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An Empirical Investigation of Emotional Reactivity and Elevated Mental contamination: a Comparison of Sexual and Physical Assault

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AN EMPIRICAL INVESTIGATION OF EMOTIONAL REACTIVITY AND ELEVATED MENTAL CONTAMINATION: A COMPARISON OF SEXUAL AND PHYSICAL ASSAULT

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ABSTRACT

Although evidence suggests that disgust and disgust-related phenomena such as mental contamination should be associated with the experience of sexual assault, there has been relatively little direct examination of this relation. Consequently, the primary aim of the current study was to conduct a multimodal assessment of disgust and mental contamination-based reactivity to an individualized script-driven imagery procedure. Participants included 27 sexually assaulted, 25 physically assaulted, and 30 non-traumatized control female adults. Subjective reactivity (i.e., ratings of disgust, anxiety, feelings of dirtiness, and urges to wash), physiological reactivity (i.e., electromyogram activity of the *levator labii superioris and* right *medial frontalis* regions) and behavioral responding (i.e., hand washing) were assessed following the presentation of both a neutral and traumatic event script (stressful script for the control group). It was hypothesized that sexually assaulted women would demonstrate elevations in subjective, physiological, and behavioral indices of disgust and mental contamination-based reactivity to the traumatic event script relative to the physical assault and control groups. It was further hypothesized that both assault groups would respond with comparably elevated levels of subjective anxious reactivity (i.e., ratings of anxiety) as compared to the non-traumatized control group. Theoretical and practical implications as well as directions for future research are discussed.

This thesis is approved for recommendation to the Graduate Council

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Introduction

Tragically, sexual assault is a relatively common experience in the United States. According to the most recent National Crime Victimization Survey (2006), there were over 300,000 incidences of sexual assault in one year alone. Conservative epidemiological estimates suggest that lifetime prevalence of sexual assault ranges from 7% to 22% among females (Burnam et al., 1988; Koss, 1993; Koss, Gidyez, & Wisniewski, 1987; Michael, Gagnon, Lauman, & Kolata, 1994; Norris, 1992; Resnick, Kilpatrick, Dansky, Saunders, & Best, 1993; Tjaden & Thoennes, 1998) and 1% to 9% among males (Burnam et al., 1988; Desai, Arias, Thompson, & Basile, 2002; Michael et al., 1994; Pimlott-Kubiak & Cortina, 2003; Tjaden & Thoennes, 1998). Sexual assault has been linked to a number of deleterious physical and psychological outcomes. Sexual assault in both females (Golding, Cooper, & George, 1997) and males (Plant, Plant, & Miller, 2005) has been associated with poorer overall physical health as well as several specific physical maladies (e.g., chronic headaches, gastrointestinal disorders; Golding, 1999; Koss & Kilpatrick, 2001; Tewksbury, 2007). Relatedly, several studies have observed that women who have been sexually assaulted utilize more medical services than women who have not been sexually assaulted [see Ullman and Brecklin (2003) for a review].

In addition to the negative physical correlates of sexual assault, several immediate and chronic psychological consequences have been identified. Following the traumatic experience, individuals often report increased anxious, depressive, and somatic symptoms (Koss & Kilpatrick, 2001). The experience of sexual assault has also been associated with high rates of several psychiatric diagnoses, including posttraumatic stress disorder

(PTSD), major depressive disorder, and substance use disorders (Foa & Rothbaum, 1998).

Given the high prevalence and wide array of negative outcomes associated with sexual assault, research has begun to focus on understanding potential risk factors, correlates, and negative consequences of sexual assault. The study of peri- and posttraumatic emotional responding may be of particular relevance in understanding the experience and sequelae of sexual assault (e.g., Amstadter & Vernon, 2008; Bernat, Ronfeldt, Calhoun, & Arias, 1998; Breslau & Kessler, 2001; Brunet et al., 2001). Indeed, the *Diagnostic and Statistical Manual – Fourth Edition Text Revision* (DSM-IV-TR; American Psychiatric Association [APA], 2000) defines the experience of a traumatic event, in part, as including an emotional response to the event characterized by feelings of intense fear, helplessness, or horror. The study of fear-related emotional responding is central to many explanatory models of negative posttraumatic psychological outcomes including biological (e.g., Yehuda, McFarlane, & Shalev, 1998), information-processing (e.g., Foa & Rothbaum, 1998), and conditioning theories (e.g., Foa, Zinbarg, & Rothbaum, 1992) of PTSD. Although fear-responding has been a primary focus in this literature, recent findings suggest that a host of emotions including anger, sadness, and disgust-based emotions such as guilt, and shame may be important in understanding the traumatic experience (Amstadter & Vernon, 2008; Andrews, Brewin, Rose, & Kirk, 2000; Brewin, Andrews & Rose, 2000; Shin et al., 1999). In particular, disgust-related responding has remained a relatively underexplored area of research in relation to trauma. Given recent theoretical and empirical evidence that suggests disgust may hold particular

relevance in understanding the experience of sexual assault and related sequelae, it will be the focus of the current investigation.

Disgust

Disgust has been defined as a rejection or revulsion response aimed at removing oneself from the presence of a potential contaminant (Davey, 1994; Olatunji & Sawchuk, 2005; Rozin, Haidt, & McCauley, 2000). Disgust has been conceptualized as a basic emotion with characteristics that uniquely distinguish it from other negative emotions such as fear and sadness (Ekman, 1992; Izard, 2007; Olatunji & Sawchuk, 2005). At its most basic level, disgust, meaning literally "bad taste," functions through gustatory reactions, such as nausea and vomiting, to prevent the ingestion of harmful substances (Rozin et al., 2000; Woody & Teachman, 2000).

Rozin and colleagues (2000) argued that while disgust may have begun as an evolutionary protective factor related to food-rejection, other stimuli are now capable of evoking a similar reaction in humans. These stimuli are thought to fall into four distinct domains: core, animal-nature, interpersonal, and moral (Olatunji & Sawchuk, 2005; Rozin et al., 2000). Core disgust elicitors must be broadly conceptualized as orally ingestible, offensive in nature, and capable of contamination. These stimuli can include potentially harmful or offensive foods, biological waste products, and certain animals. Animal-nature disgust elicitors include stimuli that serve as reminders of our mortality and blur the line that differentiates us as humans from other animals. These can include unconventional or inappropriate sexual acts, body-envelope violations (e.g., gory injuries), poor hygiene, and material related to death or decay (Haidt, Rozin, McCauley, & Imada, 1997; Olatunji & Sawchuck, 2005; Rozin et al., 2000). Interpersonal disgust

reactions are thought to function as means of separating an individual from contamination that might result from the "strangeness, disease, misfortune, and moral taint" of other humans (Rozin et al., 2000; Rozin, Markwith, & McCauley, 1994). This type of disgust involves a concern of potential transmission of undesirable or polluting features of others, rather than distress associated with specific physical contaminants. Interpersonal disgust can be elicited through close proximity to an undesirable individual or object (e.g., wearing the sweater of a homeless man; Olatunji & Sawchuck, 2005; Rozin et al., 2000). Finally, the category of moral, or socio-moral disgust as it is often referred, is defined as a reaction to violations of culturally influenced subjective beliefs about morality. Examples of common moral/socio-moral disgust concerns include rape, genocide, hypocrisy, racism, and exploitation. (Rozin et al., 2000; Simpson, Carter, Anthony, & Overton, 2006). It has been suggested that other emotions such as anger and contempt may also be involved in emotional responses to socio-moral disgust-related material (Olatunji, Forsyth, & Cherian, 2007).

