

ABSTRACT

A Multimethod Examination of the Relevance of Executive Control to Disgust and Mental Contamination among Female Sexual Assault Survivors

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Sexual assault among women is a significant and ongoing public health problem in the United States, and studies indicate a particularly high prevalence of sexual assault among college-aged women. A large body of research has linked sexual assault to posttraumatic stress symptoms (PTSS), and researchers have sought to better understand how disgust and mental contamination may contribute to PTSS following sexual assault. Existing literature points to the possibility that executive control deficits are important in understanding the role of disgust and mental contamination in relation to PTSS. Yet, to date, whether disgust or mental contamination relates to executive control deficits among female sexual assault survivors remains unexamined. Addressing this gap in the literature, the present study examined the relationship between executive control and both disgust and mental contamination among female sexual assault survivors. It was predicted that greater disgust and mental contamination would relate to greater deficits in both self-reported and performance-based executive control. Additional analyses were

completed to examine if disgust and mental contamination related to executive control deficits independent of trait anxiety and PTSS.

Eighty-eight undergraduate women who reported previously experiencing a sexual assault participated in the present study. Participants completed self-report measures assessing the targeted variables and then attended an in-person session where executive control was assessed using performance-based tasks. Consistent with predictions, greater disgust and mental contamination were associated with greater self-reported executive control deficits. However, these associations were rendered non-significant after controlling for trait anxiety. Contrary to predictions, disgust and mental contamination were generally unrelated to executive control on performance-based tasks. However, supplementary analyses revealed that among women who identified a sexual trauma (versus a non-sexual trauma) as their most distressing traumatic event, greater disgust and mental contamination were related to greater deficits in cognitive flexibility on a performance-based task. These findings suggest that sexual trauma may need to elicit a certain level of distress for disgust and mental contamination to relate to deficits in cognitive flexibility, and have important implications for the potential use of interventions targeting cognitive flexibility in the treatment of disgust and mental contamination following sexual trauma.

A Multimethod Examination of the Relevance of Executive Control to
Disgust and Mental Contamination among Female Assault Survivors

by

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CHAPTER ONE

Introduction

Sexual Assault in the United States

Sexual assault among women is a significant and ongoing public health problem in the United States. The United States Department of Justice (DoJ) defines the term *sexual assault* as any type of sexual contact or behavior that occurs without the explicit consent of the recipient (U.S. Department of Justice, 2012, para. 2). This definition encompasses a broad range of unwanted sexual experiences (e.g., forced sexual intercourse, molestation, fondling, attempted rape) and was used to define sexual assault in the present study. However, it is important to note that sexual assault has been defined somewhat inconsistently in the literature. Whereas some studies adopt a similarly broad definition (i.e., any unwanted sexual experiences; Chang, Lin et al., 2015; Eadie, Runtz, & Spencer-Rodgers, 2008), other studies utilize a narrower interpretation of the term (e.g., attempted or completed oral, anal, or vaginal penetration; Feehan, Nada-Raja, Martin, & Langley, 2001; Masho & Ahmed, 2007). Prior research suggests that women may resist endorsing sexual assault when questions contain stigmatized terminology such as “rape” (e.g., Resnick, Kilpatrick, Dansky, Saunders, & Best, 1993); thus, the current study employed the DoJ definition of sexual assault in an effort to capture a comprehensive range of unwanted sexual experiences.

A 2011 report from the Center for Disease Control estimated that 44.6% of women have experienced some form of sexual assault excluding rape (e.g., sexual

coercion, unwanted sexual contact, and unwanted non-contact sexual experiences) at some point in their lifetime. The report further estimated that 18.3% of women (approximately 1 in 5) have experienced rape at some point throughout their lives (Black et al., 2011). These statistics were estimated from a nationally representative sample of women across the United States; however studies indicate a particularly high prevalence of sexual assault among college-aged women (Koss, Gidycz, & Wisniewski, 1987; Krebs, Lindquist, Warner, Fisher, & Martin, 2009). One study found that between 20% and 25% of women in a nationwide college sample reported a completed or attempted rape while enrolled in college (Fisher, Cullen, & Turner, 2000). Another study found that 19% of women experienced forced sexual intercourse while enrolled in college (Gross, Winslett, Roberts, & Gohm, 2006). Gross et al. (2006) also found that only 0.02% of women endorsing unwanted sexual contact in college reported the incident to the police, supporting prior research suggesting that sexual assault may often be underreported (Fisher, Daigle, Cullen, & Turner, 2003; Koss, 1989). Although sexual assault is also problematic among men (Peterson, Voller, Polusny, & Murdoch, 2011), the DoJ estimates that the overwhelming majority (91%) of sexual assault and rape victims are female (Bureau of Justice Statistics, 1994). As such, and consistent with the bulk of extant research examining the psychological effects of sexual assault (e.g., Gross et al., 2006; Lindquist et al., 2013; Millegan et al., 2015), the present study specifically focused on female survivors of sexual assault.

Sexual assault is associated with substantial economic and personal burden. Tangible costs include medical care, mental health services, insurance administration costs, police investigations, criminal prosecutions, and the costs associated with both the

loss of economic productivity and managing correctional systems. Rape has been estimated to cost approximately \$127 billion annually, making it the costliest crime for victims in the United States (Miller, Cohen, & Wiersema, 1996). In addition to the economic burden related to sexual assault, there are a number of adverse physical and psychological consequences with which it is associated. Survivors often experience both short and long-term negative health consequences following the assault, one of which is severe pain. For example, a recent study investigating acute severe pain following sexual assault in a sample of female sexual assault survivors found that 64% of women experienced severe pain in one or more body regions at the time of a Sexual Assault Nurse Examiner (SANE) evaluation. A majority of women (52%) continued to experience severe pain one week later. Frequently endorsed regions of pain during the SANE evaluation and at the one week follow-up were the genital region, head, neck, back, and abdomen (McLean et al., 2012).

In addition to physical health outcomes, sexual assault is related to a diverse array of mental health outcomes. For example, sexual assault has been linked to depressive symptoms (Chang, Lin, et al., 2015; Lindquist et al., 2013), health anxiety (Stein et al., 2004), suicide probability (Bryan, McNaughton-Cassill, Osman, & Hernandez, 2013; Chang, Lian, et al., 2015), and substance misuse (Coid et al., 2003). Perhaps the most prevalent negative psychological outcome following sexual assault is posttraumatic stress (Acierno et al., 2007; Carper et al., 2015; Krupnick et al., 2004; Resnick et al., 1993; Wadsworth & Records, 2013). Several types of trauma have been linked to posttraumatic stress; however, individuals who experience sexual assault report higher levels of posttraumatic stress symptoms than individuals exposed to other forms of trauma (e.g.,

bereavement, motor vehicle accidents, physical assault; Acierno et al., 2007; Krupnick et al., 2004; Shakespeare-Finch & Armstrong, 2010).

PTSD and Sexual Assault

Posttraumatic stress disorder (PTSD) is composed of four major symptom clusters: intrusion symptoms, avoidance, negative alterations in cognitions and mood, and alterations in arousal and reactivity (American Psychiatric Association, 2013).

Posttraumatic stress symptoms exist on a continuum, such that differences in the symptoms are best viewed in terms of degree rather than kind (Ruscio, Ruscio, & Keane, 2002), and are commonly experienced following sexual assault. For example, Shevlin, Hyland, and Elklit (2014) found that 77.5% of women experienced dissociation, 93.8% reported re-experiencing, 91.9% experienced avoidance, and 97.7% experienced arousal in the acute aftermath of sexual assault. Many survivors of sexual assault experience clinically severe posttraumatic stress symptoms, with approximately 30.2% of women developing PTSD following sexual assault (Masho & Ahmed, 2007). Of note, relative to other traumas, sexual assault has been found to relate to the highest prevalence rates of PTSD (Breslau et al., 1998).

While a large percentage of people experience posttraumatic stress symptoms following a traumatic event, as noted, only a subset goes on to develop PTSD (Jones & Wessely, 2007). Ehlers and Clark (2000) provide a cognitive model for PTSD that explains both the development and maintenance of the disorder. According to this model, PTSD develops when individuals process a trauma in a way that produces the perception of a serious and current threat. This perception of threat results from (a) excessively negative appraisals of the trauma and/or its sequelae and (b) a disturbance of

autobiographical memory such that the memory of the trauma may lack specific context or detail. For example, individuals with PTSD may have difficulty viewing the event as time-limited, and instead overgeneralize the emotional consequences and overestimate the likelihood of future threat. Furthermore, a variety of cognitive and behavioral strategies employed by the individual (e.g., thought suppression, safety behaviors) often maintain the memory of the trauma and its associated negative appraisals.

Although individuals who experience sexual assault experience symptoms other than posttraumatic stress, such as anxiety or depression (Kilpatrick et al., 2003; Ullman & Nadjowski, 2009), posttraumatic stress symptoms do not appear to be the result of overlap with such related symptoms. For example, a study examining comorbid PTSD, anxiety, and depression found that changes in posttraumatic stress symptoms fully accounted for changes in depression and anxiety symptoms (but not vice versa) in a community sample of sexually assaulted women (Nickerson et al., 2013). These findings indicate that PTSD may represent a primary diagnosis among women who have been sexually assaulted and could contribute to secondary symptoms of anxiety and depression.

Disgust and Posttraumatic Stress Symptoms

Given the well-documented association between sexual assault and posttraumatic stress symptoms, researchers have sought to better understand specific affective responses linking the two. While prior research has focused heavily on symptoms of anxiety and fear (e.g., Brewin, Andrews, & Rose, 2000; Creamer, McFarlane, & Burgess, 2005; Fani et al., 2012), some research suggests a broader range of emotional responses following traumatic stress (e.g., Dalgleish & Power, 2004; Resick & Miller, 2009). For

example, traumatic events related to sexual assault may be particularly likely to elicit feelings of disgust. Disgust is defined as a rejection or revulsion response aimed at removing oneself from the presence of a potential contaminant (Davey, 1994) and has been identified as a prominent emotional experience subsequent to sexual assault (Badour, Feldner, Babson, Blumenthal, & Dutton, 2013; Feldner, Frala, Badour, Leen-Feldner, & Olatunji, 2010; Petrak, Doyle, Williams, Buchan, & Forster, 1997). In fact, the majority of women who are sexually assaulted endorse feelings of self-disgust (Petrak et al., 1997) and sexual assault survivors are six times more likely to endorse feelings of disgust during the event than survivors of physical assault (Feldner, et al., 2010). Thus, disgust may be particularly important for understanding posttraumatic stress symptoms related to sexual assault.

Indeed, findings indicate that women with PTSD demonstrate stronger associations between the self and feelings of disgust than the self and feelings of anxiety on implicit association tasks (Rüsch et al., 2011). Additionally, while sexual and physical assaults are rated comparably in terms of fear and helplessness, disgust is elevated specifically in the context of sexual assault (Feldner et al., 2010). Results from other studies suggest that the intensity of disgust experienced during a traumatic event (i.e., peritraumatic disgust) predicts subsequent posttraumatic stress symptoms above and beyond the effects of peritraumatic fear responses (e.g., Badour, Bown, Adams, Bunaciu, & Feldner, 2012; Engelhard, Olatunji, & de Jong, 2011). Thus, disgust seems to represent a unique emotional response to trauma and contributes to posttraumatic stress symptoms independent of other affective responses (e.g., fear).

Some research has examined how individual differences in the experience of disgust relate to posttraumatic stress symptoms (e.g., Ingram & Price, 2001; van Overveld, de Jong, Peters, Cavanagh, & Davey, 2006). Ingram and Price (2001) suggest that disgust sensitivity, or the tendency to find the emotion of disgust unpleasant, constitutes an individual difference variable that can increase vulnerability for PTSD. Indeed, those without PTSD report significantly lower disgust sensitivity than those with PTSD, indicating that *reduced* disgust sensitivity may serve as a protective factor against the development of PTSD (Olatunji, Armstrong, Fan, & Zhao, 2014). Olatunji et al. (2014) have suggested that low levels of disgust sensitivity may decrease emotional sensitivity (i.e., the tendency to find emotions unpleasant) in the face of trauma, thereby decreasing symptomatic responding.

Badour and Feldner (in press) hypothesized that the relationship between disgust and posttraumatic stress symptoms may be explained via a classical conditioning model similar to those suggested within the peritraumatic fear conditioning literature (Badour, Feldner, Blumenthal, & Knapp, 2013; Dalgleish & Power, 2004). This model purports that individuals who experience traumatic events are often exposed to physical (e.g., semen, blood, vomit) and non-physical (e.g., situations involving moral violations, betrayal, death) elicitors of disgust. Badour and Feldner (in press) argue that classical conditioning during the event may lead to subsequent heightened feelings of disgust when trauma cues in the environment are encountered. Support for the conditioning model of disgust suggests that disgust experienced both during and after the event predict posttraumatic stress symptoms above and beyond peritraumatic fear and posttraumatic anxiety (Badour, Feldner, Blumenthal, & Knapp, 2013). Importantly, trait disgust has

been linked to increases in peritraumatic disgust; thus, the relationship between trait disgust and posttraumatic stress may be explained in part through peritraumatic experiences (Engelhard et al., 2011). The conditioning model of disgust in posttraumatic stress is particularly linked to the intrusion symptom cluster of posttraumatic stress symptoms, as when environmental cues elicit intrusive and distressing feelings of disgust (Bomyea & Amir, 2012).

Disgust and Mental Contamination

According to Rachman (2004), disgust is associated with feelings of dirtiness and attempts to escape these feelings can sometimes be temporarily accomplished through cleansing or washing behaviors. Findings have indicated that feelings of dirtiness may be particularly important in cases of sexual assault (Adams et al., 2014; Badour, Feldner, Babson, et al., 2013; Fairbrother & Rachman, 2004). In fact, the feelings of dirtiness may be indicative of contamination fears following sexual trauma (Badour, Feldner, Blumenthal, & Bujarski, 2013; Fairbrother & Rachman, 2004). Contamination fears are thought to be universal, intense, and difficult to control. They generally spread quickly, are resistant to decay, and are typically caused by physical contact with a contaminant (Rachman, 2004). In addition to typical feelings of visible contact contamination, some survivors of sexual assault may experience feelings of dirtiness in the absence of repeated contact with a contaminant (Fairbrother & Rachman, 2004). Recent literature has referred to this phenomenon as *mental contamination*. Specifically, mental contamination is defined as an internal sense of dirtiness accompanied by an urge to wash that occurs independently of physical contact with a contaminant (Herba & Rachman, 2007). That is, one can experience mental contamination in the absence of repeated contact with a

physical contaminant, and in some cases in the absence of a physical contaminant altogether. It has been hypothesized that most, if not all, instances of mental contamination are accompanied by feelings of disgust, yet there are situations in which one may feel disgusted without feeling mentally contaminated (Fairbrother & Rachman, 2004). Fairbrother and Rachman (2004) refer to disgust as a basic emotion and mental contamination is described as a cognitive concept. Thus, mental contamination could be a belief (e.g., “I am unclean”) paired with a feeling of disgust.

