that affected persons' inattentiveness (i.e., alexithymia) to their emotions may cause them to mislabel their internal experiences; therefore, such persons may engage in emotion regulatory process upon experiencing private experiences that resemble unpleasant emotions. See Figure B-6 in Appendix B for a visual presentation of this hypothetical model. Future research should investigate this conceptualization of continued BFRB implementation characteristic of BFRBDs.

Although the current study cannot be used to make conclusions about whether emotion dysregulation underlies BFRBDs, the current study has notable implications. One implication is that BFRBD treatment models should include treatment components that target experiential avoidance and ineffectual response inhibition when distressed, as reduction of these variables may lead to reduction in BFRB severity. In addition, BFRBD treatment models may also benefit from including treatment components that target alexithymia and maladaptive emotional reactivity. Therefore, BFRBDs may benefit more from third wave cognitive behavior treatment models such as Acceptance and Commitment Therapy (ACT; Hayes, Strosahl, & Wilson, 1999) and Dialectical Behavior Therapy (DBT; Linehan, 1993) than from traditional BFRBD treatments, such as Habit Reversal Therapy (HRT; Azrin & Nunn, 1973). Indeed, studies on the effectiveness of HRT supplemented with ACT and HRT in treating clinical hair pulling and clinical skin picking further support this conclusion (Keuthen et al., 2010, 2011; McGuire et al., 2014; Twohig & Woods, 2004; Woods, Wetterneck, & Flessner, 2006).

Moreover, findings from some studies suggest that use of ACT alone leads to reductions in clinical skin picking severity (Twohig, Hayes, & Masuda, 2006).

The current study did have limitations that future research may improve on. One limitation is that the control group, subclinical BFRB group, and BFRBD groups sample sizes were unequal. In addition, the demographic uniformity (particularly in terms of age, ethnicity, and gender) of the current sample may also be viewed as a limitation. Further, the measures used may also be viewed as a limitation. In particular, the current study did not utilize the gold standard alexithymia measure, the TAS-20, nor did it utilize a nuanced measure of emotional reactivity, such as the ERS. Nevertheless, as the current study provides some evidence of the importance of emotion dysregulation to BFRB severity and BFRBD status, the current study may be useful in guiding future research.

While the current results provide a more comprehensive look at the relationship between maladaptive emotion regulation and BFRBs, several questions remain. For instance, the manner in which emotion regulation deficits are related to actual BFRB performance is unclear. Related, the relationship between internal/external stimuli and BFRB performance is unclear. More generally, it is unclear why individuals with BFRBDs utilize BFRBs as emotion regulation strategies rather than strategies characteristic of other disorders (e.g., worry, rumination, etc.). It is also unclear whether emotion dysregulation in BFRBDs is similar/dissimilar to emotion dysregulation in other disorders. Continued research on emotion dysregulation's contribution to BFRBs and

BFRBDs may be useful for answering such questions. Further, such research would be useful for improving diagnostic accuracy and developing effective treatments.

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APPENDIX A

TABLES

Table A-1

Gender, Psychiatric Comorbidity, and Age by BFRB Group

Variables	Control Group	Subclinical BFRB Group	BFRBD Group
% Female	66%	72%	70%
% with psychiatric disorder other than BFRBD	38%	38%	65%
Age: *M*(*SD*)	18.56 (.80)	18.94 (2.36)	18.61 (.72)

Table A-2

Types of BFRBs Reported by Persons in the Subclinical BFRB and BFRBD Groups

	Subclinical BFRB Group	BFRBD Group	
BFRBs	Subclinical BFRBs	Subclinical BFRBs	Clinical BFRBs
Hair Pulling	10	2	0
Skin Picking	15	4	9
Nail Biting	20	4	6
Cheek Biting	31	9	6
Teeth Grinding	10	3	7
Skin Biting	4	5	3
Other	14	14	2

Note. The numbers in each column refer to the number of persons in the subclinical BFRB and BFRBD groups that reported each type of BFRB. Persons in each group could report more than one BFRB.