Power and Dalgleish (1997) proposed a framework for understanding how these seemingly different emotion domains might have evolved. According to their model, emotional reactions can be elicited in two ways. First, disgust reactions may be evoked through an automatic process whereby emotional associations are triggered by the features of the stimuli (e.g., noxious smell). Core and animal-nature disgust-related responses may map on well to this conceptual pathway. Furthermore, disgust responses may also form, according to this model, through the subjection of stimuli to existing cognitive schemas. In this case, resulting emotional responses may be reflected through a series of cognitive appraisals. Given the subjective social and moral components of

interpersonal and moral disgust domains, it has been suggested that these types of disgust may be influenced by this second pathway (e.g., Olatunji & Sawchuck, 2005; Simpson et al., 2006). In one empirical test of this hypothesis, Simpson and colleagues (2006) found in a sample of students that disgust reactivity decreased over repeated exposure to core disgust pictures (e.g., vomit, cockroaches), but increased with repeated exposure to socio-moral disgust pictures (e.g., ethnic cleansing, racial violence). This finding supports the proposition of different underlying mechanisms in disgust generation.

Sexual Assault and Disgust

Sexual assault may evoke disgust responses that incorporate several, if not all, of these disgust domains. Although relatively little is known about the role of disgust in sexual assault, researchers have begun to explore this issue. For example, in response to reminders of childhood sexual abuse, women with PTSD report significantly elevated disgust reactivity relative to those without PTSD (Shin et al., 1999), suggesting a potential role for disgust in the maintenance of PTSD following sexual trauma. However, very few studies have explored the possibility of a unique association of disgust among sexual trauma relative to other traumatic events. In a study of peritraumatic disgust responding, Feldner, Frala, Badour, Leen-Feldner, & Olatunji (2010) asked either physically or sexually assaulted adolescents to report retrospectively on the intensity of fear, helplessness, and disgust they felt during the assault. Not surprisingly, the two groups both reported high levels of fear and helplessness, but sexually assaulted adolescents were six times more likely to endorse the presence of disgust during their sexual assault. Those in the sexual assault group also reported significantly more intense disgust during the assault. Furthermore, within-subject analyses of individuals who

reported both sexual and physical assault suggested greater disgust and fear during sexual as compared to physical assault.

In a similar study, Amstadter and Vernon (2008) asked adult participants to retrospectively report on peritraumatic and immediate posttraumatic emotional experiences, and compared these responses across traumatic event types (i.e., sexual assault, physical assault, transportation accident, and severe illness/injury). Although disgust was not expressly measured in this study, feelings of guilt and shame, which have been conceptualized as forms of inward-focused disgust (Barret, Zahn-Waxler, & Cole, 1993; Power & Dalgleish, 1997), were recorded. Sexual assault survivors reported significantly greater peri- and posttraumatic guilt as well as greater increases in shame and anger following the assault as compared to all other traumatic event types. However, no significant differences emerged in the level of fear experienced either during or after the traumatic event.

In the first study to compare real-time traumatic event-relevant disgust reactivity across traumatic event types, Badour and colleagues (in press) found that as compared to individuals with non-interpersonally-relevant traumatic experiences (e.g., motor vehicle accidents, disasters), individuals with a history of traumatic interpersonal violence (i.e., sexual or physical assault) responded with increased disgust when exposed to reminders of their traumatic event. However, this study did not directly compare disgust reactivity between sexually and physically assaulted individuals.

Sexual Assault and Mental Contamination

Researchers have also begun to explore the importance of other disgust-related feelings and behaviors that frequently manifest after a sexual assault. Rachman (2004;

2006) has proposed the existence of contamination concerns to account for feelings of dirtiness, urges to wash, and other related phenomena commonly experienced after sexual assault. Broadly, contamination, as defined by Rachman (2004), is "…an intense and persisting feeling of having been polluted or infected or endangered as a result of contact, direct or indirect with a person/place/object that is perceived to be soiled, impure, infectious, or harmful" (p. 1229). Contamination concerns have been conceptualized in two ways. First, contact contamination is linked to an external physical pollutant or contagion (e.g., dirt, vomit) that is easily spread and can typically be alleviated or removed through cleaning or washing procedures (Rachman, 2004, 2006). However, the type of contamination concerns experienced by many sexual assault victims often center around perceptions of internal dirtiness and an inability to remove the source of pollution. This unique type of contamination, termed "mental pollution" or "mental contamination" is thought to draw heavily upon moral concerns. Several emotions have been proposed to be involved in contributing to these concerns including fear, disgust, anger, guilt, and shame. Mental contamination, unlike traditional contact contamination, can occur in the absence of physical contact with a contagion or pollutant, is dominated by internal rather than external perceptions of dirtiness, and is unaffected by attempts to clean or wash (Fairbrother & Rachman, 2004; Herba & Rachman, 2007; Rachman, 2004, 2006).

It is plausible that sexual assault is related to both contact and mental contamination concerns. Feldner and colleagues (2010) suggest that the immediate emotional experience of sexual assault, which likely includes components of both fear and disgust, may lead to a conditioning of contamination fears via direct physical contact with undesired disgust-eliciting pollutants (i.e., attacker, biological contaminants).

Furthermore, given the inherent moral and psychological violations that occur during sexual assault, it is plausible that feelings of mental contamination (e.g., persistent feelings of dirtiness, moral taint) may also be conditioned during and following this experience (Herba & Rachman, 2007; Rachman, 2006). Recent research in this domain is consistent with this idea.

Case studies of sexually assaulted women have documented intrusive feelings of dirtiness and compulsive urges to wash (De Silva & Marks, 2001; Gershuny, Baer, Radomsky, Wilson, & Jenike, 2003). Consistent with these reports, Fairbrother and Rachman (2004) found that 70% of female sexual assault victims reported urges to wash, with 95% of these experienced within 24 hours of the assault. Of those who experienced urges to wash, 25% continued to experience urges for several months following the assault. Furthermore, sexually assaulted women reported that generating a memory or image of the worst part of their assault elicited significantly greater feelings of anxiety, distress, dirtiness, and urges to wash as compared to when generating a pleasant memory or image.

Additional evidence has recently emerged that is consistent with the postulation that sexual assault is likely to be associated with mental contamination. Rachman (2004) suggested mental contamination concerns may be reactivated by intangible mental events such as memories or images. One study found that sexual assault-related feelings of mental contamination could be generated independent of physical contact in a group of female students via an imagined non-consensual kiss scenario (Fairbrother, Newth, & Rachman, 2005). Participants in this study were exposed to an audio taped script that described a scenario involving a non-consensual kiss with an undesirable man. As

compared to participants exposed to a similar consensual kiss scenario, those in the non-consensual condition reported higher levels of distress, shame, and immorality; as well as feelings of dirtiness, cheapness, and urges to wash. In a related study, Herba and Rachman (2007) replicated this procedure by presenting either a consensual or non-consensual kiss scenario to groups of female students with and without a history of unwanted sexual contact. Histories of unwanted sexual contact were defined as any non-consensual sexual activity ranging from undesired touching, kissing, or fondling to forced intercourse. Following the script, approximately 20% of the total sample reported drinking to reduce physical sensations or washing to reduce feelings of dirtiness. Consistent with previous findings, significantly greater feelings of dirtiness and urges to wash were reported in the non-consensual condition regardless of sexual history. However, prior unwanted sexual contact predicted a higher level of actual washing behavior following exposure to the nonconsensual script,

Researchers have also begun to explore the relation between feelings of mental contamination following sexual assault and posttraumatic stress symptoms. For example, in a sample of sexually assaulted women, Fairbrother and Rachman (2004) found that scores on questionnaire-based mental contamination scales were positively correlated with both self-report and interviewer measures of PTSD symptom severity. Consistent with these findings, Olatunji, Elwood, Williams, and Lohr (2008) found a significant relation between mental contamination and PTSD symptoms even when controlling for symptoms of anxiety and depression. Furthermore, this relation was mediated by negative posttraumatic cognitions about the self and world as well as self-blame. The authors interpreted these findings as preliminary evidence that feelings of mental contamination

may work through negative or maladaptive cognitions to maintain PTSD symptoms in sexual assault survivors.