Mental contamination is contrasted with contact contamination, which Rachman (2004) has defined as an intense and persistent feeling of having been polluted, infected, or endangered as a result of contact with a person/place/object that is perceived to be soiled, infectious, or harmful. Rachman, Radomsky, Elliott, and Zysk (2012) argue that mental contamination stems from a human source of violation such as degradation, betrayal, or humiliation, whereas contact contamination results from contact with an inanimate source such as dirt or disease. While mental contamination may occur without physical contact, it shares many of the negative emotions that accompany contact contamination (e.g., fear, disgust, dirtiness, moral impurity, and shame; Rachman, 2004; Rachman et al., 2012). Moreover, like contact contamination, mental contamination can be transferred to a previously uncontaminated object (e.g., a pencil), even without physical contact between objects (Coughtrey, Shafran, & Rachman, 2014a).

In an effort to explain the mechanisms by which mental contamination occurs, some have offered a complementary classical conditioning perspective describing the transfer of hedonic value (e.g., pleasant/unpleasant) of an unconditioned stimulus to a previously neutral stimulus (Baeyens, Eelen, Crombez, & van den Bergh, 1992). Within

the context of mental contamination, this transfer may occur when a survivor of sexual assault transfers feelings of dirtiness (hedonic value) associated with the assault (unconditioned stimulus) onto herself (previously neutral stimulus). Mental contamination also involves urges to clean or wash away feelings of dirtiness similar to those that have been observed in contact contamination (Coughtrey, Shafran, & Rachman, 2014b; Rachman et al., 2012). However, clear differences arise when examining the source of these feelings. For example, mental contamination can result from perceptions of violation or betrayal (Fairbrother, Newth, & Rachman, 2005). Likewise, recent research has demonstrated that participants report an increase in feelings of mental contamination following the recall of personal memories associated with betrayal, harm, humiliation, and violation of moral standards (Coughtrey et al., 2014b). Interestingly, feelings of mental contamination and subsequent urges to wash have also been observed among those instructed to imagine *perpetrating* acts of violation (e.g., a male imagining kissing a non-consenting female; Rachman et al., 2012).

Mental Contamination and Posttraumatic Stress Symptoms

As previously mentioned, prior studies have demonstrated that women who have been sexually assaulted experience feelings of mental contamination following the assault (Badour, Feldner, Babson et al., 2013; Fairbrother et al., 2005; Fairbrother & Rachman, 2004; Olatunji, Elwood, Williams, & Lohr, 2008). Fairbrother and Rachman (2004) reported that 60% of women who were sexually assaulted endorsed some feelings of mental contamination. Furthermore, they found that mental contamination scores were significantly higher for women reporting an urge to wash following the assault relative to those who did not. Of the women who reported feeling an urge to wash, 49% reported

washing more than once, 24% reported washing excessively from one day to a few weeks, and over 25% reported continuing to wash excessively for several months or more following the assault. These results support other findings indicating that feelings of dirtiness associated with mental contamination may be particularly resistant to extinction (Rachman, 1994; Rachman, 2004).

Feelings of mental contamination subsequent to sexual assault have been linked to posttraumatic stress symptoms and may play an important role in the development of PTSD (Badour, Feldner, Babson, et al., 2013; Fairbrother & Rachman, 2004; Olatunji et al., 2008). In fact, evidence suggests that feelings of mental contamination are significantly correlated with posttraumatic stress symptoms above and beyond symptoms of anxiety and depression (Olatunji et al., 2008). Among sexual assault survivors, mental contamination has explained a large proportion of variance (51%) in posttraumatic stress symptoms and significantly mediated the relationship between contamination aversion and posttraumatic stress symptom severity (Adams et al., 2014). Notably, relationships between posttraumatic stress symptoms and mental contamination were not significant among physical assault survivors, highlighting the important role that mental contamination may play in posttraumatic stress symptoms following sexual assault. As previously discussed, the feelings of dirtiness or disgust experienced during mental contamination are generally resistant to decay and extinction; thus, posttraumatic stress symptoms may be especially persistent (Fairbrother et al., 2005; Olatunji et al., 2008). Indeed, feelings of mental contamination demonstrated particularly strong relationships with the avoidance symptoms cluster of PTSD among sexual assault survivors (Olatunji

et al., 2008). Avoidance of trauma-related cues are hypothesized to contribute to the maintenance of posttraumatic stress symptoms (Ehlers & Clark, 2000).

Likewise, distressing and intrusive emotions such as feeling sleazy or cheap have also been documented following exposure to a hypothetical immoral scenario (Fairbrother et al., 2005). These re-experiencing symptoms can occur in the absence of physical contact with a contaminant, making them particularly resistant to exposure-based interventions. Furthermore, Rachman (2004) describes hypervigilance and heightened arousal among those experiencing mental contamination including scanning for internal cues of contamination (e.g., “Does my body feel absolutely clean?”). Consistent over-predictions of both the likelihood and intensity of the expected fear often results in the maintenance of hypervigilance (Rachman, 2004). Finally, a study conducted by Fergus and Bardeen (2016) suggests that mental contamination is related to negative alterations in cognition and mood among those who have experienced sexual assault.

Executive Control and Posttraumatic Stress Symptoms

The extant literature suggests disgust and mental contamination are robustly associated with posttraumatic stress symptoms following sexual assault. As outlined in more detail below, cognitive theories of anxiety suggest that such associations may be better understood through a neuropsychological lens. For example, researchers propose that deficits in executive control are linked to posttraumatic stress symptoms (Aupperle, Melrose, Stein, & Paulus, 2012). Before detailing those links, it is important to clarify the use of the term *executive control* in the present research. To date, the term executive control has been used somewhat interchangeably with the term *attentional control* in some lines of research (e.g., Eysenck, Derakshan, Santos, & Calvo, 2007; Fan,

McCandliss, Sommer, Raz, & Posner, 2002). Attentional control is often used within the anxiety literature to describe the shifting of attention between competing tasks (e.g., Birk, Opitz, & Urry, in press; Taylor, Cross, & Amir, 2016). However, other studies describe the shifting of attention (or simply, *shifting*) as a specific type of executive control and use the term executive control to describe a broad construct responsible for a number of prefrontal functions (e.g., Aupperle et al., 2012; DeGutis et al., 2015; Leskin & White, 2007). The remainder of this document will use the latter terminology; thus, in subsequent discussion, executive control will be used to describe a multidimensional construct encompassing a number of higher-order, prefrontal functions (e.g., response inhibition, shifting, working memory, behavioral planning; Leskin & White, 2007).

According to the dual-process theory of higher cognition (Evans & Stanovich, 2013), inhibition and shifting of attention may be considered an implicit process, characterized by rapid, experience-based decision-making. In contrast to shifting of attention, set shifting (also referred to as *cognitive flexibility*) refers to a flexible information processing style characterized by successful integration and application of previously learned information (Kanagaratnam & Asbjørnsen, 2007). Cognitive flexibility may be considered an explicit process involving controlled, consequential decision-making. Notably, deficits in cognitive flexibility have also been associated with posttraumatic stress symptoms (Gilbertson, Gurvits, Lasko, Orr, & Pitman, 2001; Kanagaratnam & Asbjørnsen, 2007; Polak, Witteveen, Reitsma, & Olff, 2012) although findings have been mixed (Aupperle et al., 2012; Flaks et al., 2014). Cognitive flexibility will thus also be examined in the present study.

Eysenck et al. (2007) offer one conceptual model that may help explain the relationship between executive control and posttraumatic stress symptoms. More precisely, Eysenck and colleagues suggest that anxiety increases the allocation of attention to stimuli perceived to be threatening, thereby reducing executive control. Eysenck and colleagues review three major functions of executive control (inhibition, shifting, and updating) that are purportedly disrupted as a result of anxiety. Inhibition is described as the ability to deliberately inhibit responses when necessary (i.e., resisting interference from task-irrelevant stimuli). Similarly, shifting is defined as the ability to shift back and forth between multiple tasks, operations, or mental sets and involves adaptation of attentional focus. In contrast, updating involves the monitoring and updating of working memory and the transient storage of information (Eysenck et al., 2007).

Of particular relevance to posttraumatic stress symptoms may be inhibition and shifting. For example, Hirsch and Mathews (2012) suggest that central to anxiety is the inability to inhibit intrusive negative thoughts resulting from involuntary bottom-up processes and deficits in the ability to redirect or shift attention from such thoughts to intended content. Moreover, Aupperle et al. (2012) propose a bidirectional model in which subtle preexisting impairments in executive control, including inhibition and shifting, contribute to the maintenance and exacerbation of posttraumatic stress symptoms following trauma exposure. These symptoms in turn further impact and potentially worsen preexisting executive deficits.

More precisely, Aupperle et al. (2012) argue that the majority of trauma survivors learn associations between the trauma and trauma-related stimuli and direct attentional

resources towards these trauma-relevant stimuli. Aupperle and colleagues suggest that individuals who go on to develop PTSD may exhibit minor executive control deficits that predate the trauma and contribute to difficulty inhibiting responses to, and disengaging attention from, trauma reminders. These deficits purportedly lead to the hallmark hypervigilance and re-experiencing symptoms of PTSD. When attempts to inhibit and disengage from the memory of the trauma prove unsuccessful, Aupperle and colleagues suggest that individuals may rely on avoidance strategies to cope with trauma-related stimuli. However, while the avoidance of thoughts, emotions, and triggers associated with the trauma may reduce immediate distress, individuals may have to sacrifice previously enjoyed activities to avoid trauma reminders (e.g., attending a crowded sporting event). Over time, avoidance strategies prevent individuals from engaging in situations in which prior trauma associations can be extinguished or overcome. In addition, failure to disengage from the trauma and a reduction in previously enjoyed activities can negatively impact self-esteem and contribute to depressive symptoms. Overall, trauma survivors who exhibit deficits in executive control may be especially likely to process a trauma in a way that produces the perception of a serious and current threat.

The relationships between posttraumatic stress symptoms and executive control hypothesized by Aupperle et al. (2012) have been supported in the extant literature. For example, previous work has demonstrated a positive relationship between intrusions on tasks assessing memory recall and trauma-related re-experiencing symptoms (Vasterling, Brailey, Constans, & Sutker, 1998), potentially indicating attentional interference (i.e., interference of a primary task due to difficulty withdrawing attention from threat; Pineles,

Shipherd, Welch, & Yovel, 2007). In fact, re-experiencing symptoms have been associated with deficits in executive control, and both re-experiencing symptoms and avoidance are associated with attentional interference (Bomyea, Amir, & Lang, 2012; Wisco, Pineles, Shipherd, & Marx, 2013). Further, Bardeen, Fergus, and Orcutt (2015) found that poor self-reported shifting prospectively predicted greater posttraumatic stress symptoms among individuals experiencing trauma exposure. Bardeen et al.'s findings are consistent with the possibility that pre-trauma deficits in executive control may contribute to difficulty disengaging attention from trauma reminders and exacerbate symptomatology.

Disgust, Mental Contamination, and Executive Control

Prior studies support associations between executive control deficits and posttraumatic stress symptoms. However, it remains unclear if those deficits relate to additional cognitive-affective responses following trauma shown to be important in the development and maintenance of posttraumatic stress symptoms, such as disgust and mental contamination. To date, only indirect empirical evidence links performance on executive control to disgust. For example, Olatunji, Williams, et al. (2007) hypothesized that disgust may represent a lower-order factor of trait anxiety and prior research suggests that trait anxiety is associated with disrupted prefrontal mechanisms responsible for regulating attention to threat (Bishop, 2009). Additionally, several studies have explored specific brain regions and neurocognitive domains critical for the perception and experience of disgust. For example, Phillips et al. (2000) demonstrated activation of the insula following the presentation of disgusting pictures. Likewise, a study conducted by Shapira et al. (2003) revealed insula activation during a disgust-inducing elicitor.

Importantly, studies utilizing fMRI to investigate functional specificity of the executive system suggest links between these areas and executive control (e.g., Menon & Uddin, 2010; Urry et al., 2006). Despite such promising findings, no known published study has yet *directly* examined how performance on indices of executive control relates to disgust. Because disgust is considered a necessary component of mental contamination (Fairbrother & Rachman, 2004), it is possible that mental contamination may relate to similar executive control deficits as disgust. However, no known published study has yet examined associations between executive control and mental contamination. An investigation as to how disgust and mental contamination relate to executive control among sexual assault survivors is needed at this time, as such an investigation may serve to help clarify how these two cognitive-affective responses influence posttraumatic stress symptoms following sexual assault. More precisely, disgust and mental contamination may exhibit similar influences on executive control as trait anxiety; such as when bottom-up processing of emotionally salient events (e.g., affective responses to trauma such as disgust) override higher-order executive control processes (Menon & Uddin, 2010). These influences on the executive system may in turn, lead to worsened posttraumatic stress symptoms.

Consider the following example. Subsequent to sexual assault, an individual high in disgust or mental contamination experiences intrusive thoughts and feelings related to the assault. These strong emotional experiences lead to a bottom-up process in which the individual's attention is involuntarily directed toward thoughts and feelings related to the assault. The individual's efforts to inhibit these experiences and/or redirect attention toward intended content is thwarted when bottom-up processes override diminished top-

down executive control abilities. Consequently, the individual has an increased likelihood of experiencing thoughts and emotions related to the assault compared to someone without deficits in executive control. Following from the reviewed classical conditioning approach to disgust and mental contamination (Badour & Feldner, in press), trauma-related cues may elicit further feelings of disgust and mental contamination. Disgust, mental contamination, and executive control deficits may ultimately contribute to the sustained perceptions of a serious and current threat that are defining features of posttraumatic stress symptoms within existing conceptual models (e.g., Ehlers & Clark, 2000).

The example is consistent with Eysenck et al.'s (2007) conceptual model suggesting that anxiety impacts, and possibly overrides, one's ability to inhibit the disruption or interference of threat-related stimuli on task-relevant behavior. Likewise, Hirsch and Mathews (2012) proposed that central to anxiety is the dominance of threat representations that negate the shifting of attentional resources toward goal-directed content, particularly for individuals with diminished executive control. That is, in the event that one is unable to inhibit threat representations and instead directs attention toward negative thoughts, bottom-up processes may circumvent the ability to shift attention away from these thoughts, subsequently maintaining anxiety. While executive control deficits may exhibit a particularly strong influence on re-experiencing symptoms, the large intercorrelation between the four posttraumatic stress symptom dimensions among sexual assault survivors (Fergus & Bardeen, 2016) raises the possible general worsening of all posttraumatic stress symptoms as a result of such deficits.