Table A-3

Overall Means, Standard Deviations, and Correlations for Variables of Interest and Age

Variables	1	2	3	4	5	6	7	8
1. DERS-Awareness	-							
2. DERS-Clarity	.48**	-						
3. PAI-BOR-A	.17	.48**	-					
4. AAQ-II	.25**	.60**	.59**	-				
5. DERS-Goals	.03	.36**	.41**	.55**	-			
6. SSRT	.16	-.01	.05	.11	-.12	-		
7. Highest CGI-S Rating	.13	.14	.29**	.40**	.31**	.15	-	
8. Age	-.09	-.02	.04	-.08	-.08	.11	.05	-
Mean	15.69	11.74	51.04	20.09	18.76	184.16	2.66	18.76
Standard Deviation	4.83	4.25	10.78	8.85	1.73	49.07	1.33	1.73

Note. DERS-Awareness = Difficulties in Emotion Regulation Scale: Awareness Subscale; DERS-Clarity = Difficulties in Emotion Regulation Scale: Clarity Subscale; PAI-BOR-A = Personality Assessment Inventory Borderline Features-Affective Instability Subscale; AAQ-II = Acceptance and Action Questionnaire- Second Version; DERS-Goals = Difficulties in Emotion Regulation Scale: Goals Subscale; SSRT = Stop Signal Reaction Time; Highest CGI-S Rating = Participants' highest Clinical Global Impressions-Severity rating.
* $p < 0.05$. ** $p < 0.01$.

Table A-4

Gender Differences on Variables of Interest

Variables	Females *M* (*SD*)	Males *M* (*SD*)	Effect Size (*d*)
DERS-Awareness	15.41 (5.01)	16.33 (4.41)	-.20
DERS-Clarity	12.00 (4.39)	11.15 (3.91)	.21
PAI-BOR-A	51.81 (10.78)	49.27 (10.74)	.24
AAQ-II	20.40 (8.84)	19.39 (8.95)	.11
DERS-Goals	14.53 (5.05)	13.76 (4.47)	.16
SSRT	183.34 (52.51)	186.08 (40.54)	-.06
Highest CGI-S Rating	2.71 (1.32)	2.55 (1.37)	.12

Note. DERS-Awareness = Difficulties in Emotion Regulation Scale: Awareness Subscale; DERS-Clarity = Difficulties in Emotion Regulation Scale: Clarity Subscale; AAQ-II = Acceptance and Action Questionnaire- Second Version; PAI-BOR-A = Personality Assessment Inventory Borderline Features-Affective Instability Subscale; DERS-Goals = Difficulties in Emotion Regulation Scale: Goals Subscale; SSRT = Stop Signal Reaction Time; Highest CGI-S Rating = Participants' highest Clinical Global Impressions-Severity rating.

Table A-5

BFRB Group Differences on Response Inhibition

	Control Group *M* (*SD*)	Subclinical BFRB Group *M* (*SD*)	BFRBD Group *M* (*SD*)
DERS-Goals	12.47 (3.97)[a]	13.98 (4.57)[a]	17.09 (5.12)[b]
SSRT	178.77 (52.11)[a]	183.59 (49.59)[a]	192.93 (44.14)[a]

Note. Means sharing a superscript did not differ at $p < .05$ according to Bonferroni post-hoc analyses. Control Group $n = 32$; Subclinical BFRB Group $n = 52$; BFRBD Group $n = 23$. DERS-Goals = Difficulties in Emotion Regulation Scale: Goals Subscale; SSRT = Stop Signal Reaction Time.

Table A-6

Standardized Canonical Discriminant Function Coefficients Used to Differentiate Persons belonging to Different BFRB Groups

	Function 1	Function 2
DERS-Awareness	.60	.92
DERS-Clarity	-.59	-.12
PAI-BOR-A	.23	.20
AAQ-II	.74	-.32
DERS-Goals	.36	-.34
SSRT	.05	-.31

Note. DERS-Awareness = Difficulties in Emotion Regulation Scale: Awareness Subscale; DERS-Clarity = Difficulties in Emotion Regulation Scale: Clarity Subscale; PAI-BOR-A = Personality Assessment Inventory Borderline Features-Affective Instability Subscale; AAQ-II = Acceptance and Action Questionnaire- Second Version; DERS-Goals = Difficulties in Emotion Regulation Scale: Goals Subscale; SSRT = Stop Signal Reaction Time.