Current Study

Taken together, theoretical and empirical work suggests that disgust and related cognitive-behavioral phenomena, in particular mental contamination, may be important for understanding peri- and post-traumatic responding to sexual assault. Although the bulk of theoretical work has linked disgust and mental contamination specifically to sexual assault, to date there have been no controlled empirical tests to determine whether this relation is specific to traumatic experiences that are sexual in nature. Therefore, one goal of the current study was to examine the specificity of disgust- and mental contamination-related responding to an individualized traumatic event-related script driven imagery procedure among sexually assaulted participants as compared to physically assaulted and non-traumatized control participants. The inclusion of a non-traumatized control group provides evidence that hypothesized findings are due to traumatic experiences, specifically, as opposed to generally stressful events. Moreover, given the shared interpersonal violation inherent to both sexual and physical assault, the inclusion of a group of physically assaulted participants should provide a particularly conservative test of the specificity of disgust-related responding to sexual assault relative to other types of traumatic experiences.

This study employed an individualized script-driven imagery procedure, as opposed to the standardized script procedures used in this area previously (Fairbrother et al., 2005; Herba & Rachman, 2007). This method stands to uniquely add to our

understanding of the relation between disgust reactivity and cues of sexual assault per se, as opposed to unwanted sexual advances generally.

Accordingly, the primary hypotheses of the current study were as follows: in response to an individualized script driven imagery procedure, participants in the sexual assault group, as compared to the physical assault and non-traumatized control groups, should react with 1) greater increases in subjective disgust and mental contamination concerns: self-report ratings of a) disgust, b) feelings of dirtiness, and c) urges to wash), 2) increased physiological reactivity associated with disgust reactivity: a) greater EMG activation of the *levator labii superioris* (Chapman, Kim, Susskind, & Anderson, 2009; Vrana, 1993), b) increased balance in the ratio indicating predominance of EMG activity of the *levator labii superioris* relative to activity of the *medial frontalis* (signaling physiological activation associated with both disgust and fear), and 3) increased washing behavior. To evaluate the specificity of the relation between disgust and sexual assault, anxious reactivity was also examined. Specifically, it was hypothesized that the sexual and physical assault groups would evidence (comparably) greater anxious reactivity to the script procedure as indexed by a) greater increases in subjective anxiety (i.e., self-report anxiety ratings), and b) greater physiological reactivity associated with anxiety (i.e., activity of the *medial frontalis;* Ekman & Friesen, 1978; Smith, 1989) as compared to the non-traumatized control group. Finally, expected group differences in emotional reactivity should be specific to the traumatic/stressful event script (cf., neutral).

Method

Participants

The sample consisted of 82 female adults (i.e., at least 18 years old) recruited

through the University of Arkansas and the local Northwest Arkansas community. Participants were divided into three groups based on self-reported history of traumatic event exposure. The sexual assault group (n = 27) included persons endorsing an index traumatic sexual assault experience meeting criterion A of the DSM-IV-TR (APA, 2000) diagnosis for PTSD (i.e., exposure to an event characterized by perceived threat of death or serious injury that is accompanied by a response of extreme fear, helplessness, or horror), and denying a history of physical assault. Participants were included in the physical assault group (n = 25) based on endorsing an index traumatic physical assault and denying a traumatic sexual assault history. Participants were included in the non-traumatized control group (n = 30) if they denied directly experiencing or witnessing any traumatic event during their lifetime.

Measures

Posttraumatic Diagnostic Scale (PDS). The PDS (Foa, Cashman, Jaycox, & Perry, 1997) is a 49-item questionnaire-based measure designed to assess DSM-IV (American Psychiatric Association [APA], 1994)-defined traumatic event exposure as well as severity of posttraumatic stress symptoms. The PDS can be used as a dichotomous index of PTSD presence or absence as well as a continuous index of symptomatology. Further, the PDS can be used to calculate indices of symptom severity within each of the three DSM-IV-TR-defined PTSD symptom clusters (i.e., reexperiencing, avoidance/numbing, and hyperarousal; APA, 2000). The PDS has been recommended for use in research settings due to its strong psychometric properties (Foa, et al., 1997). Consistent with Criterion A of the DSM-IV-TR definition of PTSD, respondents indicate whether they have experienced any of 12 potentially traumatic

events and identify which event was the most distressing, as well as indicate whether they experienced 1) threat to self or others and 2) helplessness or terror. Respondents then rate the frequency with which they have experienced each of 17 symptoms of PTSD within the past month on a 4-point Likert-type scale (0 = *not at all, or only one time* to 3 = *five or more times a week/almost always*). The first portion of the PDS was used in the current study as an initial index of self-reported traumatic event exposure.

Clinician-Administered PTSD Scale for DSM-IV (CAPS). The CAPS (Blake et al., 1995) is a well-established semi-structured interview that provides an index of DSM-IV (APA, 1994)-defined traumatic event exposure. The CAPS also provides a measure of frequency and intensity of 17 PTSD symptoms, as well as a dichotomous index of PTSD diagnosis. The CAPS has excellent psychometric properties including both convergent and discriminant validity, adequate test-retest and interrater reliability, and internal consistency (Weathers, Keane, & Davidson, 2001) and is considered a gold standard of PTSD assessment. A trained graduate-level researcher administered all interviews. Training in the administration of the CAPS was delivered by a certified trainer in the interview and included 1) reading published material associated with the administration, scoring and psychometrics of the CAPS, 2) formal didactic training in the administration of the CAPS, 3) observing the CAPS administered, and 4) administering the CAPS under the direct supervision of a clinical psychologist trained in the administration of the interview. Reliability checks of 15% of interviews administered yielded 100% diagnostic agreement. For the purposes of the current study, a PTSD symptom severity score was computed by summing the frequency and intensity scores obtained for the 17 symptoms on the CAPS. Additionally, diagnostic status was obtained using scoring rules

recommended by Weathers, Ruscio, and Keane (1999). Symptom information was collected in relation to participants' self-identified most stressful, but non-traumatic, event among those in the control group.

Positive and Negative Affect Schedule (PANAS). The PANAS (Watson, Clark, & Tellegen, 1988) is a 20-item self-report measure that provides an index of the extent to which individuals typically experience different feelings and emotions. Factor analysis of the PANAS supports the existence of two-dimensional measures: negative and positive affectivity. Evaluation of this instrument has demonstrated that it evidences adequate discriminant and convergent validity as well as high internal consistency (Watson et al., 1988). A large number of studies have provided support for the validity of the measure (see Watson, 2000). The 10-item negative affect subscale of the PANAS was used in the current study to provide an index of general negative affect.