Present Study

The existing literature points to the possibility that executive control deficits may be important to understanding the role of disgust and mental contamination in relation to posttraumatic stress symptoms. Yet, to date, whether either variable relates to executive control among female sexual assault survivors remains unexamined in the extant literature. The purpose of the present study was to fill that identified gap in the literature. It was predicted that disgust and mental contamination would both relate to executive control deficits, such that greater disgust and mental contamination among female sexual assault survivors would relate to greater executive control *deficits*. Following from existing conceptualizations of links between anxiety and executive control (e.g., Hirsch & Mathews, 2012), as well as between posttraumatic stress symptoms and executive control (e.g., Kanagaratnam & Asbjørnsen, 2007), inhibition, shifting, and cognitive flexibility were the three aspects of executive control of interest in the present study. As reviewed, executive control deficits relate to both trait anxiety (e.g., Eysenck et al., 2007) and posttraumatic stress symptoms (e.g., Aupperle et al., 2012). Additionally, disgust and mental contamination overlap with both trait anxiety and posttraumatic stress symptoms (e.g., Badour, Ojserkis, McKay, & Feldner, 2014; Olatunji, Williams, et al., 2007). Analyses were thus completed to examine if disgust and mental contamination relate to executive control deficits independent of trait anxiety and posttraumatic stress symptoms.

Currently, accounts as to how disgust and mental contamination contribute to posttraumatic stress symptoms (e.g., Badour & Feldner, in press), including more specifically following sexual trauma, do not explicitly outline the role of executive control. The predicted pattern of results may have important implications for the

treatment of posttraumatic stress symptoms in female survivors of sexual assault. For example, interventions may benefit from directly targeting low levels of inhibition and shifting, given prior research suggesting that individuals with PTSD experience hypervigilance toward threat-related stimuli and subsequent difficulty disengaging from perceived threat (Aupperle et al., 2012). Indeed, there is evidence to suggest that attention control training (ACT), which involves computerized cognitive training strategies designed to teach patients to ignore irrelevant threat, relates to a reduction in PTSD symptom severity (Badura-Brack et al., 2015). Treatments targeting deficits in inhibition and shifting of attention among sexual assault survivors may provide similar results, leading to greater self-regulatory control of attention and subsequent reductions in posttraumatic stress symptoms, disgust, and mental contamination.

Previous studies investigating whether performance-based measures and rating scales of executive functioning yield comparable results have reported inconsistent findings (e.g., Absjornsen, Jones, Munkvold, Obrzut, & Manger, 2010; Demant, Vinberg, Kessing, & Miskowiak, 2015; Nęcka, Lech, Sobczyk, & Śmieja, 2012). Barkley (2011) suggests that rating scales may offer unique advantages over traditional performance-based measures of executive function. For example, Barkley suggests that rating scales may capture relatively infrequent behaviors that are likely to be missed in the short window of time used to assess executive dysfunction in traditional performance-based tests. Moreover, Barkley proposes that performance-based tests often fail to identify the higher adaptive, strategic levels of executive function that occur in daily functioning and social interactions over longer spans of time. In contrast, Barkley asserts that rating scales may be useful in capturing summary judgments of behavior, particularly in regard to

executive function that occurs within real-world, social contexts. At the same time, Barkley acknowledges potential disadvantages of rating scales, such as variability among raters' capacity to provide accurate reports of their own behaviors and the use of vague reference points (e.g., *very often*) to assess frequency of behavior. In light of these assertions, the present study employed a multimethod approach to assess executive control, utilizing both self-report and performance-based measures. A copy of each self-report measure is presented in the Appendix.

CHAPTER TWO

Method

Participants

A total of 991 students from an undergraduate population at a private Southern university were screened for the current study. Women who reported that they had experienced sexual trauma during their lifetime on the Life Events Checklist for DSM-5 (Weathers et al., 2013a) were eligible to participate. Of the 991 screened, 171 female students were eligible for participation. Of those 171 eligible students, 88 (51.5%) ultimately participated. Women who participated in the study had lower PCL-5 total scores ($M = 40.5$, $SD = 14.6$) than those who were eligible but did not participate ($M = 46.7$, $SD = 18.2$), $t_{(166)} = 2.45$, $p = .02$. There were no significant differences in age (participated: $M = 19.2$, $SD = 2.5$; eligible: $M = 19.8$, $SD = 3.5$), DPSS-R (participated: $M = 28.6$, $SD = 8.1$; eligible: $M = 29.3$, $SD = 8.6$), VOCI-MC (participated: $M = 37.0$, $SD = 14.1$; eligible: $M = 38.0$, $SD = 16.3$), or STICSA total scores (participated: $M = 40.3$, $SD = 9.5$; eligible: $M = 40.6$, $SD = 10.4$) between women who participated and those who were eligible but did not participate ($|ts| < 1.4$, $ps > .19$). Additionally, there was no significant difference in the racial/ethnic distribution of women who participated and those who were eligible but did not participate, $\chi^2_{(5)} = 2.54$, $p = .77$.

A sample of 88 women was eligible and agreed to participate in the current study. The mean age was 19.4 years ($SD = 3.3$) and participants identified as white (59.1%), Latino (17.0%), black (9.1%), multi-racial (9.1%), Asian (3.4%), or other (2.3%). The

average number of LEC-5 events endorsed was 10.7 ($SD = 3.9$). Among the total sample of 88 women, 47.7% endorsed exposure to sexual trauma as their most distressing event. Among the remaining 46 women, the breakdown of traumatic events endorsed as most distressing was as follows: severe human suffering (17.4%), sudden violent death (15.2%), other stressful event (15.2%), physical assault (10.9%), transportation accident (8.7%), life threatening illness or injury (6.5%), sudden accidental death (6.5%), natural disaster (4.3%), captivity (4.3%), serious injury, harm, or death you caused to someone else (4.3 %), fire or explosion (2.2%), assault with a weapon (2.2%), combat/exposure to a war zone (2.2%).

Measures and Materials

Self-Report Measures

Life Events Checklist for DSM-5 (LEC-5; Weathers et al., 2013a). The LEC-5 assesses exposure to 17 potentially traumatic life events (e.g., sexual assault, natural disaster, serious accident). The LEC-5 is an updated version of the original LEC (Gray, Litz, Hsu, & Lombardo, 2004) and was created to assess DSM-5 criterion A. For each event, participants indicate whether the event directly happened to them, they witnessed it, they learned about it, it was part of their job, they are unsure, or the event did not apply to them. To be eligible to participate in the present study, participants had to endorse either item 8 (i.e., rape or any other forced sexual act) or item 9 (i.e., other unwanted or uncomfortable sexual experience) as having directly happened to them. Participants were instructed to reference their most distressing event when later completing a measure of posttraumatic stress symptoms. Limited data are available on the psychometric properties

of the LEC-5, however the LEC is strongly correlated with another measure of trauma exposure ($r = .55$; Gray et al., 2004).

PTSD Checklist-5 (PCL-5; Weathers et al., 2013b). The PCL-5 is a 20-item self-report measure of posttraumatic stress symptoms. The PCL-5 is an updated version of the PCL (Weathers, Huska, & Keane, 1991) and was created to reflect changes in PTSD symptom criteria in the DSM-5. The PCL-5 produces a total score, as well as a score for each of the four PTSD symptom clusters (i.e., intrusions, hyperarousal, avoidance, and alterations in cognition and mood). Participants are asked to consider a single stressful event when completing the measure and indicate how much they have been bothered by the event in the past month on a 5-point scale from 0 (*not at all*) to 4 (*extremely*). Higher scores reflect greater posttraumatic stress symptoms. The PCL-5 is strongly correlated with another measure of posttraumatic stress symptoms ($r = .85$) among trauma-exposed college students (Blevins, Weathers, Davis, Witte, & Domino, 2015). The PCL-5 demonstrated excellent internal consistency (Cronbach's $\alpha = .92$) in the present study.

Disgust Propensity and Sensitivity Scale- Revised (DPSS-R; van Overveld et al., 2006). The DPSS-R is a self-report measure of two distinguishable factors of trait disgust (i.e., disgust propensity and sensitivity). Fergus and Valentiner (2009) reduced the original DPSS-R item pool to 12 items, from the original 16 items, thereby improving the factorial validity of the measure. This version of the measure consists of six items assessing disgust propensity (e.g., “I avoid disgusting things”) and six items assessing disgust sensitivity (e.g., “It scares me when I feel nauseous”), respectively. Participants are asked to rate the degree to which each statement is true for them on a 5-point scale

from 1 (*never*) to 5 (*always*). Higher scores reflect greater trait disgust. The DPSS-R is strongly correlated with posttraumatic stress symptoms ($r = .52$; Badour, Feldner, Blumenthal, & Bujarski, 2013). The DPSS-R demonstrated good internal consistency ($\alpha = .86$) in the present study.

Vancouver Obsessional Compulsive Inventory- Mental Contamination Scale (VOCI-MC; Radomsky, Rachman, Shafran, Coughtrey, & Barber, 2014). The VOCI-MC is a 20-item self-report measure of trait mental contamination. Participants rate the degree to which each item applies to them (e.g., “I often feel dirty under my skin”) on a 5-point scale from 0 (*not at all*) to 4 (*very much*). Higher scores reflect greater trait mental contamination. The VOCI-MC is strongly correlated with another measure of contamination fears ($r = .71$; Fergus, 2014), as well as with posttraumatic stress symptoms ($r = .63$; Badour et al., 2014). The VOCI-MC demonstrated excellent internal consistency ($\alpha = .93$) in the present study.

State Trait Inventory for Cognitive and Somatic Anxiety (STICSA; Ree, French, MacLeod, & Locke, 2008). The STICSA is a 21-item measure of cognitive and somatic anxiety. The trait anxiety version is of interest to the present study. To assess trait anxiety, participants are asked to rate the degree to which each item indicates how they “generally feel” on a 4-point scale from 1 (*almost never*) to 4 (*almost always*). The cognitive dimension includes items measuring symptoms associated with thought processes (e.g., “I think the worst will happen”), whereas the somatic dimension includes items measuring physical symptoms (e.g., “My muscles feel weak”). Higher scores reflect greater anxiety. The STICSA trait version is strongly correlated with another

measure of trait anxiety ($r = .66$; Grös, Antony, Simms, & McCabe, 2007). The STICSA demonstrated good internal consistency ($\alpha = .85$) in the present study.

Attentional Control Scale (ACS; Derryberry & Reed, 2002). The ACS is a 20-item measure comprised of nine items measuring attentional focusing (e.g., “I have a hard time concentrating when I’m excited about something”) and 11 items measuring attentional shifting (e.g., “It is easy for me to alternate between two different tasks), respectively. Participants are asked to rate items on a 4-point scale from 1 (*almost never*) to 4 (*always*). Higher scores reflect greater attentional control. The ACS demonstrates significant negative correlations with measures of cognitive failures and anxiety ($r_s = -.68$ and $-.49$, respectively; Judah, Grant, Mills, & Lechner, 2014). The ACS demonstrated good internal consistency ($\alpha = .88$) in the present sample.

Behavior Rating Inventory of Executive Function- Adult version (BRIEF-A; Roth et al., 2005). The BRIEF-A was developed as an extension of the original BRIEF (Gioia, Isquith, Retzlaff, & Espy, 2002) to assess perceived executive functioning in adults. The BRIEF-A is a 75-item measure consisting of nine clinical scales subsumed under two higher-order indices. The behavior-regulation index (BRI) includes inhibit, shift, emotional control, and self-monitor scales. The metacognition index (MCI) includes initiate, working memory, plan/organize, task monitor, and organization of materials scales. The BRI assesses regulation of behavioral and emotional responses whereas the MCI assesses higher-order problem-solving skills. The global executive composite (GEC) provides an overall picture of perceived executive functioning and is calculating by summing the nine clinical scales. Given that there are no predictions of the differential

performance of the separate BRIEF-A scales, the GEC was used in the present study. Higher scores indicate greater executive dysfunction. All BRIEF-A subscales are positively correlated with all subscales of another self-report measure of executive dysfunction ($r_s = .37-.80$; Liu, Huang, & Wang, 2013). The GEC scale of the BRIEF-A demonstrated excellent internal consistency ($\alpha = .96$) in the present study.

Performance-Based Measures

Attention Network Test (ANT; Fan et al., 2002). The ANT is a laboratory-based task designed to independently evaluate three attention networks (i.e., alerting, orienting, and executive control [shifting]) within a 30-minute testing session. Fan et al. (2002) refer to alerting as achieving and maintaining an alert state; orienting as the selection of information from sensory input; and shifting as resolving conflict among responses. The ANT requires participants to indicate the direction of a central arrow flanked by four arrows either pointing in the same (congruent condition) or opposite (incongruent condition) direction of the central arrow. In the neutral condition the central arrow is presented without flanker arrows. Preceding the arrows is the presentation of one of three temporally informative cues or no cue. Two of the cues indicate that the arrow will soon appear, and the third cue is spatially informative of the target location of the arrow. After completing a 24-trial practice block that provides feedback regarding response speed and accuracy, participants complete three 96-trial blocks (288 total trials). The ANT provides a measure of response time (speed) and error rate (accuracy) for each of the three attention networks. Prior research demonstrates significant associations between the

shifting (i.e. conflict) index of the ANT and posttraumatic stress symptoms ($r = -.43$ among female participants; Leskin & White, 2007).

Wisconsin Card Sort Test (WCST; Grant & Berg, 1948). The WCST is a neuropsychological test designed to assess a broad range of executive functions (e.g., cognitive flexibility, sustained attention, abstract reasoning). A computerized version of the original WCST (Grant & Berg, 1948) was used in the present study, in which participants complete the task on a computer rather than with an experimenter. The WCST consists of two decks of response cards (64 cards per deck) and four stacks of stimulus cards. The stimulus cards differ in color, shape, and number, and participants are asked to match each response card to one of the four types of stimulus cards. The response card can match different stimulus cards based on different sorting dimensions (i.e., color, form, and number); however, the correct sorting principle is never explicitly revealed. Instead, participants receive feedback (i.e., correct or incorrect) following each attempted match and are expected to use this feedback to deduce the sorting principle. After the participant is able to complete a number of successful, consecutive matches, the sorting principle is changed without warning, and continues to change throughout the remainder of the test.

Of particular relevance to the proposed study was the assessment of cognitive flexibility, which has been defined as the ability to successfully integrate and apply previously learned information (Kanagaratnam & Asbjørnsen, 2007). Following prior research, the Categories Completed (number of sets of 10 consecutive correct responses completed), percentage of Perseverative Errors (percentage of trials involving errors due to perseveration of the previously established sorting principle), and percentage of

Perseverative Responses (percentage of trials involving responses due to perseveration of the previously established sorting principle) metrics were used to assess cognitive flexibility in the present study (e.g., Gilbertson et al., 2001; Hazlett, Figueroa, & Nielson, 2015; Landry & Al-Taie, 2016). The percentage of Perseverative Responses index was used in addition to the percentage of Perseverative Errors index because it captures both unambiguous and ambiguous perseverative responses and thus may be considered a broader measure of perseveration (Berry, 1996; Flashman, Homer, & Freides, 1991). Prior research demonstrates significant associations between WCST performance (Perseverative Errors, Categories Completed) and posttraumatic stress symptoms ($r_s = .34$ and $-.34$, respectively; Kanagaratnam & Asbjørnsen, 2007).