Table A-7

Functions at BFRB Group Centroids

BFRB Groups	Function 1	Function 2
Control	-.43	.31
Subclinical BFRB	-.25	-.22
BFRBD	1.17	.05

APPENDIX B

FIGURES

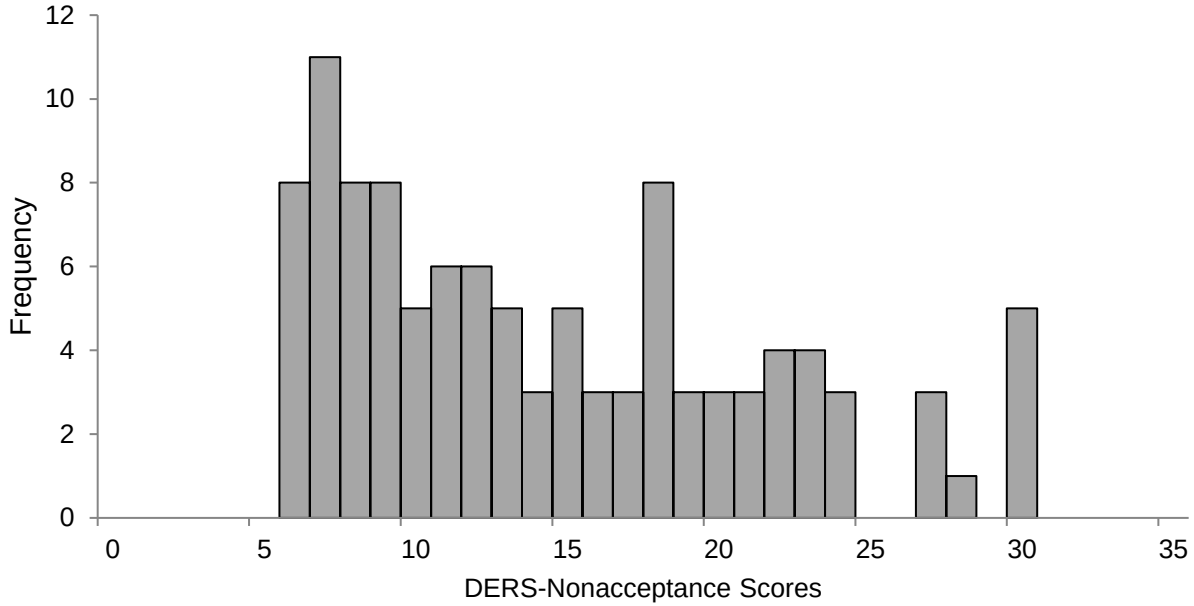

Figure B-1. Frequency of the current samples' scores on the DERS-Nonacceptance subscale.