Subjective Units of Distress Scale (SUDS). Ratings of change in self-reported disgust and anxiety elicited by the script-driven imagery procedure (i.e., reactivity) were assessed using the SUDS (Wolpe, 1958). Participants were asked to report levels of disgust and anxiety immediately preceding and following the presentation of each of the scripts. Ratings were made by drawing a single vertical mark on each of two separate visual analogue scales. The scales consisted of 100 mm lines anchored at either end (*no anxiety*/*no disgust* to *extreme anxiety*/*extreme disgust*). The distance between the no anxiety/disgust anchor and the mark generated by the participant were measured to create ratings between 0 and 100 for each emotion. The use of SUDS ratings to index emotional responding has been well established in prior research using script-driven imagery

procedures (e.g., Orr et al., 1998; Pitman et al., 1987). Self-reported vividness of each script was also obtained using this method (*not at all vivid/extremely vivid*).

The Mental Contamination Report. Ratings of changes in perceived dirtiness and urges to wash in response to the script-driven imagery procedure (i.e., reactivity) were measured using the Mental Contamination Report (Herba & Rachman, 2007). This four-item self-report measure asks respondents to rate the degree to which they currently feel dirty and have urges to participate in each of five washing behaviors. Ratings of dirtiness were assessed on a five-item Likert-type scale indicating the degree to which an individual feels dirty or unclean (*not at all* to *very much*). Using the same scale, participants rated the degree to which they experienced an urge to engage in five washing behaviors including 1) *rinse mouth/spit/drink something*, 2) *brush teeth/use mouthwash*, 3) *wash my face*, 4) *wash my hands*, and 5) *take a shower*. An average of ratings on these five items comprise an index of urges to wash. Good internal consistency was established among the five washing behavior items ($\alpha = .89$; Herba & Rachman, 2007). The Mental Contamination Report was administered prior to and following each script.

Physiological measures. A J&J Engineering I-330-C2 system was used to digitally record physiological data on-line at a sample rate of 1024 samples per second across all channels using J&J Engineering Physiolab Software. Facial electromyography (EMG) activity was recorded over the right *levator labii superioris* and right *medial frontalis* regions using two disposable Ag/AgCl electrodes placed bipolar on the lines. These muscles were chosen because of previous associations as physiological markers of disgust (involved in the curling of the lip; Chapman et al., 2009; Vrana, 1993) and fear (involved in raising of the forehead/brow; Ekman & Friesen, 1978; Smith, 1989),

respectively. Three EMG measures were assessed: 1) change in frontalis EMG activity, 2) change in levator labii EMG activity, and 3) according to published procedures (Ribeiro, Teixeira-Silva, Pompéia, & Bueno, 2007), a predominance of EMG reactivity score was calculated by subtracting the mean baseline to post-script change in levator labii activity from the mean baseline to post-script change in frontalis activity with a negative difference score indicating predominance of levator labii activity and a positive difference score indicating predominance of frontalis activity. Cleaning of the skin with an alcohol swab to reduce inter-electrode impedance preceded placement of all electrodes.

Behavioral measures. Participant washing behavior, as indexed by experimenter-observed hand washing (yes/no), was assessed after completing the script-driven imagery procedure and removal of physiological monitoring electrodes. Participants then completed the Reasons for Washing Index, a questionnaire designed for the current study based on prior research examining mental contamination (Herba & Rachman, 2007). The Reasons for Washing Index asks respondents to indicate (yes/no) to the following question: *Did you wash your hands?* Respondents who reported washing were then asked to describe in an open-ended fashion why they washed. Finally, participants were asked to check all that applied from the following close-ended reasons for washing: *To clean off electrode gel, Because I felt dirty,* and *I'm not sure why*.

Procedure

Female participants were recruited from the University of Arkansas as well as from the greater Northwest Arkansas community using electronic and paper flyers as well as media advertisements. Interested females were given instructions to contact the

Intervention Sciences Laboratory where a preliminary screening for eligibility was conducted over the telephone. Women deemed potentially eligible upon the initial phone screening were invited to the laboratory.

All laboratory procedures were conducted in a 12' x 14' experimental room in the Department of Psychology. This room contained a chair, desk, computer, and audio recorder. The experimenter was located in an adjacent room. An intercom system and closed-circuit surveillance system were in place to allow for monitoring and communication between the experimenter and participant. During the laboratory session, participants were informed of any potential risks associated with the study (e.g., temporary psychological distress associated with the script-driven imagery procedure) and written informed consent was provided. Participants then completed a screening battery that included demographic information and the PDS to identify participants' traumatic event exposure history. A graduate researcher trained in administration of the interview then administered the CAPS. Individuals identified as ineligible at this time were thanked, debriefed, and compensated $10 for completing the initial portion of the study.

Script development. Eligible participants were then seated in a quiet room where they were asked, in concert with the experimenter, to generate two scripts based on autobiographical experiences. Script content included a description of one neutral experience (e.g., a trip to the grocery store) as well as the traumatic experience discussed during the CAPS. Participants in the non-traumatized control group generated a script of their single most stressful life event, rather than of a traumatic event. Examples of stressful experiences among the control group included termination of an intimate

relationship, moving, and being pulled over by police. Specific procedures for script development followed those described in previous work (e.g., Lang, Levin, Miller, & Kozak, 1983; Pitman et al., 1987). Per published procedures (e.g., Pitman et al., 1987), a checklist of specific bodily sensations (e.g., racing heart) were administered to participants during the script generation period to assist in identifying sensations present during the event and incorporating them into the scripts. Upon finishing the written scripts, participants were asked to complete a self-report questionnaire battery that included the PANAS and other measures not relevant to the current manuscript. During this time, the experimenter left the room to create an audio recording of the scripts to be used during the script-driven imagery procedure.

Script-driven imagery procedure. Participants were fitted with the physiological recording equipment, during which time the experimenter explained electrode placement procedures to minimize participant discomfort. The imagery procedure began with a ten-minute quiet resting period. Each participant then completed a pre-script two-min baseline self-report assessment, which included SUDS ratings for anxiety and disgust as well as the Mental Contamination Report. Following this, participants were presented with another 30-sec quiet baseline period followed by the presentation of the neutral script (30-sec), a 30-sec imaginal rehearsal period in which participants were instructed to continue imagining the scene as vividly as possible, and a 30-sec recovery period. Participants then completed a two-min post-script self-report report assessment period that included administration of anxiety and disgust SUDS, script vividness ratings, and the Mental Contamination Report. The identical procedure was

completed again for the traumatic/stressful script beginning with a second pre-script two-min baseline self-report assessment period.

Washing behavior. Following the script-driven imagery procedure, the experimenter entered the participant room and removed all physiological monitoring equipment. Participants were made aware of available facial tissue, paper towels and a sink to wash if they desired. Washing behavior, as defined by hand washing (yes/no), was recorded by the experimenter. Participants were instructed to notify the experimenter when they were ready to continue. Participants then completed the Reasons for Washing Index.

Debriefing and compensation. At this point, participants were debriefed regarding all study procedures and thanked for their time. Referral information was provided to participants for local women's shelters, rape crisis centers, and general mental health services. Participants were compensated $30 for their time.

General Data Analytic Approach

Descriptive analyses. Zero-order correlations among all relevant factors were examined. Groups were then compared in terms of theoretically relevant covariates including age, PTSD symptoms, negative affect, and ratings of vividness for each of the scripts in the script-driven imagery task. Demographic and task-relevant variables observed to differ between groups in the descriptive analyses were examined for appropriateness to include as additional covariates in the primary analyses (i.e., age, script vividness). Furthermore, given the inclusion of the non-traumatized control group, differences among groups in terms of traumatic event-relevant (and potentially affective) variables were to be expected. Specifically, the sexual and physical assault groups were

expected to endorse higher levels of PTSD symptom levels and negative affect as compared to the non-traumatized control group. However, since these variables are characteristic and defining features of the groups, they were determined a priori to be inappropriate covariates for an analysis comparing all three groups (Miller & Chapman, 2001).