Color Word Stroop Task (Stroop, 1935). The modified Color Word Stroop Task is a computerized version of the original Stroop task (Stroop, 1935) designed to assess response inhibition. In the congruent condition the stimuli were four color words (“red”, “blue”, “green”, and “black”) presented in the color that is congruent with the word (e.g., “blue” shown in the color blue). In the incongruent condition the stimuli were color words presented in one of the three colors incongruent with the word (e.g., “blue” shown in the color red, green, or black). In the neutral condition a colored rectangle is presented. Participants are asked to respond to the printed color of the stimulus and ignore the word (when applicable). Participants respond by pressing one of four keys corresponding to the four print colors. Before beginning the task, participants complete 80 practice trials (20 trials per color-to-key mapping). The task consists of 2 blocks of 84 trials (168 total trials). Participants were asked to perform the task giving equal weight to speed and accuracy. The Color Word Stroop Task provides a measure of response time (speed) and

error rate (accuracy). Prior research demonstrates that performance on the Stroop task is significantly associated with frontal lobe function (r s ranging from .45-.70; Stuss, Floden, Alexander, Levine, & Katz, 2001).

Procedure

Participants were recruited from undergraduate psychology courses at a private Southern university. In exchange for partial course credit toward a research participation requirement, participants initially completed an online battery of the self-report measures described above. Participants who endorsed experiencing sexual trauma during their lifetime on the LEC-5 (Weathers et al., 2013a) were eligible to participate in an in-person follow-up session. During the follow-up session, participants completed the executive functioning tasks described above for additional course credit toward a research participation requirement. The presentation order of the executive functioning tasks was randomized across participants, and each task was presented on a computer in a private room. All participants provided informed consent prior to completing both the online and in-person study sessions.

Data Analytic Strategy

All data were analyzed using IBM SPSS Statistics for Windows, Version 23.0. Pearson correlations were used to examine the study prediction that disgust and mental contamination would correlate with executive control. More precisely, these analyses examined if the VOCI-MC and DPSS-R *negatively* correlated with the ACS and *positively* correlated with the BRIEF-A. It was further predicted that the VOCI-MC and DPSS-R would *positively* correlate with the shifting index of the ANT, *positively*

correlate with response time on the Stroop Interference Task, and *positively* correlate with the percentage of Perseverative Errors and percentage of Perseverative Responses, and *negatively* correlate with the number of Categories Completed on the WCST. Partial correlations were used next to examine whether those predicted associations were the byproduct of shared variance with trait anxiety and posttraumatic stress symptoms. More precisely, these analyses examined if the VOCI-MC and DPSS-R share unique associations with self-reported executive control on the ACS and BRIEF-A and performance on the ANT, Color Word Stroop Task, and WCST, respectively, after controlling for the STICSA and the PCL-5. The increased possibility of Type I error when completing these multiple tests was addressed using the False Discovery Rate (Benjamini & Hochberg, 1995).

CHAPTER THREE

Results

Missing Data and Descriptive Statistics

There were no missing data from the performance-based measures. Data missing among the self-report measures were less than 1% and were missing completely at random (Little's $\chi^2_{(24)} = 10.86, p = .99$) and were imputed using estimation maximization (EM). EM has been found to be an acceptable practice with low levels of data missing completely at random (Rubin, Witkiewitz, Andre, & Reilly, 2007; Scheffer, 2002).

Descriptive statistics among the study variables are presented in Table A.1. Similar to other studies (e.g., Arffa, Lovell, Podell, & Goldberg, 1998; Paolo, Axelrod, & Tröster, 1996), a ceiling effect was observed for the Categories Completed index of the WCST ($M = 5.36, SD = 1.25, skew = -1.95, kurtosis = 2.70$), with the majority of participants (82%) completing at least five out of the six categories. Due to the restricted variability among the index, the Categories Completed index was excluded from analyses. When examining potential non-normality among the remaining study variables, multiple variables fell outside the recommended range of -1 to 1 established for skew and kurtosis statistics (Morgan, Griego, & Gloeckner, 2001), indicating non-normally distributed data. To ensure that statistical findings were not impacted because these study variables were non-normally distributed, data were also analyzed after implementing a square-root transformation. Results using square-root transformed study variables were

identical to results obtained using the non-transformed study variables. For ease of interpretation, only results using the non-transformed study variables are presented.

Preliminary Analysis

The mean number of days between the completion of the online battery and participation in the in-person follow-up session (i.e., time lapse) was 21.16 ($SD = 15.94$) and ranged from 1 day to 73 days. The time lapse between sessions was correlated with the percentage of Perseverative Responses ($r = .24, p = .023$) and the PCL-5 ($r = -.23, p = .034$). The remaining correlations between the study variables and the time lapse between sessions were non-significant (r s ranging from $-.10$ to $.13, p$ s $> .229$). The pattern of results remained unchanged after controlling for the time lapse between sessions and results are presented without including time lapse as a covariate.

Zero-Order Correlations

Zero-order correlations among affective responses are presented in Table A.2, zero-order correlations among indices of executive control are presented in Table A.3, and zero-order correlations between affective responses and executive control indices are presented in Table A.4. Consistent with study hypotheses regarding the relationships between affective responses (i.e., disgust and mental contamination) and self-reported executive control, the DPSS-R was negatively correlated with the ACS and the VOI-MC was positively correlated with the BRIEF-A. Inconsistent with study predictions, the VOI-MC was not correlated with the ACS nor was the DPSS-R correlated with the BRIEF-A.

Regarding the predicted associations between affective responses and performance-based executive control (see Table A.4), the study hypotheses were largely unsupported. The association between the DPSS-R and percentage of Perseverative Errors on the WCST was trending in the predicted direction, and there was no association between the VOCI-MC and percentage of Perseverative Errors. Additionally, no significant associations were observed between the DPSS-R or the VOCI-MC and the percentage of Perseverative Responses. Moreover, neither the DPSS-R nor the VOCI-MC correlated with the shifting index of the ANT. Unexpectedly, the VOCI-MC correlated with the Color Word Stroop Task in the opposite direction than was predicted, while the DPSS-R shared no association with the Color Word Stroop Task. Trait anxiety shared associations with both self-reported indices of executive control in the expected directions and posttraumatic stress symptoms were positively associated with the BRIEF-A. Moreover, trait anxiety correlated with one performance-based index of executive control (i.e., shifting index of the ANT), whereas posttraumatic stress symptoms did not correlate with any performance-based index of executive control. When the False Discovery Rate (Benjamini & Hochberg, 1995) was used to address the increased possibility of the Type I error, yielding a family-wise alpha of $p < .003$, none of the predicted associations between disgust or mental contamination and either self-reported or performance-based executive control reached statistical significance. Additionally, trait anxiety no longer related to the shifting index of the ANT, but trait anxiety did still relate to self-reported executive control deficits on both the ACS and BRIEF-A.

Partial Correlations

Partial correlations were used to examine if observed associations between both the DPSS-R and VOCI-MC with the respective self-report measure of executive control stayed intact after statistically controlling for trait anxiety and posttraumatic stress symptoms. The correlation between the DPSS-R and ACS stayed intact after statistically controlling for posttraumatic stress symptoms (partial $r = -.23, p = .029$) but no longer correlated with the ACS after statistically controlling for trait anxiety (partial $r = -.12, p = .271$). Moreover, the correlation between the VOCI-MC and the BRIEF-A stayed intact after statistically controlling for posttraumatic stress symptoms (partial $r = .21, p = .049$) but no longer correlated with the BRIEF-A after statistically controlling for trait anxiety (partial $r = -.02, p = .876$).

Supplementary Analyses

Although all participants reported directly experiencing a sexual trauma, not all participants reported that a sexual trauma was the most distressing experienced traumatic event on the LEC-5. Supplementary analyses were performed to examine whether the nature of the most distressing traumatic event (i.e., sexual or non-sexual) impacted the relationship between affective responses and executive control. Descriptive statistics for the sexual versus non-sexual groups are presented in Table A.5. The potential moderating effect of the most distressing traumatic event was examined using hierarchical multiple linear regression analyses and followed the recommendations of Aiken and West (1991). The most distressing traumatic event (i.e., sexual or non-sexual) was dummy-coded, such that non-sexual trauma was coded as '0' and sexual trauma was coded as '1'. The affective response variable was mean-centered and then an interactive term was

calculated as the product of the mean-centered affect response variable and the dummy-coded trauma variable. The respective affective response variable and trauma variable were then entered into Block 1 of a regression model and the interactive term was entered into Block 2 of a regression model with an index of executive control serving as the criterion variable.

The only associations between the affective responses and executive control moderated by trauma type involved cognitive flexibility. Results from the cognitive flexibility regression analyses are presented in Table A.6 and Table A.7. As shown in Table A.6, trauma type moderated the association between each affective response and the percentage of Perseverative Errors. Moreover, as shown in Table A.7, trauma type moderated the association between each affective response and the percentage of Perseverative Responses. Simple effects were used to further interpret the significant interactions. Simple effects were examined following the recommendations of Aiken and West (1991). To plot the simple effects, two values of the respective affective response scale score (± 1 *SD* from the respective mean score) were substituted into the simple regression equations. Simple effects are presented in Figure B.1 (disgust), Figure B.2 (mental contamination), Figure B.3 (trait anxiety) and Figure B.4 (posttraumatic stress), respectively.

Among women who identified a sexual trauma as their most distressing event ($n = 42$), self-reported disgust on the DPSS-R was positively associated with the percentage of Perseverative Errors ($\beta = .49, p = .002$) and percentage of Perseverative Responses on the WCST ($\beta = .50, p = .003$). Additionally, self-reported mental contamination on the VOCI-MC was positively associated with the percentage of Perseverative Errors ($\beta = .32,$

$p = .017$) and percentage of Perseverative Responses ($\beta = .35, p = .025$) among women who identified a sexual trauma as their most distressing event. In contrast, among those who identified a non-sexual trauma as their most distressing event ($n = 46$), there was no association between the DPSS-R and percentage of Perseverative Errors ($\beta = -.06, p = .697$) or percentage of Perseverative Responses ($\beta = .01, p = .966$). Further, and unexpectedly, there was a negative association between the VOCI-MC and both percentage of Perseverative Errors ($\beta = -.56, p < .001$) and percentage of Perseverative Responses ($\beta = -.53, p = .001$) among those who identified a non-sexual trauma as their most distressing event.

Among women who identified a sexual trauma as their most distressing event, trait anxiety on the STICSA was positively associated with the percentage of Perseverative Errors ($\beta = .31, p = .040$) and percentage of Perseverative Responses ($\beta = .32, p = .036$). Moreover, posttraumatic stress on the PCL-5 was positively associated with the percentage of Perseverative Errors ($\beta = .32, p = .046$) and showed a trending positive association with percentage of Perseverative Responses ($\beta = .32, p = .064$) among women who identified a sexual trauma as their most distressing event. Among women who identified a non-sexual trauma as their most distressing event, there was no association between the STICSA and either the percentage of Perseverative Errors ($\beta = -.21, p = .151$) or percentage of Perseverative Responses ($\beta = -.25, p = .098$). Additionally, there was no association between the PCL-5 and either the percentage of Perseverative Errors ($\beta = -.23, p = .111$) or percentage of Perseverative Responses ($\beta = -.25, p = .084$) among women who identified a non-sexual trauma as their most distressing event.

CHAPTER FOUR

Discussion

The purpose of the present study was to examine whether disgust and mental contamination related to executive control among female sexual assault survivors. Given prior associations between executive control deficits and posttraumatic stress symptoms (Aupperle et al., 2012) and between posttraumatic stress symptoms and disgust and mental contamination (Badour, Feldner, Babson et al., 2013; Fairbrother & Rachman, 2004), it was predicted that greater disgust and mental contamination would relate to greater executive control deficits. Moreover, given the inconsistencies in the literature regarding whether performance-based measures and self-report rating scales of executive functioning yield comparable results, and the relative advantages of each method (e.g., Absjornsen et al., 2010; Barkley, 2011; Demant et al., 2015; Nęcka et al., 2012), the present study utilized both self-report and performance-based measures to assess executive control (i.e., a multi-method approach).

Self-Reported Executive Control, Disgust, and Mental Contamination

Consistent with study hypotheses, self-reported executive control on the ACS was negatively correlated with disgust, indicating that higher levels of disgust are associated with lower levels of executive control. Likewise, self-reported executive control on the BRIEF-A was positively correlated with mental contamination, suggesting that higher levels of mental contamination are also associated with lower levels of executive control. These results are consistent with previous findings in the anxiety literature (e.g., Eysenck

et al., 2007; Hirsch & Mathews, 2012) suggesting that intrusive negative thoughts and feelings resulting from involuntary bottom-up processes may adversely impact one's ability to redirect or shift attention away from such negative content. However, inconsistent with study predictions, disgust was not related to executive control on the BRIEF-A nor was mental contamination associated with executive control on the ACS. Thus, disgust only related to executive control deficits on the ACS and mental contamination only related to executive control deficits on the BRIEF-A.

This pattern of results may be considered in the context of differences in the constructs assessed by the ACS and BRIEF-A, as the correlation between these measures in the present study ($r = -.51$) suggests a degree of distinctiveness in the constructs assessed by the two measures. Although both measures purportedly assess for executive control, the ACS specifically assesses for attentional shifting (Derryberry & Reed, 2002) and the BRIEF-A assesses for a broad range of executive functions (Roth et al., 2005). In addition, although shifting is one of the nine domains assessed by the BRIEF-A, the items comprising the shift subscale of the BRIEF-A reflect both behavioral and cognitive (e.g., attentional) shifting (Roth et al., 2005) and the ACS exclusively assesses cognitive shifting. Therefore, the ACS is likely a more targeted measure of attentional shifting than the BRIEF-A. These findings suggest that mental contamination may be related to a broader array of perceived executive function difficulties than disgust.

However, it is important to consider the partial correlation analyses that statistically accounted for trait anxiety. After statistically controlling for trait anxiety, neither disgust nor mental contamination was associated with self-reported executive control. Given that these associations stayed intact when controlling for posttraumatic

stress symptoms, the associations between disgust and mental contamination and self-reported executive control appear to be primarily accounted for by shared variance with trait anxiety. This finding shares some consistency with previous research suggesting that disgust may be conceptualized as a lower-order factor of trait anxiety (Olatunji, Williams, et al., 2007). Indeed, it has been recommended that trait anxiety be routinely assessed when including measures of disgust to ensure that trait anxiety does not account for associations observed between disgust and outcomes (Davey & Bond, 2006).