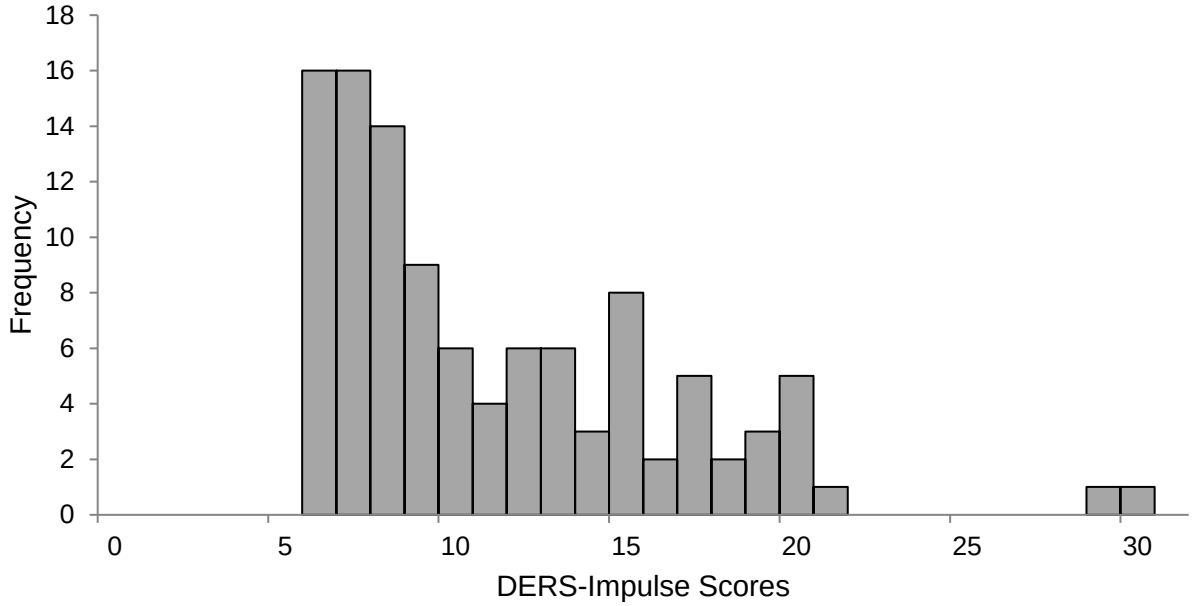

Figure B-2. Frequency of the current samples' scores on the DERS-Impulse subscale.