Primary hypothesis testing. Hypotheses were analyzed via univariate, as opposed to multivariate, analyses because self-report and physiological indices of emotion often display desynchronous response patterns during laboratory-based experiments (for a discussion see Hodgson & Rachman, 1974; Larsen & Prizmic-Larsen, 2006). In order to demonstrate that hypothesized group differences were specific to traumatic event-relevant responding as opposed to generally elevated affective responding, group differences in subjective and physiological reactivity were examined in response to the neutral script as well as the traumatic/stressful scripts. Unless otherwise noted, all reported mean values were adjusted for the influence of covariates, and significance was evaluated at $\alpha = .05$. Magnitude of between-group effect sizes (η^2) were interpreted according to guidelines recommended by Cohen (1988; small $\eta^2 \approx .01$, medium $\eta^2 \approx .06$, large $\eta^2 \approx .14$).

Results

Descriptive Statistics

Zero-order correlations were examined and due to the size of the correlation matrix, selected correlations are summarized in Table 1. Group differences among continuous variables were assessed using one-way ANOVA analyses. As expected, groups differed in terms of PTSD symptoms [$F(2, 79) = 18.72$, $p < .001$] and negative

affect [$F(2, 77) = 9.08, p < .001$]. Post-hoc comparisons using Bonferroni corrections for multiple comparisons revealed that consistent with expectations, the control group demonstrated significantly lower PTSD symptoms relative to the sexual ($p < .001$) or physical assault ($p < .001$) groups. The control group also demonstrated significantly lower negative affect as compared to the physical assault group ($p < .001$), but no differences emerged on this factor between the control and sexual assault groups. The two traumatic event-exposed groups did not differ in PTSD symptom level or negative affect. There no group differences in age [$F(2, 79) = .86, ns$]. Chi-square analyses revealed no significant differences in proportion of individuals meeting diagnostic criteria for PTSD in the two assault groups [$X^2 (1, N=52) = 1.16, ns$]. Table 2 includes descriptive information for each of these factors as well as other relevant demographic information.

Vividness of Scripts

Ratings of image vividness did not differ among groups in terms of either the neutral [$F(2, 74) = .81, ns$] or traumatic/stressful script [$F(2, 75) = 1.12, ns$]. As such script vividness was not included as a covariate in the primary hypothesis tests.

Primary Hypotheses: Subjective Reactivity to the Script-Driven Imagery Procedure

Specific analytic approach. Two approaches were taken to examine primary hypotheses regarding subjective emotional reactivity. First, group differences among the sexual assault, physical assault, and control groups in change in self-report measures (i.e., anxiety ratings, disgust ratings, feelings of dirtiness, urges to wash) in response to both the neutral and the traumatic/stressful scripts were examined in independent analyses covariance (ANCOVAs). In each of these ANCOVA models baseline levels of the

outcome variable of interest was entered as a covariate to examine change in the dependent variable across time (Cohen, Cohen, West, & Aiken, 2003). Significant group differences were examined using Bonferroni corrected pairwise comparisons. Table 3 includes raw means and corresponding standard deviations as well as adjusted means and corresponding standard errors for all subjective outcome variables using this analytic approach.

Second, to examine the role of PTSD symptom severity and negative affect in predicting group differences in subjective reactivity to the script-driven imagery procedure, a second set of ANCOVAs was utilized repeating the previously described analyses with PTSD symptoms and negative affect added as additional covariates. Given that differences between the assault groups and the control group in terms of psychopathology-relevant measures would be expected to be essential features of the groups (Miller & Chapman, 2001), this second set of analyses examined group differences between the assault groups only. Comparisons between the sexual and physical assault groups were included to provide more conservative tests of the study hypotheses by examining whether group differences persist after accounting for variance associated with psychopathology-relevant variables. Table 4 includes adjusted means and corresponding standard errors for all subjective outcome variables using this analytic approach.

Anxiety. In relation to the neutral script, there was a significant association with baseline anxiety [$F(1, 75) = 49.00, p < .001, \eta^2 = .40$]; however, no significant between-group differences emerged [$F(2, 75) = .19, ns$]. In terms of the traumatic/stressful script, there was a significant association with baseline anxiety [$F(1, 77) = 40.95, p < .001, \eta^2 =$

.35]. However, contrary to hypotheses, no significant group differences [$F(1, 77) = 2.73$, *ns*]. This pattern is graphically depicted in Figure 1.

In the second set of analyses comparing the sexual and physical assault groups after controlling for PTSD symptoms and negative affect, baseline anxiety significantly predicted anxiety following the neutral script [$F(1, 43) = 18.60, p < .001, \eta^2 = .30$]; however, there were no significant effects of PTSD symptoms [$F(1, 43) = 1.22$, *ns*], negative affect [$F(1, 43) = 1.30$, *ns*], or group [$F(1, 43) = .14$, *ns*]. In relation to the traumatic event script, significant associations emerged for baseline anxiety [$F(1, 45) = 18.77, p < .001, \eta^2 = .29$] and PTSD symptoms [$F(1, 45) = 6.64, p < .05, \eta^2 = .13$], but associations with negative affect [$F(1, 45) = .79$, *ns*] and group [$F(1, 45) = .98$, *ns*] were not significant, suggesting that participants in the sexual and physical assault groups displayed comparable levels of anxious reactivity to the traumatic event script. These data are graphically depicted in Figure 2.

Disgust. In terms of disgust reactivity to neutral script, a significant association emerged for baseline disgust [$F(1, 75) = 22.78, p < .001, \eta^2 = .23$]; however, no significant between-group differences emerged [$F(2, 75) = .45$, *ns*]. In relation to the traumatic/stressful script, significant associations emerged for baseline disgust [$F(1, 76) = 6.54, p < .05, \eta^2 = .08$] and group [$F(2, 76) = 12.22, p < .001, \eta^2 = .24$]. As predicted, pairwise comparisons using Bonferroni correction procedures revealed that disgust reactivity was greater in the sexual assault group relative to the physical assault ($p < .05$) and control groups ($p < .001$). No differences emerged between the physical assault and control groups. This pattern is graphically depicted in Figure 3.

In the second set of analyses comparing the sexual and physical assault groups

after controlling for PTSD symptoms and negative affect, baseline disgust significantly predicted disgust following the neutral script [$F(1, 41) = 14.57, p < .001, \eta^2 = .26$]; however, there were no significant associations with PTSD symptoms [$F(1, 41) = 1.05$, *ns*], negative affect [$F(1, 41) = 1.76$, *ns*], or group [$F(1, 41) = .75$, *ns*]. In terms of the traumatic event script, after controlling for significant relations with baseline disgust [$F(1, 41) = 4.12, p < .05, \eta^2 = .09$], PTSD symptoms [$F(1, 41) = 11.34, p < .01, \eta^2 = .22$] and a non-significant association with negative affect [$F(1, 41) = .00$, *ns*], significant group differences emerged [$F(1, 41) = 15.40, p < .001, \eta^2 = .27$], such that the sexual assault group reported significantly more disgust reactivity to the traumatic event script than the physical assault group. This pattern is graphically depicted in Figure 4.