Additionally, it is important to note that while the association between disgust and the ACS, as well as between mental contamination and the BRIEF-A, were rendered non-significant after applying a Type I error correction, the associations between trait anxiety and both the ACS and BRIEF-A remained intact after that correction. Overall, the present findings indicate that self-reported executive control deficits are of particular relevance to trait anxiety and are in line with prior research suggesting a robust association between anxiety and self-reported impairments in executive control (e.g., Bardeen & Orcutt, 2011; Derryberry & Reed, 2002; Fergus, Bardeen, & Orcutt, 2012).

Performance-Based Executive Control, Disgust, and Mental Contamination

Study hypotheses regarding associations between disgust and mental contamination and performance-based executive control were largely unsupported. It was predicted that both disgust and mental contamination would be associated with deficits in performance-based measures of executive control. However, no significant associations were observed between either disgust or mental contamination with shifting, as indexed by the shifting network of the ANT, nor between disgust and inhibition as indexed by the interference score on the Color Word Stroop task.

When examining the relationship between affective responses to trauma and cognitive flexibility, as indexed by performance on the WCST, a somewhat different pattern of findings was observed. Primary analyses indicated findings similar to those demonstrated in the inhibition and shifting domains. No significant associations were observed between either disgust or mental contamination with cognitive flexibility, as measured by the percentage of Perseverative Errors and percentage of Perseverative Responses indices of the WCST, although the association between disgust and percentage of Perseverative Errors was trending in the predicted direction. When supplemental analyses were performed to separately examine these relationships in women who identified a sexual trauma versus non-sexual trauma as their most distressing event, a divergent pattern of results emerged from the pattern evidenced in the total sample. Disgust was positively associated with both percentage of Perseverative Errors and percentage of Perseverative Responses among those who endorsed sexual trauma as their most distressing event, but unrelated to these indices among those who endorsed a non-sexual trauma as most distressing. Likewise, mental contamination was positively associated with both percentage of Perseverative Errors and percentage of Perseverative Responses among those reporting a sexual trauma as most distressing. Mental contamination was unexpectedly negatively associated with these indices among those who identified a non-sexual trauma as most distressing. Thus, both disgust and mental contamination appear to be associated with executive control deficits among women who reported a sexual trauma as their most distressing event when assessing cognitive flexibility, but not inhibition or shifting.

More specifically, among women who report a sexual trauma as most distressing, disgust and mental contamination appear to relate to a perseverative response style characterized by a rigid adoption of previously attempted strategies and a failure to incorporate and apply new information to alter future behavior. These findings indicate that disgust and mental contamination demonstrate parallels to trait anxiety in how they influence executive control. Indeed, trait anxiety was similarly associated with deficits in cognitive flexibility among those who reported a sexual trauma as their most distressing event. Hirsch and Mathews (2012) posit that central to anxiety is the dominance of threat representations that prevent the shifting of attention toward goal-directed content. In the context of a sexual trauma identified as particularly distressing, women with high levels of disgust and mental contamination may experience intrusive, emotionally salient thoughts and feelings related to the trauma that prevent flexible responding to environmental changes. That is, bottom-up processes related to the traumatic event may override the ability to recognize new, disconfirming information, thereby worsening affective responses to the trauma (e.g., disgust, mental contamination). For example, a woman who frequently avoids situational factors that she associates with the trauma (e.g., poorly-lit rooms, walking alone at night) may dismiss experiences that provide information inconsistent with these associations (e.g., walking to her car safely one night) rather than incorporating this information and subsequently altering behavior. Over time, these deficits in cognitive flexibility may lead to strengthened trauma associations and worsened affective experiences.

In contrast to the similarities exhibited between disgust, mental contamination, and trait anxiety regarding deficits in cognitive flexibility, disgust and mental

contamination differ from trait anxiety in that they do not appear to relate to deficits in shifting as indexed by performance on the ANT. Thus, trait anxiety may be specifically relevant to shifting. The lack of association observed between shifting and disgust and mental contamination may be explained in part by the recruitment of additional cognitive resources to bolster task performance among those with heightened disgust and mental contamination. According to attentional control theory, affective responses may relate to reduced processing efficiency (i.e., the manner in which cognitive resources are employed to achieve desired performance) but not reduced effectiveness (i.e., the ability to perform the task; Berggren & Derakshan, 2013). Following from that theory, individuals with primarily either heightened disgust or mental contamination may demonstrate intact behavioral performance (i.e., preserved task effectiveness); however, maintenance of this performance requires the recruitment of additional cognitive resources, leading to reduced processing efficiency and greater cognitive effort. Thus, one possible explanation for the differential pattern of associations between trait anxiety and disgust and mental contamination may be that unlike individuals with heightened trait anxiety, those with heightened levels of disgust or mental contamination, were able to recruit the additional cognitive resources necessary to offset shifting deficits. Indeed, prior research suggests that the transient recruitment of cognitive resources among those with anxiety is associated with a number of task-specific variables (e.g., task difficulty, inter-stimulus-intervals; Ansari & Derakshan, 2011; Fales et al., 2008). Therefore, it is possible that task demands specific to the ANT influenced compensatory processes related to trait anxiety to a greater degree than disgust and mental contamination. However, it is important to note that after correcting for multiple comparisons the

association between trait anxiety and shifting deficits was rendered non-significant and thus, may be due to a Type I error. These findings indicate that shifting may demonstrate inconsistent relations with affective responses and are in line with recent evidence suggesting that trait anxiety is not associated with general shifting impairments, but instead may only relate to shifting when the task involves asymmetry in the attentional control demand (Gustavson, Altamirano, Johnson, Whisman, & Miyake, 2017). That is, when the shifting task requires individuals to establish task sets (e.g., WCST), such effort may make it more difficult to subsequently shift attention away from those tasks.

Whereas disgust and mental contamination were associated with deficits in cognitive flexibility among women who reported a sexual trauma as their most distressing traumatic event, there were no associations between these affective responses and inhibition or shifting. One possible explanation for this pattern of findings may be related to the high cognitive burden required of the WCST. According to Buchsbaum, Greer, Chang, and Berman (2005), good performance (i.e., cognitive flexibility) on the WCST requires three basic operations. These operations include: (a) a feedback-based recognition that a current strategy is no longer adaptive and thus should be abandoned; (b) an ability to search for a new rule by attempting each stimulus dimension for a correct match; and (c) memory for the appropriate sorting rule and repeated application of this rule until negative feedback is given once again. In other words, high levels of cognitive flexibility on the WCST are demonstrated by maintaining the correct cognitive set, inhibiting the incorrect cognitive set, and shifting the cognitive set when necessary (Buchsbaum et al., 2005). In contrast, shifting on the ANT primarily requires shifting attention away from the direction of the flanker (i.e., distractor) arrows to the direction of

the central (i.e., target) arrow (Fan et al., 2002). While the direction of both the target and flanker arrows may vary over the course of the task, the task rules remain the same from start to finish. Likewise, the Color Word Stroop task requires inhibiting the impulse to respond to the name of the printed word rather than the color in which the word is printed. While good performance on the Stroop task requires the ability to keep this rule in mind (i.e., inhibiting the incorrect, prepotent response), the rules remain constant throughout the task.

Therefore, the WCST requires the ability to learn, apply, discard, and replace task rules in order to make the appropriate choice when many possible choices are available, whereas the ANT and Stroop task solely require the ability to learn and apply consistent task rules. The greater cognitive load required of the WCST may exceed working memory capacity limits, which can result in diminished ability to suppress irrelevant information and impaired task performance (Gazzaley, 2011). Given that trait anxiety and posttraumatic stress symptoms were also associated with deficits in cognitive flexibility, these findings indicate that women with a proneness to experience negative emotions in response to a particularly distressing sexual trauma may demonstrate intact executive control unless the task at hand is sufficiently demanding of cognitive resources. The specificity of these relationships to women who identified a sexual trauma as their most distressing event will be discussed in further detail below.

Posttraumatic Stress Symptoms and Executive Control

A number of existing studies suggest that posttraumatic stress symptoms are related to broad deficits in executive function (e.g., Aupperle et al., 2012; DeGutis et al., 2015; Gilbertson et al., 2001; Leskin & White, 2007; Polak et al., 2012). However, other

studies have failed to find such a relationship when examining certain indices of both self-reported and performance-based executive control (e.g., attentional shifting, cognitive flexibility; Bardeen & Read, 2010; Bardeen et al., 2015; Twamley, Hami, & Stein, 2004; Vasterling et al., 1998). Consistent with the latter studies, the present study found no associations between posttraumatic stress symptoms and performance-based executive control deficits related to inhibition, shifting or cognitive flexibility.

Posttraumatic stress symptoms were positively associated with self-reported executive control deficits on the BRIEF-A; however, this association was rendered non-significant after applying a Type I error correction. While it is possible that a significant association between posttraumatic stress symptoms and executive control was not observed due to sampling variability, another possibility for the non-significant association may be that the present sample was underpowered to detect such an effect. For example, although prior research has demonstrated relationships between measures of posttraumatic stress and self-reported executive control (e.g., Bardeen & Fergus, 2016; Bardeen & Orcutt, 2011), when found, these associations can be small in magnitude (e.g., $r_s = -.28, -.24$, respectively). A post-hoc power analysis indicated that the present study was underpowered to detect a small association (i.e., $r = .20$) in magnitude ($1-\beta = .49$; Faul, Erdfelder, Buchner, & Lang, 2009).

Disgust and Mental Contamination

When examining the relationships among affective responses, disgust and mental contamination shared a relatively small association in the present sample. Although this finding is inconsistent with a number of prior studies demonstrating larger associations between the two variables (e.g., Badour, Feldner, Blumenthal, & Bukarski, 2013; Badour

et al., 2014), the divergence between disgust and mental contamination may help to explain the differential associations between these affective responses and measures of executive control in the current study. Prior research suggests that disgust and mental contamination share a number of defining characteristics. Both phenomena are associated with feelings of dirtiness and have been identified as prominent affective responses following sexual assault (Badour, Feldner, Babson, et al., 2013; Fairbrother & Rachman, 2004; Rachman, 2004). Indeed, feelings of disgust are considered a critical aspect of mental contamination (Fairbrother & Rachman, 2004). However, mental contamination is not considered a necessary component to the experience of disgust (Fairbrother & Rachman, 2004). As such, the two constructs are not synonymous with one another.

More specifically, a fear of feeling dirty or contaminated is a defining characteristic of mental contamination (Rachman, 2004), whereas fear is not a necessary characteristic of disgust. That is, disgust can be experienced in the absence of fear and there is evidence to suggest that disgust and fear provoke divergent behavioral responses (Gray, 1987; Rozin & Fallon, 1987). For example, fear has been associated with an orienting response to sensory information (Gray, 1987), while disgust is associated with an immediate rejection of sensory information (Rozin & Fallon, 1987). Thus, while disgust and mental contamination share a number of similarities, the lack of a necessary fear component in the experience of disgust but not mental contamination may help to explain why mental contamination and disgust relate somewhat differently to measures of executive control.

In the present study, greater mental contamination, but not disgust, was associated with greater inhibition on the Color Word Stroop task. It should be noted that while not

significant, disgust, trait anxiety, and posttraumatic stress symptoms each shared a similar pattern of negative associations with response time on the Stroop task. Given that the inverse direction of the predicted associations was observed across all affective measures, it is possible that this unexpected pattern of associations is related to the Stroop task itself. Indeed, although a large body of research indicates that anxiety shares a robust association with executive control deficits (e.g., Berggren & Derakshan, 2013; Bishop, 2009; Eysenck et al., 2007; Hirsch & Mathews, 2012), prior research suggests inconsistent associations between anxiety and the Stroop task (e.g., Amir et al., 1996; Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & Van Ijzendoorn, 2007; Mathews & Sebastian, 1993). Thus, it is possible that the Stroop task may not adequately capture the influence of certain affective responses on inhibitory processes. Additionally, it should be noted that the unexpected association between mental contamination and Stroop performance was rendered non-significant after applying a Type I error correction, suggesting that this association is not particularly robust or may be due to a Type I error.

When examining the effect of trauma type on the relationship between affective responses and cognitive flexibility, greater mental contamination, but not disgust, was associated with greater levels of cognitive flexibility among women who identified a non-sexual trauma as their most distressing event. Mental contamination and disgust demonstrated divergent patterns of association with cognitive flexibility such that mental contamination, but not disgust, was related to enhanced cognitive flexibility on the WCST when the most distressing event reported was *non-sexual* in nature. In contrast, when the most distressing event was identified as *sexual* in nature, both disgust and mental contamination were associated with decreased cognitive flexibility. In fact, trait

anxiety and posttraumatic stress symptoms were also significantly related to deficits in cognitive flexibility. Thus, when the most distressing event was related to sexual trauma, as predicted, all four affective responses (i.e., disgust, mental contamination, trait anxiety, and posttraumatic stress symptoms) were significantly associated with impaired cognitive flexibility. However, the inverse relationship was observed for all affective responses, aside from disgust, when a non-sexual trauma was reported as most distressing. That is, greater mental contamination was significantly associated with greater cognitive flexibility, and trait anxiety and posttraumatic stress symptoms also trended in this direction. While unexpected, the divergent pattern of relationships between disgust and mental contamination is somewhat consistent with prior research suggesting that disgust and fear may differentially influence attention (e.g., Cisler, Olatunji, Lohr, & Williams, 2009; Krusemark & Li, 2011; van Hooff, Devue, Vieweg, & Theeuwes, 2013; van Hooff, van Buuringen, El M'rabet, de Gier, & van Zalingen, 2014).

As previously discussed, fear is a central and necessary component to the experience of mental contamination but not disgust (Rachman, 2004). Fear is likewise a central component to both anxiety (Reiss, Peterson, Gursky, & McNally, 1986) and posttraumatic stress symptoms (Foa, Riggs, Massie, & Yarczower, 1995); thus, it may be argued that disgust conceptually differs from the other three affective responses in relation to fear. Cisler and colleagues (2009) demonstrated that in contrast to fear, disgust is related to attentional biases only when the experience of disgust is highly relevant (e.g., in those highly sensitive or prone to disgust). Fear on the other hand, appears to broadly relate to attentional biases regardless of fear propensity (Cisler et al., 2009). Although there were not mean level differences in disgust *proneness* between women who

identified a sexual versus non-sexual trauma as most distressing, it is possible that disgust is more *situationally* salient among women who have experienced a particularly distressing sexual trauma. Indeed, sexual assault survivors are six times more likely to endorse feelings of disgust during the event than survivors of physical assault (Feldner, et al., 2010). Therefore, it may follow that disgust needs to be particularly relevant (i.e., when a sexual trauma is identified as most distressing), for disgust, in addition to other affective responses, to relate to deficits in cognitive flexibility. However, when disgust is less relevant (i.e., when a non-sexual trauma is considered most distressing), fear-based responses (e.g., trait anxiety, posttraumatic stress symptoms, mental contamination), but not disgust, may relate to cognitive flexibility. These findings support the assertion that disgust, but not fear, needs to be highly relevant to influence cognitive responses (Cisler et al., 2009). Although differences in how fear and disgust may relate to the type of trauma experienced do not explain the *enhanced* cognitive flexibility observed among women who identified a non-sexual trauma as most distressing, they nonetheless support the divergence of disgust and mental contamination in their association with cognitive flexibility. Future research is needed to examine the replicability of associations between affective responses with a fear component and cognitive flexibility among women who identified a non-sexual trauma given that no prior research speaks to the enhancement of cognitive flexibility in such circumstances.