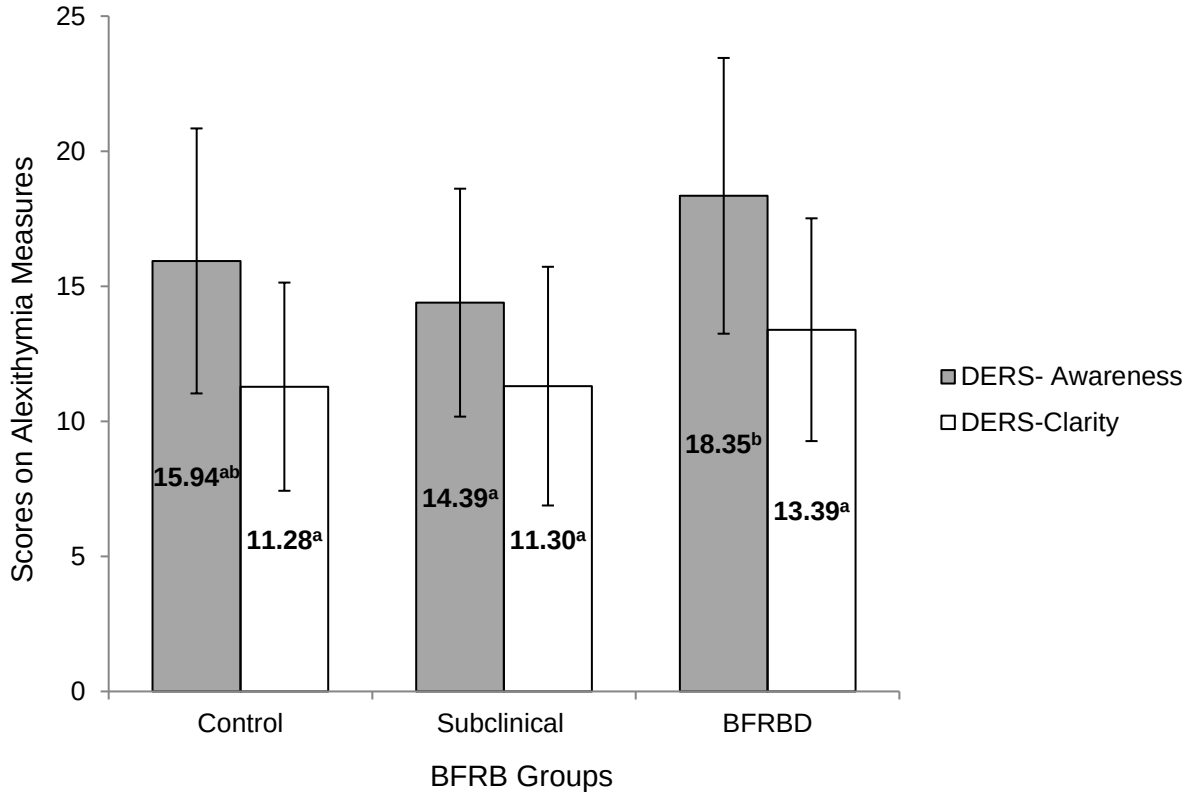

Figure B-3. Comparison of BFRB groups' mean alexithymia levels. Error bars represent standard deviations. DERS-Awareness = Difficulties in Emotion Regulation Scale: Awareness Subscale; DERS-Clarity = Difficulties in Emotion Regulation Scale: Clarity Subscale. Means sharing a superscript did not differ at $p < .05$ according to Bonferroni post-hoc analyses.