Feelings of dirtiness. In terms of changes in feelings of dirtiness in response to the neutral script, significant baseline feelings of dirtiness [$F(1, 69) = 49.44, p < .001, \eta^2 = .42$] emerged; however, there were no significant between-group differences. In terms of the traumatic/stressful script, after controlling for a significant association of baseline feelings of dirtiness [$F(1, 67) = 35.29, p < .001, \eta^2 = .16$] significant between-group differences emerged [$F(2, 67) = 6.40, p < .01, \eta^2 = .16$]. As predicted, pairwise comparisons using Bonferroni correction procedures revealed greater increases in feelings of dirtiness in the sexual assault group relative to the control group ($p < .01$); however, no differences emerged between the two assault groups. This pattern is graphically depicted in Figure 5.

In the second set of analyses comparing the sexual and physical assault groups after controlling for PTSD symptoms and negative affect, baseline feelings of dirtiness [$F(1, 39) = 35.35, p < .001, \eta^2 = .48$] and PTSD symptoms [$F(1, 39) = 4.05, p = .05, \eta^2 =$

.09] significantly predicted feelings of dirtiness following the neutral script. Associations with negative affect [$F(1, 39) = 3.66$, *ns*] and group [$F(1, 39) = 2.32$, *ns*] did not reach significance. In terms of reactivity to the traumatic event script, significant relations emerged for baseline feelings of dirtiness [$F(1, 39) = 16.16$, $p < .001$, $\eta^2 = .29$], PTSD symptoms [$F(1, 39) = 5.21$, $p = .05$, $\eta^2 = .12$], and group [$F(1, 39) = 4.71$, $p < .05$, $\eta^2 = .11$]. However, a significant association with negative affect was not found $F(1, 39) = .01$]. This pattern is graphically depicted in Figure 6.

Urges to wash. In terms of changes in urges to wash in response the neutral script, there was a significant association with baseline urges to wash [$F(1, 69) = 136.53$, $p < .001$, $\eta^2 = .66$]; however, no significant between-group differences emerged [$F(2, 69) = .45$, *ns*]. In relation to the traumatic/stressful script, after controlling for a significant association with baseline urges to wash [$F(1, 68) = 97.45$, $p < .001$, $\eta^2 = .59$] significant group differences emerged [$F(2, 68) = 6.83$, $p < .01$, $\eta^2 = .17$]. As predicted, pairwise comparisons using Bonferroni correction procedures revealed that increases in urges to wash were greater in the sexual assault group relative to the physical assault ($p < .05$) and control groups ($p < .01$). No differences emerged between the physical assault and control groups. This pattern is graphically depicted in Figure 7.

In the second set of analyses comparing the sexual and physical assault groups after controlling for PTSD symptoms and negative affect, baseline urges to wash [$F(1, 40) = 78.51$, $p < .001$, $\eta^2 = .66$] and negative affect [$F(1, 40) = 12.69$, $p < .01$, $\eta^2 = .24$] significantly predicted urges to wash following the neutral script; however, there were no significant associations with PTSD symptoms [$F(1, 40) = .11$, *ns*] or group [$F(1, 40) = .94$, *ns*]. In terms of the traumatic event script, after controlling for a significant

association of baseline urges to wash [$F(1, 38) = 15.65, p < .001, \eta^2 = .29$] and non-significant relations of PTSD symptoms [$F(1, 38) = 3.55, ns$] and negative affect [$F(1, 38) = .93, ns$], significant group differences emerged [$F(1, 38) = 8.61, p < .01, \eta^2 = .19$]. As predicted, the sexual assault group reported significantly greater increases in urges to wash following the traumatic event script as compared to the physical assault group. This pattern is graphically depicted in Figure 8.

Primary Hypotheses: Physiological Reactivity to the Script-Driven Imagery Procedure

Specific analytic approach. Group differences in reactivity of frontalis and levator labii EMG activity in response to a) the neutral script and b) the traumatic/stressful script were examined in the same way as the indices of subjective reactivity. Specifically, two sets of ANCOVAs were conducted to examine group differences 1) among the sexual assault, physical assault, and control groups and 2) between the sexual and physical assault groups while controlling for PTSD symptoms and negative affect. For these analyses, baseline EMG activity was defined as a 30-sec period following completion of the entire script-driven imagery procedure. This baseline period was selected (cf. pre-task baseline) in an effort to minimize the effects of expected elevations in physiological arousal associated with the anticipation of hearing a narrative of participants' traumatic/stressful event (Elzinga, Schmahl, Vermetten, van Dyck, & Bremner, 2003).

The predominance of EMG reactivity score was examined in two ways. First, the predominance of frontalis EMG reactivity as compared to levator labii EMG reactivity was compared to zero within each group to determine whether absolute (within-subject)

predominance in reactivity emerged in response to a) the neutral script and b) the traumatic/stressful script. This was conducted via a series of three one-sample *t*-tests (sexual assault, physical assault, control). Second, group differences among the sexual assault, physical assault, and control groups were then examined to assess relative (between-group) change in predominance of EMG reactivity to both scripts via an analysis of variance (ANOVA). Significant group differences were explored using Bonferroni corrected pairwise comparisons. Table 5 includes raw means and corresponding standard deviations as well as adjusted means and corresponding standard errors for all physiological outcome variables using this analytic approach.

A second set of analyses was conducted to examine the impact of PTSD symptoms and negative affect on 1) absolute (within-subject) predominance of frontalis EMG reactivity as compared to levator labii EMG reactivity (relative to zero) within the physical and sexual assault groups, by submitting adjusted means and standard errors to a one-sample *t*-test and 2) differences between the two assault groups in terms of relative change in the predominance of frontalis EMG activity and levator labii EMG activity to the neutral and traumatic event scripts. This second ANCOVA included PTSD symptoms and negative affect entered as covariates to determine whether group differences persist after accounting for variance associated with these psychopathology-relevant factors. Table 6 includes adjusted means and corresponding standard errors for all physiological outcome variables using this analytic approach.

Frontalis EMG activity. In terms of frontalis EMG reactivity during the neutral script, there was a significant association with baseline frontalis activity [$F(1, 54) = 166.87, p < .001, \eta^2 = .76$]; however, no significant between-group differences emerged

[$F(2, 54) = 0.51, ns$]. In relation to the traumatic/stressful script, there was again a significant association with baseline frontalis activity [$F(1, 55) = 480.67, p < .001, \eta^2 = .90$], but no significant between-group differences [$F(2, 55) = 1.26, ns$]. This pattern is graphically depicted in Figure 9.

In the second set of analyses comparing the sexual and physical assault groups after controlling for PTSD symptoms and negative affect, baseline frontalis activity significantly predicted activity during the neutral script [$F(1, 37) = 69.73, p < .001, \eta^2 = .65$]; however, there were no significant associations with PTSD symptoms [$F(1, 37) = 0.05, ns$], negative affect [$F(1, 37) = 2.82, ns$], or group [$F(1, 37) = 1.25, ns$] In terms of the traumatic event script, there were significant associations with baseline frontalis activity [$F(1, 38) = 203.38, p < .001, \eta^2 = .84$] and group [$F(1, 38) = 4.063, p = .05, \eta^2 = .08$] such that participants in the physical assault group displayed significantly greater frontalis reactivity as compared to the sexual assault group Associations with PTSD symptoms [$F(1, 38) = .15, ns$] and negative affect [$F(1, 38) = 3.51, ns$] did not reach significance. This pattern is graphically depicted in Figure 10.