Disgust and Posttraumatic Stress Symptoms

Another unexpected finding regarding the relationships between affective responses among the present sample was the lack of association between disgust and posttraumatic stress symptoms. This finding is inconsistent with prior studies suggesting

that disgust is positively associated with posttraumatic stress symptoms following sexual trauma (e.g., Badour, Feldner, Blumenthal, & Bujarski, 2013; Badour, Feldner, Blumenthal, & Knapp 2013). One potential explanation for the difference in findings may be related to the severity of the sexual trauma experienced. Prior studies documenting associations between disgust and posttraumatic stress symptoms subsequent to sexual trauma have restricted their samples to only those women who have experienced a DSM-IV criterion A event (e.g., Badour, Feldner, Blumenthal, & Bujarski, 2013; Badour, Feldner, Blumenthal, & Knapp 2013). That is, participants must have experienced or witnessed a sexual trauma involving an actual or threatened death or serious injury to self or others resulting in intense fear, helplessness, or horror (American Psychiatric Association, 2000). While the present sample was restricted to those women who experienced, rather than witnessed, a sexual trauma, women were not excluded based on the severity of the trauma experienced. Additionally, no relationship between disgust and posttraumatic stress symptoms was observed when we further restricted the sample to only those women who reported sexual trauma as their most distressing traumatic event. Thus, it is possible that a sexual trauma must be not only distressing but also involve specific aspects related to the severity of the trauma (e.g., the threat of serious injury, intense horror) to relate to disgust, and that associations between disgust and posttraumatic stress symptoms would be observed in a sample characterized by greater trauma severity.

Clinical Relevance

Women who experience a sexual trauma as particularly distressing may be especially likely to present for psychological services (Ullman & Brecklin, 2002; Ullman

& Filipas, 2001); thus, findings from the supplementary analyses may have important clinical implications. For example, prior research suggests that disgust-based reactions are less amenable to exposure-based interventions (Fairbrother et al., 2005; Olatunji, Forsyth, & Cherian, 2007; Olatunji, Wolitzky-Taylor, Willems, Lohr, & Armstrong, 2009), which have been identified as the gold standard treatment for posttraumatic stress symptoms (Rauch, Eftekhari, & Ruzek, 2012). Residual feelings of disgust and mental contamination in cases of sexual trauma may be particularly problematic following exposure treatment and are thought to relate to poorer treatment outcomes (Engelhard, Leer, Lange, & Olatunji, 2014; Olatunji et al. 2009). For example, although a woman may no longer fear trauma-related stimuli following exposure treatment, she may continue to avoid places or situations relevant to the trauma due to their association with residual feelings of disgust and mental contamination. The findings from the present study suggest that feelings of disgust and mental contamination following sexual trauma are related to deficits in cognitive flexibility among women who report the sexual trauma as being particularly distressing. As previously outlined, deficits in cognitive flexibility, which are characterized by an increased tendency toward perseverative behavior, may lead to strengthened trauma associations and worsened affective experiences over time. Thus, interventions for women with heightened levels of disgust and mental contamination following sexual trauma may benefit from directly targeting low levels of cognitive flexibility.

Prior research suggests that training procedures designed to enhance cognitive flexibility result in significant increases in pre to post performance on the WCST, including reductions in perseverative responding (e.g., Bellack, Weinhardt, Gold, &

Gearon, 2001; Kurtz, Moberg, Gur, & Gur, 2001). Training strategies vary across studies but can include didactic instruction, modeling, corrective feedback and repeated explanation of task rules, as well as specific problem solving strategies (Bellack et al., 2001). Importantly, enhanced cognitive flexibility resulting from these interventions has been shown to generalize beyond the tasks utilized in the training procedure, suggesting that increased performance is not due to task-specific practice effects (e.g., Krabbendam & Aleman, 2003). Although the majority of studies examining training strategies designed to enhance cognitive flexibility have investigated their efficacy in those with schizophrenia (e.g., Bellack et al., 2001; Kurtz et al. 2001) and traumatic brain injury (e.g., Cicerone et al. 2000), the present findings suggest that these interventions may also have clinical relevance for women experiencing persistent feelings of disgust and mental contamination following sexual trauma. Treatments targeting deficits in cognitive flexibility among sexual assault survivors may lead to improvements in the incorporation and application of new information; thus, altering previously held trauma-related beliefs and perseverative behaviors and reducing associated posttraumatic affective responses (e.g., disgust and mental contamination).

Limitations and Conclusions

The above discussion should be considered in light of study limitations. Although a limitation that would extend to any selected task, it is important to acknowledge the potential influence of task variation. More precisely, there are a number of performance-based tasks used to assess executive control (e.g., Chamberlain, Fineberg, Blackwell, Robbins, & Sahakian, 2006; Fox, Russo, Bowles, & Dutton, 2001; Menon, Adleman, White, Glover, & Reiss, 2001; Mogg & Bradley, 1999). Whereas the chosen tasks have

been widely cited to assess inhibition, shifting, and cognitive flexibility, respectively, (e.g., Gilbertson et al., 2001; Hazlett et al., 2015; Landry & Al-Taie, 2016; Leskin & White, 2007; Stuss et al., 2001), it is possible that task-specific idiosyncrasies may have influenced associations among the study variables.

One important component of the selected tasks was the use of neutral as opposed to emotionally evocative stimuli. The decision to utilize neutral stimuli was based on prior research suggesting that neutral stimuli are related to general executive control, whereas emotionally evocative stimuli are associated with executive control in emotionally salient situations (Egner, Etkin, Gale, & Hirsch, 2008). Given that the present study sought to establish a relationship between disgust and mental contamination and general executive control deficits, the use of neutral stimuli was deemed most relevant to this investigation. That being said, future studies seeking to examine executive control as it relates to disgust and mental contamination within emotionally salient situations, may benefit from the use of emotionally evocative stimuli. In particular, such studies may help clarify the emotional impact of trauma-related stimuli on executive control and subsequent feelings of disgust and mental contamination among women who have experienced sexual trauma. Indeed, prior research suggests that threat-related stimuli may intensify negative affective states thereby contributing to deficits in executive control among anxious individuals (e.g., MacLeod, Mathews, & Tata, 1986; Bar-Haim et al., 2007). Thus, it might follow that emotionally evocative stimuli would intensify feelings of disgust and mental contamination thereby further impairing executive control among women high in trait disgust and trait mental contamination who have experienced sexual assault.

While prior research supports the notion of conceptualizing posttraumatic stress symptoms along a continuum (Ruscio et al., 2002), thus supporting the use of a sample with a range of posttraumatic stress symptoms, the present results require replication among a clinical population in order to generalize these findings to those with a diagnosis of PTSD. Additionally, the cross-sectional design of the present study precludes causal conclusions among study variables. Future research may address this limitation and provide insight into the temporal relationships among disgust, mental contamination, and deficits in executive control through the use of a cross leg panel study design. More specifically, a future study could assess for mental contamination, disgust, and executive control at multiple time points among a sample of participants with no trauma exposure. Of particular interest would be whether executive control at baseline predicts disgust and mental contamination at a later time point among individuals who experienced a trauma in between baseline and later assessment. Finally, it is possible that life events occurring between the two sessions (e.g., head injury, trauma exposure) could have impacted responses collected in the in-person session. Future studies should assess for the occurrence of these events at the in-person session.

With these study limitations in mind, the present results provide further evidence that trait anxiety is associated with self-reported deficits in executive control among a sample of women who have experienced sexual trauma. However, disgust and mental contamination appear to share a more complex relationship with executive control, such that the relationship between these affective responses and executive control deficits may be situation-specific. That is, disgust and mental contamination shared an association with deficits in cognitive flexibility, but not inhibition or shifting, and only shared this

association among women who identified their sexual trauma as particularly distressing. Thus, it appears that the sexual trauma may need to elicit a certain level of distress for disgust and mental contamination to relate to impairments in cognitive flexibility. Importantly, among this subset of women, trait anxiety and posttraumatic stress symptoms were also associated with deficits in cognitive flexibility. Therefore, affective responses appear to broadly relate to perseverative responding among women who have experienced sexual trauma. Interestingly, only those affective responses with a primary fear component (e.g., mental contamination, posttraumatic stress symptoms, and trait anxiety) related to cognitive flexibility among women who identified a non-sexual trauma as their most distressing event, suggesting that disgust and fear may differ in how they relate to executive control under certain circumstances. Further examination and understanding of the associations between disgust and mental contamination and executive control may lead to the use of interventions designed to target cognitive flexibility in the treatment of these affective responses following sexual trauma.

APPENDICES

APPENDIX A

Tables

Table 1

Descriptive Statistics in Total Sample

Variable	Mean	SD	Skew	Kurtosis
DPSS-R	28.17	7.81	0.42	0.31
VOCI-MC	36.17	13.81	1.53	2.58
PCL-5	40.97	14.78	0.92	0.96
STICSA	40.21	8.96	0.32	-0.25
ACS-Total	50.11	10.02	0.34	1.11
BRIEF-A-General Executive	112.15	23.63	0.49	0.03
Stroop Interference	203.04	159.48	-0.31	0.50
WCST-% PE	7.42	3.09	1.27	2.67
WCST-% PR	10.72	4.46	0.85	1.23
ANT-Shifting	95.68	60.82	2.60	8.36

Note. DPSS-R = Disgust Propensity and Sensitivity Scale-Revised; VOCI-MC = Vancouver Obsessional Compulsive Inventory-Mental Contamination Scale; PCL-5 = PTSD Checklist-5 (Civilian Version); STICSA = State Trait Inventory for Cognitive and Somatic Anxiety; ACS = Attentional Control Scale; BRIEF-A-General Executive = Behavior Rating Inventory of Executive Function-Adult version, General Executive score; Stroop Interference = Color Word Stroop Interference score (milliseconds); WCST-% PR = Wisconsin Card Sort Test- Percentage of Perseverative Responses; WCST-% PE = Wisconsin Card Sort Test- Percentage of Perseverative Errors; ANT-Shifting = Attention Network Test- Shifting network score (milliseconds).

Table 2
Zero-Order Correlations among Affective Responses

Variable	1	2	3
1. VOCI-MC	-		
2. DPSS-R	.26*	-	
3. STICSA	.51**	.36**	-
4. PCL-5	.46**	.03	.35**

Note. $N = 88$. ** $p < .01$, * $p < .05$ (two-tailed).

Table 3

Zero-Order Correlations among Indices of Executive Control

Variable	1	2	3	4	5
1. ACS-Total	-				
2. BRIEF-A-GE	-.51**	-			
3. Stroop Interference	.10	-.24*	-		
4. WCST-% Perseverative Errors	-.07	.01	-.02	-	
5. WCST-% Perseverative Responses	-.03	.02	-.03	.91**	-
6. ANT-Executive Attention	-.09	.08	.03	-.08	-.08

Note. $N = 88$. ** $p < .01$, * $p < .05$ (two-tailed).

Table 4

Zero-Order Correlations between Affective Responses and Indices of Executive Control

Variable	VOCI-MC	DPSS-R	STICSA	PCL-5
ACS-Total	.09	-.23*	-.34**	.17
BRIEF-A-General Executive	.29*	.19	.59**	.22*
Stroop Interference	-.27*	-.17	-.13	-.21
WCST-% Perseverative Errors	-.07	.20	.04	.01
WCST-% Perseverative Responses	-.04	.20	.03	-.01
ANT-Executive Attention	.08	-.01	.23*	.10

Note. $N = 88$. ** $p < .003$ (alpha-corrected), * $p < .05$ (two-tailed).

Table 5

Descriptive Statistics based upon Most Distressing LEC-5 Event

	<u>Sexual Trauma</u>		<u>Non-Sexual Trauma</u>		
Variable	<i>(n = 42)</i>		<i>(n = 46)</i>		<i>t</i> ₍₈₆₎
VOCI-MC	37.76	(14.98)	34.72	(12.63)	1.03
DPSS-R	28.62	(7.79)	27.76	(7.89)	0.51
STICSA	40.64	(9.18)	39.82	(8.84)	0.43
PCL-5	41.93	(14.34)	40.09	(15.28)	0.58
ACS-Total	50.95	(10.96)	49.35	(9.13)	0.75
BRIEF-A-GE	111.07	(24.30)	113.14	(23.22)	0.41
Stroop Interference	177.53	(169.96)	226.33	(147.27)	1.44
WCST-% PE	7.12	(2.83)	7.69	(3.31)	0.86
WCST-% PR	10.44	(4.22)	10.98	(4.69)	0.56
ANT-Executive Attention	98.40	(66.88)	93.19	(55.35)	0.40

Table 6

Most Distressing LEC-5 Event Group as Moderator of Affective Response (AR) and Perseveration (% Perseverative Errors)

AR	Mental Contamination			Disgust			Trait Anxiety			Posttraumatic Stress		
	ΔR^2	Step 1 β	Step 2 β	ΔR^2	Step 1 β	Step 2 β	ΔR^2	Step 1 β	Step 2 β	ΔR^2	Step 1 β	Step 2 β
<u>Step 1</u>	.01			.05			.01			.01		
AR		-.06	-.56**		.20	-.06		.05	-.21		.02	-.23
Group		-.09	-.08		-.10	-.11		-.10	-.10		-.09	-.10
<u>Step 2</u>	.19**			.07*			.07*			.07*		
AR x Group			.65**			.37**			.37*			.36*

Note. $N = 88$. ** $p < .01$, * $p < .05$ (two-tailed).

Table 7

Most Distressing LEC-5 Event Group as Moderator of Affective Response (AR) and Perseveration (% Perseverative Responses)

AR	Mental Contamination			Disgust			Trait Anxiety			Posttraumatic Stress		
	ΔR^2	Step 1 β	Step 2 β	ΔR^2	Step 1 β	Step 2 β	ΔR^2	Step 1 β	Step 2 β	ΔR^2	Step 1 β	Step 2 β
<u>Step 1</u>	.01			.05			.01			.00		
AR		-.03	-.53**		.20	-.01		.03	-.25		-.01	-.25
Group		-.06	-.05		-.07	-.07		-.06	-.06		-.06	-.06
<u>Step 2</u>	.19**			.05*			.08**			.07*		
AR x Group			.66**			.32*			.40**			.36*

Note. $N = 88$. ** $p < .01$, * $p < .05$ (two-tailed).