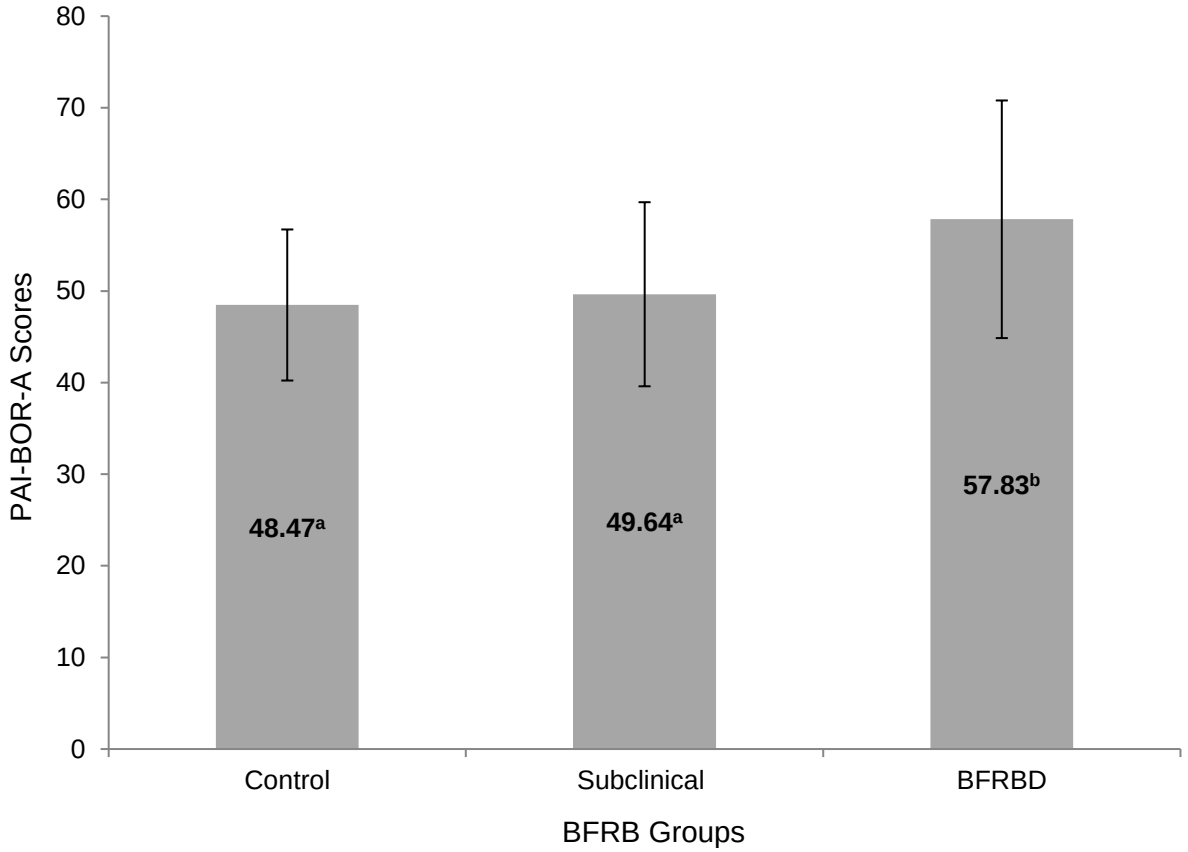

Figure B-4. Comparison of BFRB groups' mean maladaptive emotional reactivity levels. Error bars represent standard deviations. PAI-BOR-A = Personality Assessment Inventory Borderline Features-Affective Instability subscale. Means sharing a superscript did not differ at $p < .05$ according to Bonferroni post-hoc analyses.

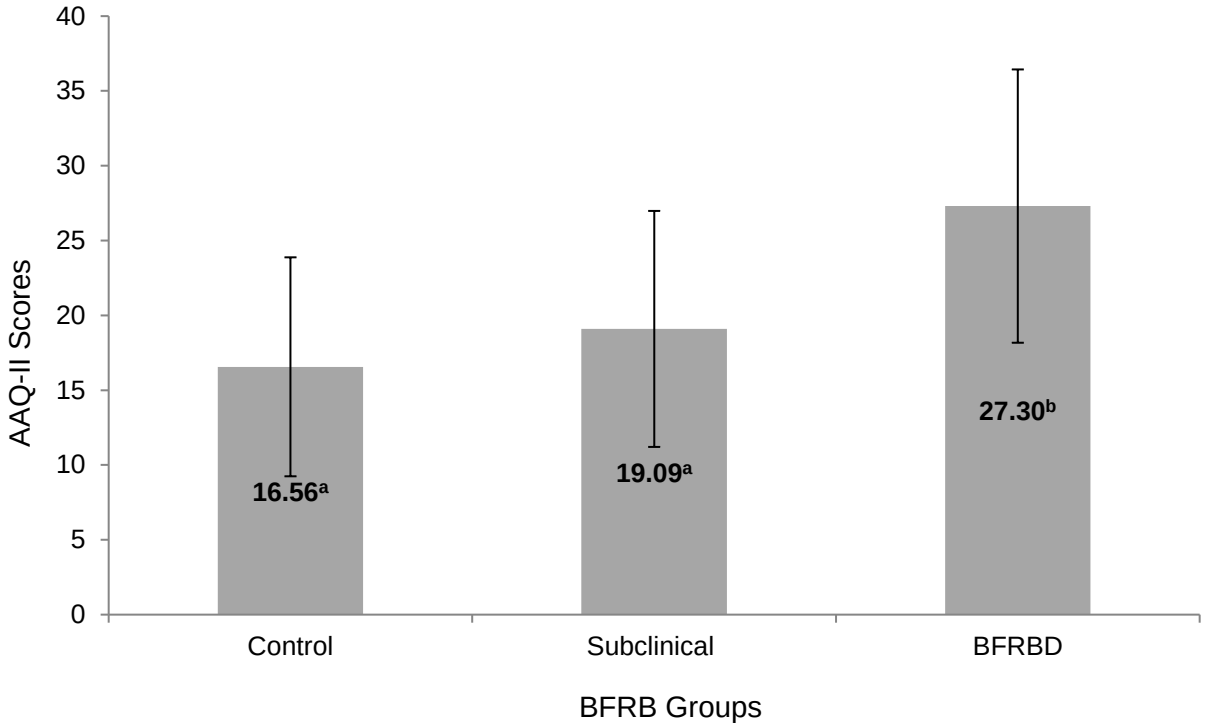

Figure B-5. Comparison of BFRB groups' mean experiential avoidance levels. Error bars represent standard deviations. AAQ-II = Acceptance and Action Questionnaire- Second Version. Means sharing a superscript did not differ at $p < .05$ according to Bonferroni post-hoc analyses.