Levator labii EMG activity. In terms of levator labii EMG reactivity during the neutral script, there was a significant association with baseline levator labii activity [$F(1, 54) = 945.93, p < .001, \eta^2 = .78$]; however, no significant between-group differences emerged [$F(2, 54) = .29, ns$]. In terms of the traumatic/stressful script, there was a significant association with baseline levator labii activity [$F(1, 56) = 527.38, p < .001, \eta^2 = .90$]. However, the group differences did not reach significance [$F(2, 56) = 2.88, ns$]. This pattern is graphically depicted in Figure 11.

In the second set of analyses comparing the sexual and physical assault groups

after controlling for PTSD symptoms and negative affect, baseline levator labii activity [$F(1, 37) = 215.51, p < .001, \eta^2 = .65$] significantly predicted activity following the neutral script; however, there were no significant associations with PTSD symptoms [$F(1, 37) = 0.05, ns$], negative affect [$F(1, 37) = 2.82, ns$], or group [$F(1, 37) = .41, ns$]. In terms of the traumatic event script, there were significant associations with baseline levator labii activity [$F(1, 38) = 203.39, p < .001, \eta^2 = .84$] and group [$F(1, 38) = 4.06, p = .05, \eta^2 = .10$] such that individuals in the sexual assault group displayed significantly greater levator labii reactivity to the traumatic event script relative to the physical assault group. Relations with PTSD symptoms [$F(1, 38) = .15, ns$] and negative affect [$F(1, 38) = 3.51, ns$] were nonsignificant. This pattern is graphically depicted in Figure 12.

Predominance of EMG activity. In terms of absolute (within-subject) predominance of frontalis EMG reactivity compared to levator labii EMG reactivity (relative to zero) scores did not differ from zero for the sexual assault [$t(22) = -.53, ns$], physical assault [$t(19) = 1.13, ns$], or control groups [$t(13) = .28, ns$]. In response to the traumatic/stressful script, the predominance of EMG reactivity score significantly differed from zero for the physical assault group [$t(19) = 2.27, p < .05$], such that participants with a history of physical assault displayed a significantly greater predominance of frontalis EMG reactivity to the traumatic event script. The predominance score did not differ from zero for the sexual assault [$t(23) = -1.62, ns$] or control groups [$t(14) = 1.56, ns$].

There were no significant relative (between-group) differences in the predominance of frontalis as compared to levator labii EMG activity during the neutral script [$F(2, 54) = 0.51, ns$]. However, there were significant group differences in terms of

the predominance of EMG reactivity in response to the traumatic/stressful script presentation [$F(2, 54) = 4.43, p < .05, \eta^2 = .14$]. Pairwise comparisons using Bonferroni corrections revealed that the physical assault group displayed significantly greater predominance of frontalis reactivity relative to the sexual assault group ($p < .05$). However, no other differences emerged. This pattern is graphically depicted in Figure 13.

In the second set of analyses comparing the sexual and physical assault groups after controlling for PTSD symptoms and negative affect significant absolute (within-subject) predominance of frontalis EMG reactivity compared to levator labii EMG reactivity (relative to zero) failed to emerge for either the sexual assault [$t(21) = -1.40$, *ns*] or physical assault groups [$t(19) = 1.28$, *ns*]. In response to the traumatic/stressful script, the EMG reactivity predominance score significantly differed from zero for the physical assault group [$t(19) = 2.84, p < .05$], such that participants with a history of physical assault displayed a significantly greater predominance of frontalis EMG reactivity to the traumatic event script as compared to levator labii EMG reactivity. The predominance score did not differ from zero for the sexual assault [$t(22) = -1.72$, *ns*].

There were no significant relative (between-group) differences in the predominance of frontalis as compared to levator labii EMG activity during the neutral script [$F(1, 38) = 3.47$, *ns*]; however, there was a significant association with negative affect [$F(1, 38) = 5.31, p < .03, \eta^2 = .12$]. The association with PTSD symptoms was not significant [$F(1, 38) = 0.98$, *ns*]. In terms of the traumatic event script, there were significant associations with PTSD symptoms [$F(1, 39) = 3.89, p = .05, \eta^2 = .09$], negative affect [$F(1, 39) = 5.59, p < .05, \eta^2 = .13$], and group [$F(1, 39) = 10.23, p < .01, \eta^2 = .21$] such that individuals in the physical assault group displayed a greater

predominance of medial frontalis EMG reactivity relative to the sexual assault group even after accounting for variance associated with PTSD symptoms and negative affect. This pattern is graphically depicted in Figure 14.

Primary Hypotheses: Behavioral Responding to the Script-Driven Imagery Procedure

Specific analytic approach. Group differences among the sexual assault, physical assault, and control groups in terms of washing behavior following the script-driven imagery procedure were examined via exact logistic regression. This approach was chosen based on recommendations that the use of asymptotic methods characteristic of binary logistic regression analyses are unreliable in data sets with relatively small sample sizes (Mehta & Patel, 1995). A second exact logistic regression was employed to examine between-group (sexual versus physical assault) differences in washing behavior after controlling for variance associated with PTSD symptoms and negative affect.

Hand washing. In total, 38.5% of participants in the sexual assault group, 8.6% of participants in the physical assault group, and 23.1% of participants in the control group engaged in hand washing. When asked why these participants engaged in hand washing, 100% of those who washed in the physical assault and control groups indicated they exclusively washed to remove electrode gel. Conversely, only 30% of those in the sexual assault group indicated that they exclusively washed to remove electrode gel. The remaining 70% of participants in the sexual assault group who engaged in washing behavior reported a combination of washing to remove electrode gel, washing because they felt dirty, and/or feeling unsure about the reason for washing.

An examination of between-group differences indicated that participants in the

sexual assault group were significantly more likely to engage in hand washing as compared to the physical assault group (odds ratio [OR] = 1.84, 95% confidence interval [CI; 0.11 to 4.21], exact $p = .03$); however, no differences emerged between the sexual assault and control groups (OR = 2.05, 95% CI [0.54 to 8.50], exact $p = .37$) or the physical assault and control groups (OR = 0.33, 95% CI [0.29 to 2.10], exact $p = .33$). In the second model, group differences between the sexual assault and physical assault groups were examined after accounting for variance associated with PTSD symptoms and negative affect. Results suggested group uniquely and significantly predicted likelihood of hand washing (OR = 26.51, 95% CI [2.32 to > 999.99], exact $p = .002$) with individuals in the sexual assault group being significantly more likely to engage in hand washing after accounting for non-significant associations with PTSD symptoms (OR = 1.04, 95% CI [0.99 to 1.10], exact $p = .13$) and negative affect (OR = 1.13, 95% CI [0.94 to 1.37], exact $p = .20$).

Discussion

While the affective experience of fear and anxiety has been widely recognized as central to various traumatic events, both theoretical accounts (Dagleish & Power, 2004) as well as emerging empirical evidence (Badour et al., in press; Fairbrother et al., 2004; Feldner et al., 2010) indicate certain experiences, such as sexual assault, may also be frequently accompanied by elevated feelings of disgust and mental contamination. In light of theory and preliminary evidence suggesting a link between disgust, mental contamination concerns, and the etiology and maintenance of negative posttraumatic sequelae such as PTSD after a sexual assault (Fairbrother & Rachman, 2004; Olatunji et al., 2008; Shin et al., 1999), it is critical to further elucidate our understanding of these

reactions. Accordingly, the current study was designed to uniquely expand upon this burgeoning literature by examining whether real-time elicitation of disgust and mental contamination concerns in response to reminders of a traumatic event is more strongly linked to experiences of sexual assault relative to physical assault. Results were generally consistent with hypotheses.