APPENDIX B

Figures

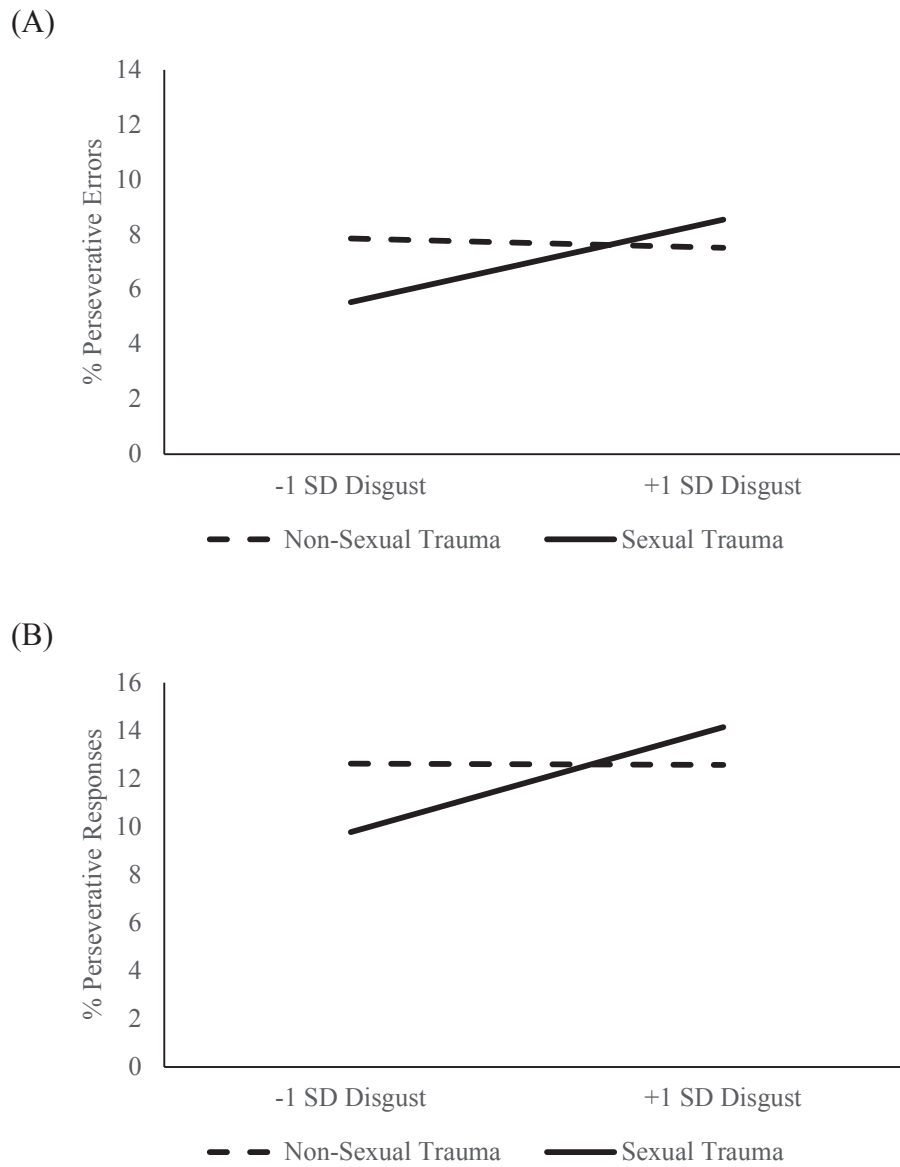


Figure 1. Type of most distressing traumatic event as a moderator of the association between A) disgust and percentage of Perseverative Errors and B) disgust and percentage of Perseverative Responses.

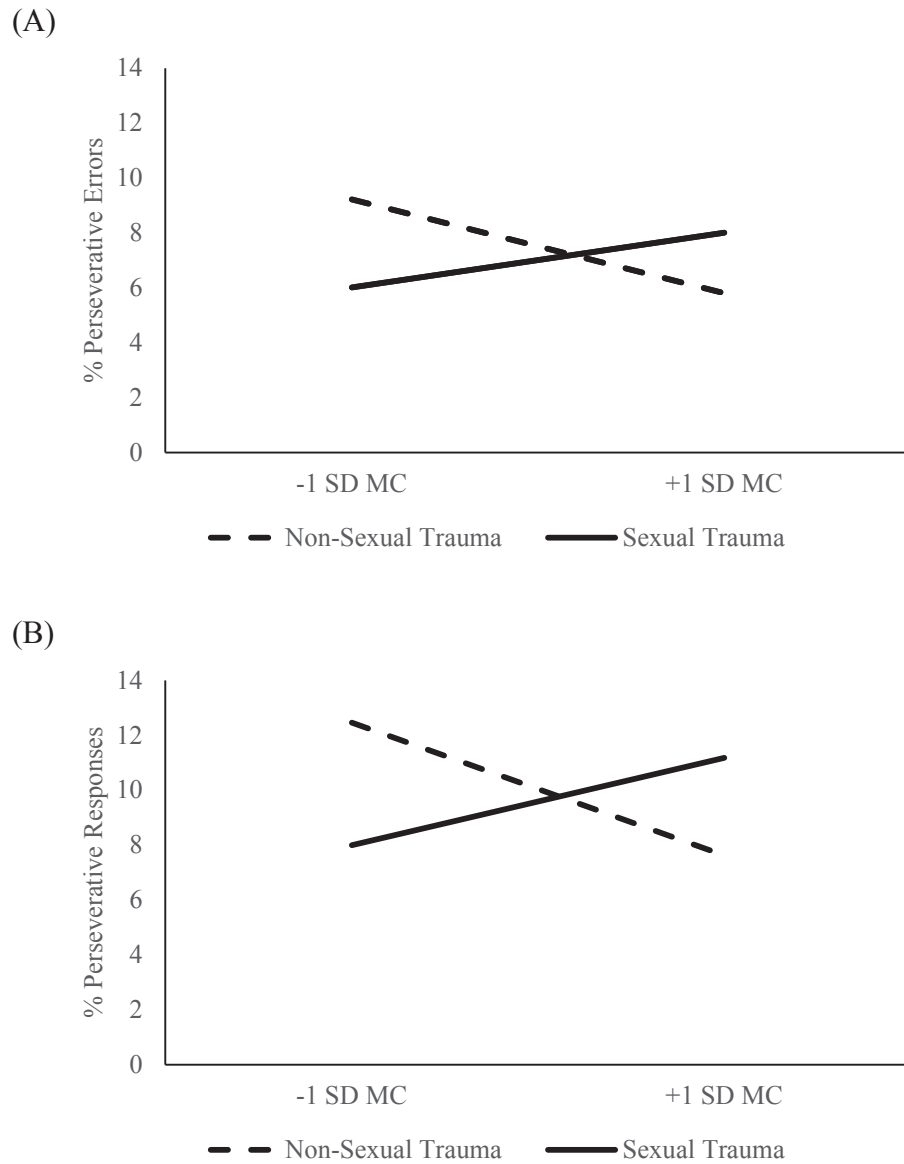
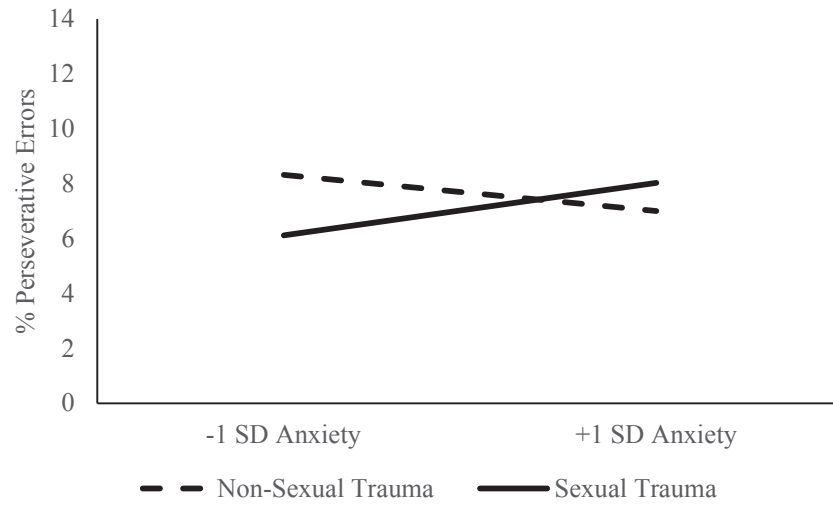


Figure 2. Type of most distressing traumatic event as a moderator of the association between A) mental contamination and percentage of Perseverative Errors and B) mental contamination and percentage of Perseverative Responses.

(A)



(B)

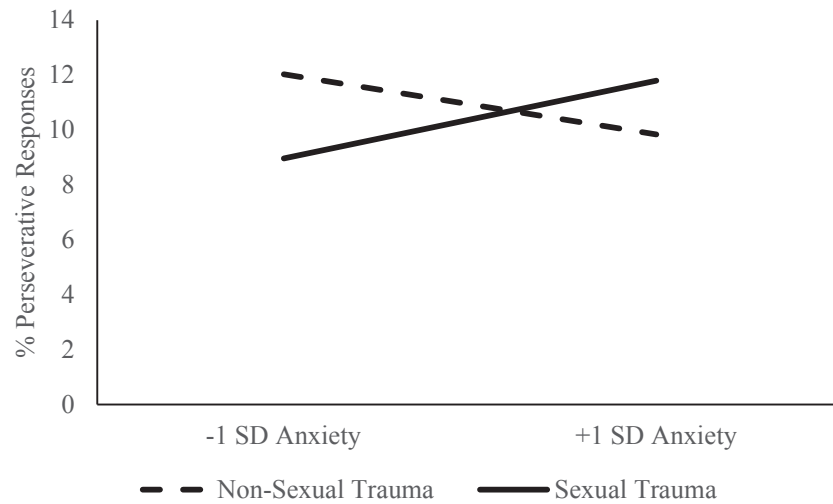
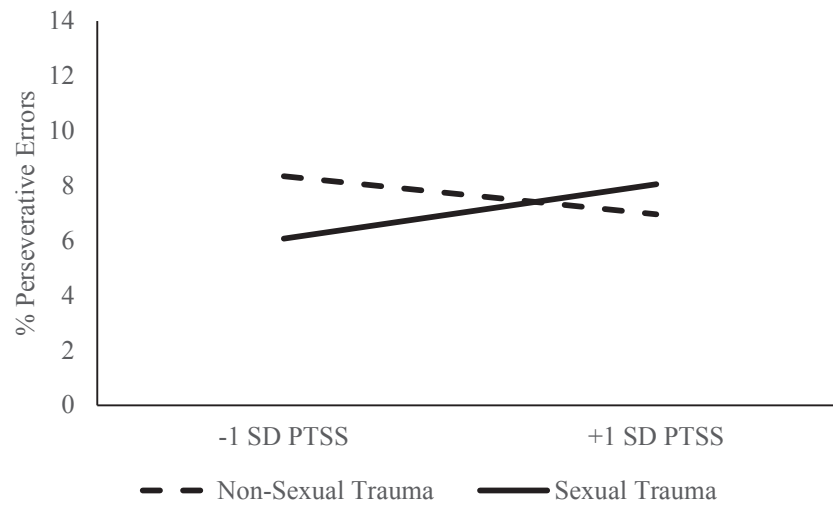


Figure 3. Type of most distressing traumatic event as a moderator of the association between A) trait anxiety and percentage of Perseverative Errors and B) trait anxiety and percentage of Perseverative Responses.

(A)



(B)

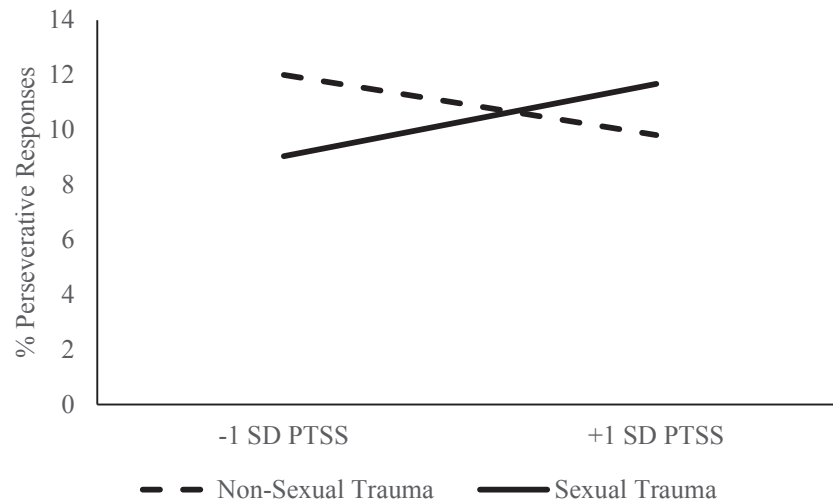


Figure 4. Type of most distressing traumatic event as a moderator of the association between A) posttraumatic stress and percentage of Perseverative Errors and B) posttraumatic stress and percentage of Perseverative Responses.

APPENDIX C

Measures

Life Events Checklist for DSM-5 (LEC-5)

Instructions: Listed below are a number of difficult or stressful things that sometimes happen to people. For each event check one or more of the boxes to the right to indicate that: (a) it happened to you personally; (b) you witnessed it happen to someone else; (c) you learned about it happening to a close family member or close friend; (d) you were exposed to it as part of your job (for example, paramedic, police, military, or other first responder); (e) you're not sure if it fits; or (f) it doesn't apply to you.

1	2	3	4	5	6
Happened to me	Witnessed it	Learned about it	Part of my job	Not sure	Doesn't apply

Response
(1 to 6)

- | | | |
|-------|----|--|
| _____ | 1. | Natural disaster (for example, flood, hurricane, tornado, earthquake) |
| _____ | 2. | Fire or explosion |
| _____ | 3. | Transportation accident (for example, car accident, boat accident, train wreck, plane crash) |
| _____ | 4. | Serious accident at work, home, or during recreational activity |
| _____ | 5. | Exposure to toxic substance (for example, dangerous chemicals, radiation) |
| _____ | 6. | Physical assault (for example, being attacked, hit, slapped, kicked, beaten up) |
| _____ | 7. | Assault with a weapon (for example, being shot, stabbed, threatened with a knife, gun, bomb) |

- _____ 8. Sexual assault (rape, attempted rape, made to perform any type of sexual act through force or threat of harm)
- _____ 9. Other unwanted or uncomfortable sexual experience
- _____ 10. Combat or exposure to a war-zone (in the military or as a civilian)
- _____ 11. Captivity (for example, being kidnapped, abducted, held hostage, prisoner of war)
- _____ 12. Life-threatening illness or injury
- _____ 13. Severe human suffering
- _____ 14. Sudden violent death (for example, homicide, suicide)
- _____ 15. Sudden accidental death
- _____ 16. Serious injury, harm, or death you caused to someone else
- _____ 17. Any other very stressful event or experience

PART 2:

A. If you checked anything for #17 in PART 1, briefly identify the event you were thinking of:

B. If you have experienced more than one of the events in PART 1, think about the event you consider the worst event, which for this questionnaire means the event that currently bothers you the most. If you have experienced only one of the events in PART 1, use that one as the worst event. Please answer the following questions about the worst event (check all options that apply):

1. Briefly describe the worst event (for example, what happened, who was involved, etc.).

2. How long ago did it happen? _____(please estimate if you are not sure)

3. How did you experience it?

____It happened to me directly

- ☐ I witnessed it
- ☐ I learned about it happening to a close family member or close friend
- ☐ I was repeatedly exposed to details about it as part of my job (for example, paramedic, police, military, or other first responder)
- ☐ Other, please describe:

4. Was someone's life in danger?

- ☐ Yes, my life
- ☐ Yes, someone else's life
- ☐ No

5. Was someone seriously injured or killed?

- ☐ Yes, I was seriously injured
- ☐ Yes, someone else was seriously injured or killed
- ☐ No

6. Did it involve sexual violence? ☐ Yes ☐ No

7. If the event involved the death of a close family member or close friend, was it due to some kind of accident or violence, or was it due to natural causes?