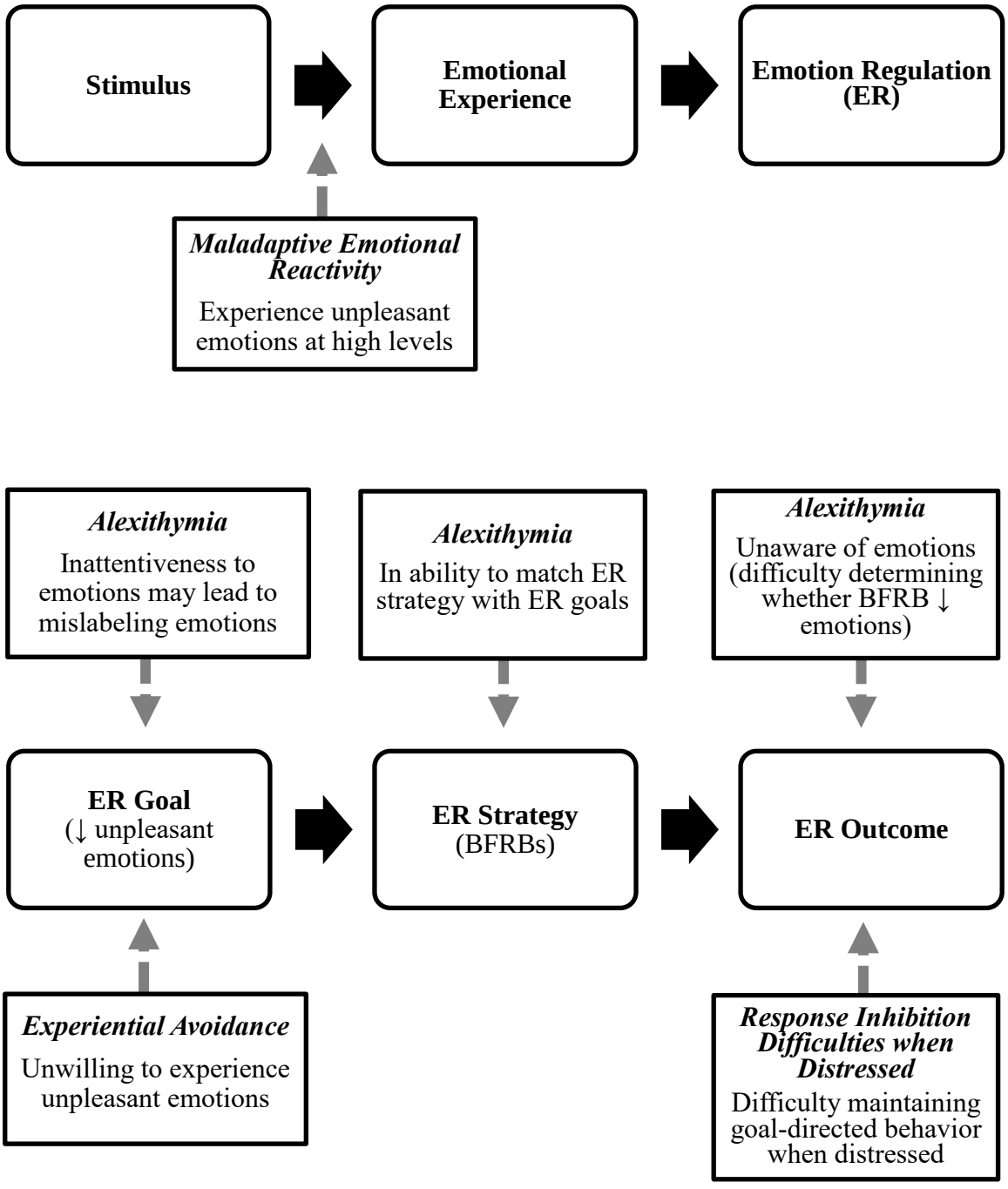

Figure B-6. Conceptual figure of the way emotion regulation contributes to BFRB implementation in person with BFRBDs. ER = Emotion Regulation.