- ☐ Accident or violence
- ☐ Natural causes
- ☐ Not applicable (The event did not involve the death of a close family member or close friend)

8. How many times altogether have you experienced a similar event as stressful or nearly as stressful as the worst event?

- ☐ Just once
- ☐ More than once (please specify or estimate the total # of times you have had this experience _____)

PTSD Checklist-5 (PCL-5)

Instructions: Below is a list of problems that people sometimes have in response to a very stressful experience. Keeping your worst event in mind, please read each problem carefully and then circle one of the numbers to the right to indicate how much you have been bothered by that problem in the past month.

0	1	2	3	4
Not at all	A little bit	Moderately	Quite a bit	Extremely

In the past month, how much were you bothered by:

Response
(0 to 4)

- | | |
|-------|---|
| _____ | 1. Repeated, disturbing, and unwanted memories of the stressful experience? |
| _____ | 2. Repeated, disturbing dreams of the stressful experience? |
| _____ | 3. Suddenly feeling or acting as if the stressful experience were actually happening again (as if you were actually back there reliving it)? |
| _____ | 4. Feeling very upset when something reminded you of the stressful experience? |
| _____ | 5. Having strong physical reactions when something reminded you of the stressful experience (for example, heart pounding, trouble breathing, sweating)? |
| _____ | 6. Avoiding memories, thoughts, or feelings related to the stressful experience? |
| _____ | 7. Avoiding external reminders of the stressful experience (for example, people, places, conversations, activities, objects, or situations)? |
| _____ | 8. Trouble remembering important parts of the stressful experience? |
| _____ | 9. Having strong negative beliefs about yourself, other people, or the world (for example, having thoughts such as: I am bad, there is |

something seriously wrong with me, no one can be trusted, the world is completely dangerous)?

- _____ 10. Blaming yourself or someone else for the stressful experience or what happened after it?
- _____ 11. Having strong negative feelings such as fear, horror, anger, guilt, or shame?
- _____ 12. Loss of interest in activities that you used to enjoy?
- _____ 13. Feeling distant or cut off from other people?
- _____ 14. Trouble experiencing positive feelings (for example, being unable to feel happiness or have loving feelings for people close to you)?
- _____ 15. Irritable behavior, angry outbursts, or acting aggressively?
- _____ 16. Taking too many risks or doing things that could cause you harm?
- _____ 17. Being “superalert” or watchful or on guard?
- _____ 18. Feeling jumpy or easily startled?
- _____ 19. Having difficulty concentrating?
- _____ 20. Trouble falling or staying asleep?

Weathers, F. W., Litz, B. T., Keane, T. M., Palmieri, P. A., Marx, B. P., & Schnurr, P. P. (2013b). *The PTSD checklist for DSM-5 (LEC-5)*. Instrument available from the National Center for PTSD at www.ptsd.va.gov.

Disgust Propensity and Sensitivity Scale- Revised (DPSS-R)

Instructions: This questionnaire consists of 12 statements about disgust. Please read each statement and think how often it is true for you, then circle the corresponding response option.

0	1	2	3	4
Never	Rarely	Sometimes	Often	Always

Response
(0 to 4)

- | | |
|-------|--|
| _____ | 1. I avoid disgusting things. |
| _____ | 2. When I feel disgusted, I worry that I might pass out. |
| _____ | 3. It scares me when I feel nauseous. |
| _____ | 4. I feel repulsed. |
| _____ | 5. Disgusting things make my stomach turn. |
| _____ | 6. I screw my face in disgust. |
| _____ | 7. When I notice that I feel nauseous, I worry about vomiting. |
| _____ | 8. I experience disgust. |
| _____ | 9. It scares me when I feel faint. |
| _____ | 10. I find something disgusting. |
| _____ | 11. It embarrasses me when I feel disgusted. |
| _____ | 12. I think feeling disgust is bad for me. |

Fergus, T. A., & Valentiner, D. P. (2009). The Disgust Propensity and Sensitivity Scale – Revised: An examination of a reduced-item version. *Journal of Anxiety Disorders*, 23, 703-710.

Vancouver Obsessional Compulsive Inventory- Mental Contamination Scale (VOCI-MC)

Instructions: Please rate the extent to which you agree with the following statements.

0	1	2	3	4
Not at all	A little	Some	Much	Very much

Response
(0 to 4)

- | | | |
|-------|-----|--|
| _____ | 1. | Often I look clean but feel dirty. |
| _____ | 2. | Having an unpleasant image or memory can make me feel dirty inside. |
| _____ | 3. | Often I cannot get clean no matter how thoroughly I wash myself. |
| _____ | 4. | If someone says something nasty to me it can make me feel dirty. |
| _____ | 5. | Certain people make me feel dirty or contaminated even without any direct contact. |
| _____ | 6. | I often feel dirty under my skin. |
| _____ | 7. | Some people look clean, but feel dirty. |
| _____ | 8. | I often feel dirty or contaminated even though I haven't touched anything dirty. |
| _____ | 9. | Often when I feel dirty or contaminated, I also feel guilty or ashamed. |
| _____ | 10. | I often experience unwanted and upsetting thoughts about dirtiness. |
| _____ | 11. | Some objects look clean, but feel dirty. |
| _____ | 12. | I often feel dirty or contaminated without knowing why. |
| _____ | 13. | Often when I feel dirty or contaminated, I also feel angry. |
| _____ | 14. | Unwanted and repugnant thoughts often make me feel contaminated or dirty. |
| _____ | 15. | Standing close to certain people makes me feel dirty and/or contaminated. |

- _____ 16. I often feel dirty inside my body.
- _____ 17. If I experience certain unwanted repugnant thoughts, I need to wash myself.
- _____ 18. Certain people or places that make me feel dirty or contaminated leave everyone else completely unaffected.
- _____ 19. The possibility that my head will be filled with worries about contamination makes me very anxious.
- _____ 20. I often feel the need to cleanse my mind.

Radomsky, A. S., Rachman, S., Shafran, R., Coughtrey, A. E., & Barber, K. C. (2014). The nature and assessment of mental contamination: A psychometric analysis. *Journal of Obsessive-Compulsive and Related Disorders*, 3, 181-187.

State Trait Inventory for Cognitive and Somatic Anxiety (STICSA Trait Version)

Instructions: Below is a list of statements which can be used to describe how people feel. Beside each statement are four numbers which indicate how often each statement is true of you (e.g., 1 = almost never, 4 = almost always). Please read each statement carefully and circle the number which best indicates how often, in general, the statement is true of you.

1	2	3	4
Almost never	Occasionally	Often	Almost Always

In general.....

Response
(1 to 4)

- | | | |
|-------|-----|---|
| _____ | 1. | My heart beats fast |
| _____ | 2. | My muscles are tense |
| _____ | 3. | I feel agonized over my problems |
| _____ | 4. | I think that others won't approve of me |
| _____ | 5. | I feel like I'm missing out on things because I can't make up my mind soon enough |
| _____ | 6. | I feel dizzy |
| _____ | 7. | My muscles feel weak |
| _____ | 8. | I feel trembly and shaky |
| _____ | 9. | I picture some misfortune |
| _____ | 10. | I can't get some thought out of my mind |
| _____ | 11. | I have trouble remembering things |
| _____ | 12. | My face feels hot |
| _____ | 13. | I think that the worst will happen |

- _____ 14. My arms and legs feel stiff
- _____ 15. My throat feels dry
- _____ 16. I keep busy to avoid uncomfortable thoughts
- _____ 17. I cannot concentrate without irrelevant thoughts intruding
- _____ 18. My breathing is fast and shallow
- _____ 19. I worry that I cannot control my thoughts as well as I would like to
- _____ 20. I have butterflies in the stomach
- _____ 21. My palms feel clammy

Ree, M. J., French, D., MacLeod, C., & Locke, V. (2008). Distinguishing cognitive and somatic dimensions of state and trait anxiety: Development and validation of the State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA). *Behavioural and Cognitive Psychotherapy*, 36, 313-332.

Attentional Control Scale (ACS)

Instructions: This survey consists of a number of statements that describe attention or concentration. Read each statement and then mark the answer to the right that best describes how much or how often that statement applies to you in general. Use the following scale:

1	2	3	4
Almost never	Sometimes	Often	Always

Response
(1 to 4)

- | | | |
|-------|-----|---|
| _____ | 1. | It's very hard for me to concentrate on a difficult task when there are noises around. |
| _____ | 2. | When I need to concentrate and solve a problem, I have trouble focusing my attention. |
| _____ | 3. | When I am working hard on something, I still get distracted by events around me. |
| _____ | 4. | My concentration is good even if there is music in the room around me. |
| _____ | 5. | When concentrating, I can focus my attention so that I become unaware of what's going on in the room around me. |
| _____ | 6. | When I am reading or studying, I am easily distracted if there are people talking in the same room. |
| _____ | 7. | When trying to focus my attention on something, I have difficulty blocking out distracting thoughts. |
| _____ | 8. | I have a hard time concentrating when I'm excited about something. |
| _____ | 9. | When concentrating I ignore feelings of hunger or thirst. |
| _____ | 10. | I can quickly switch from one task to another. |
| _____ | 11. | It takes me a while to get really involved in a new task. |

- _____ 12. It is difficult for me to coordinate my attention between the listening and writing required when taking notes during lectures.
- _____ 13. I can become interested in a new topic very quickly when I need to.
- _____ 14. It is easy for me to read or write while I'm also talking on the phone.
- _____ 15. I have trouble carrying on two conversations at once.
- _____ 16. I have a hard time coming up with new ideas quickly.
- _____ 17. After being interrupted or distracted, I can easily shift my attention back to what I was doing before.
- _____ 18. When a distracting thought comes to mind, it is easy for me to shift my attention away from it.
- _____ 19. It is easy for me to alternate between two different tasks.
- _____ 20. It is hard for me to break from one way of thinking about something and look at it from another point of view.

Derryberry, D., & Reed, M. A. (2002). Anxiety-related attentional biases and their regulation by attentional control. *Journal of Abnormal Psychology, 111*, 225-236.

Behavior Rating Inventory of Executive Function- Adult version (BRIEF-A)

Instructions: During the past month, how often has each of the following behaviors been a *problem*?

0
Never

1
Sometimes

2
Often

Response
(0 to 2)

- | | |
|-------|--|
| _____ | 1. I have angry outbursts |
| _____ | 2. I make careless errors when completing tasks |
| _____ | 3. I am disorganized |
| _____ | 4. I have trouble concentrating on tasks (such as chores, reading, or work) |
| _____ | 5. I tap my fingers or bounce my legs |
| _____ | 6. I need to be reminded to begin a task even when I am willing |
| _____ | 7. I have a messy closet |
| _____ | 8. I have trouble changing from one activity or task to another |
| _____ | 9. I get overwhelmed by large tasks |
| _____ | 10. I forget my name |
| _____ | 11. I have trouble with jobs or tasks that have more than one step |
| _____ | 12. I overreact emotionally |
| _____ | 13. I don't notice when I cause others to feel bad or get mad until it is too late |
| _____ | 14. I have trouble getting ready for the day |
| _____ | 15. I have trouble prioritizing activities |

- _____ 16. I have trouble sitting still
- _____ 17. I forget what I am doing in the middle of things
- _____ 18. I don't check my work for mistakes
- _____ 19. I have emotional outbursts for little reason
- _____ 20. I lie around the house a lot
- _____ 21. I start tasks (such as cooking, projects) without the right materials
- _____ 22. I have trouble accepting different ways to solve problems with work, friends, or tasks
- _____ 23. I talk at the wrong time
- _____ 24. I misjudge how difficult or easy tasks will be
- _____ 25. I have problems getting started on my own
- _____ 26. I have trouble staying on the same topic when talking
- _____ 27. I get tired
- _____ 28. I react more emotionally to situations than my friends
- _____ 29. I have problems waiting my turn
- _____ 30. People say that I am disorganized
- _____ 31. I lose things (such as keys, money, wallet, homework, etc.)
- _____ 32. I have trouble thinking of a different way to solve a problem when stuck
- _____ 33. I overreact to small problems
- _____ 34. I don't plan ahead for future activities
- _____ 35. I have a short attention span
- _____ 36. I make inappropriate sexual comments
- _____ 37. When people seem upset with me, I don't understand why

- _____ 38. I have trouble counting to three
- _____ 39. I have unrealistic goals
- _____ 40. I leave the bathroom a mess
- _____ 41. I make careless mistakes
- _____ 42. I get emotionally upset easily
- _____ 43. I make decisions that get me into trouble (legally, financially, socially)
- _____ 44. I am bothered by having to deal with changes
- _____ 45. I have difficulty getting excited about things
- _____ 46. I forget instructions easily
- _____ 47. I have good ideas but cannot get them on paper
- _____ 48. I make mistakes
- _____ 49. I have trouble getting started on tasks
- _____ 50. I say things without thinking
- _____ 51. My anger is intense but ends quickly
- _____ 52. I have trouble finishing tasks (such as chores, work)
- _____ 53. I start things at the last minute (such as assignments, chores, tasks)
- _____ 54. I have difficulty finishing a task on my own
- _____ 55. People say that I am easily distracted
- _____ 56. I have trouble remembering things, even for a few minutes (such as directions, phone numbers)
- _____ 57. People say that I am too emotional
- _____ 58. I rush through things
- _____ 59. I get annoyed

- _____ 60. I leave my room or home a mess
- _____ 61. I get disturbed by unexpected changes in my daily routine
- _____ 62. I have trouble coming up with ideas for what to do with my free time
- _____ 63. I don't plan ahead for tasks
- _____ 64. People say that I don't think before acting
- _____ 65. I have trouble finding things in my room, closet, or desk
- _____ 66. I have problems organizing activities
- _____ 67. After having a problem, I don't get over it easily
- _____ 68. I have trouble doing more than one thing at a time
- _____ 69. My mood changes frequently
- _____ 70. I don't think about consequences before doing something
- _____ 71. I have trouble organizing work
- _____ 72. I get upset quickly or easily over little things
- _____ 73. I am impulsive
- _____ 74. I don't pick up after myself
- _____ 75. I have problems completing my work

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