Specifically, a detailed multimodal assessment across cognitive, physiological, and behavioral domains broadly suggested that sexual assault was indeed more strongly associated with disgust-based reactivity and increases in mental contamination relative to physical assault or non-traumatic stressful events. Between-group effect sizes for subjective and physiological indices of disgust-based reactivity and mental contamination ranged in size from $\eta^2 = .09$ to $\eta^2 = .27$ representing robust effects ranging from medium to large in magnitude (Cohen, 1988). Each of these domains will now be discussed in greater detail. This will be followed by consideration of how these results pertain to previous studies as well as theoretical and practical implications of the findings. Finally limitations of the current study and directions for future research that would improve upon these limitations will be offered.

Subjective Reactivity

Consistent with prior research documenting elevated subjective disgust reactivity (Badour et al., in press; Shin et al., 1999) and increases in feelings of mental contamination (Fairbrother & Rachman, 2004) when exposed to reminders of a traumatic sexual assault, participants with a history of sexual assault in the current study reported significantly greater increases in subjective feelings of disgust, feelings of dirtiness, and urges to wash in response to reminders of their traumatic event as compared to those with

a history of physical assault and those with no traumatic event history (in response to a stressful script). The size of between-group differences ranged from medium to large in magnitude. Importantly elevated reactivity was specific to the traumatic event script, suggesting this effect was not due to generally elevated reactivity to laboratory procedures among this group. Moreover, increased reactivity persisted among the sexual assault group even after accounting for variability in PTSD symptoms and negative affect among the two assault groups. These findings suggest group differences are likely not simply an artifact of posttraumatic psychopathological processes.

Also consistent with hypotheses, participants with a history of sexual assault evidenced greater increases in subjective feelings of dirtiness in response to reminders of their traumatic event as compared to those without a history of traumatic event exposure (in response to reminders of a stressful event). Although increases in feelings of dirtiness in response to the traumatic event script did not differ between the sexual and physical assault group in the initial analysis, significantly greater change in feelings of dirtiness was evidenced among the sexual assault group after accounting for variability in PTSD symptoms and negative affect across the two assault groups. Similar to the findings for disgust and urges to wash, group differences found in increases in feelings of dirtiness were specific to the traumatic event script. Group differences between the sexual and physical assault group in the initial analysis (without controlling for PTSD symptoms and negative affect) may have been masked by greater increases in feelings of dirtiness exhibited by individuals in the physical assault group with elevated PTSD symptoms given the strong positive association between PTSD symptoms and feelings of dirtiness across both assault groups.

Contrary to hypotheses, subjective ratings of anxious reactivity to the traumatic event script among the two assault groups was not statistically greater than ratings of anxious reactivity in response to the stressful script among the control group. However, examination of group means for SUDS ratings (Table 3) and a medium-sized effect of group differences ($\eta^2 = .07$; Cohen, 1988) suggest that although the control group trended toward lower anxious reactivity, this analysis was likely underpowered to detect a statistically significant difference. However, as hypothesized, the two assault groups displayed comparably elevated levels of subjective anxious reactivity to reminders of their traumatic event both with and without accounting for variability associated with PTSD symptoms and negative affect. Consistent with a previously well-documented positive association between PTSD symptoms and elevated anxious reactivity to the script-driven imagery procedure (e.g., Lindauer et al., 2006; Pitman et al., 1987), PTSD symptoms in the current study were found to significantly predict increased anxious reactivity to the traumatic event script when collapsed across assault type, supporting the internal validity of the study manipulation.

Physiological Reactivity

Emerging research has begun to identify distinct patterns of physiological reactivity associated with disgust and fear (For a review see Cisler, Olatunji, & Lohr, 2009). In particular, facial EMG appears to be a promising method for distinguishing between real-time disgust and fear-based reactivity. Specifically, activity of the *levator labii superioris and* right *medial frontalis* regions have been identified as physiological markers of disgust (Chapman et al., 2009; Vrana, 1993) and fear (Ekman & Friesen, 1978; Smith, 1989), respectively. Following procedures successfully utilized in previous

studies to assess differential patterns of facial EMG reactivity in response to laboratory-based affect eliciting tasks (Ribeiro et al., 2007), levator labii and frontalis EMG reactivity to the script-driven imagery procedure were each assessed independently. In addition, an EMG reactivity predominance score was examined to assess group differences in the relative predominance of frontalis EMG reactivity as compared to levator labii EMG reactivity to both the neutral and traumatic/stressful script.

Specifically, levator labii EMG reactivity was found to be greater among the sexual assault group relative to the physical assault group after accounting for PTSD symptoms and negative affect during the presentation of the traumatic event script, but not the neutral script. Although group did not emerge as a significant predictor of levator labii EMG reactivity when comparing all three groups (without controlling for PTSD symptoms and negative affect), examination of the means (Table 5) and a moderate-sized group difference ($\eta^2 = .09$) suggest that this the sexual assault group trended toward greater levator labii EMG reactivity but the analysis was likely underpowered to detect a statistically significant effect. These findings are consistent with the hypothesis that the sexual assault group should display significantly elevated disgust-relevant physiological reactivity compared to the physical assault and control groups specifically to reminders of the traumatic event.

Frontalis EMG reactivity was not found to differ among the sexual assault, physical assault, and control groups to either the neutral or traumatic/stressful scripts. However, when accounting for variability associated with PTSD symptoms and negative affect, differences did emerge between the two assault groups, with the physical assault group displaying greater frontalis EMG reactivity specifically to the traumatic event

script. It is unclear why this pattern emerged, as individuals in the sexual assault group were expected to demonstrate comparably high levels fear/anxiety-based physiological reactivity to the traumatic event script relative to the physical assault group. Although there is no theoretical framework to suggest individuals with a history of physical assault should react with increased fear/anxiety-based physiological arousal to reminders of their traumatic event, characteristics of the different events might lead to increased fear conditioning during physical assault. For example, physically assaulted individuals more frequently report perceived life threat during their traumatic event as compared to sexually assaulted individuals (Resnick et al., 1993), which might evoke higher levels of peritraumatic fear. Future research should examine differences in additional indices of fear/anxiety-based physiological reactivity (e.g., heart rate, skin conductance) between these two groups.

Both absolute (within-subject) and relative (between-group) predominance of frontalis EMG reactivity as compared to levator labii EMG reactivity were examined as markers of the ratio of fear and disgust-based reactivity to the script-driven imagery procedure. The physical assault group displayed an absolute predominance of frontalis EMG reactivity to the traumatic event script, but not the neutral script. Moreover, relative to the sexual asasault group, the physical assault group displayed a relative greater predominance frontalis EMG reactivity specifically to the traumatic event script, both with and without accounting for variability associated with PTSD symptoms and negative affect. Predominant frontalis EMG reactivity to the traumatic event script among physically assaulted participants is consistent with the hypothesis that emotional responding to reminders of traumatic physical assault should primarily be marked by

fear-based physiological reactivity. In contrast, it would be expected that the sexual assault group would respond to reminders of their traumatic event with a more equal ratio of physiological reactivity characteristic of both disgust- and fear-based reactivity. Although not reaching statistical significance, examination of the mean EMG reactivity predominance scores (Tables 5-6) suggests that the sexual assault group trended toward slight dominance of levator labii EMG reactivity.

Physiological reactivity to the script-driven imagery procedure was examined in the current study as an additional modality of differential disgust and fear/anxiety-based reactivity to reminders of a traumatic/stressful event. Although assessment of laboratory-based affective reactivity often documents desynchrony across modes (e.g., subjective versus physiological assessment; Hodgson & Rachman, 1974), the overall current pattern of findings suggests a certain degree of synchrony, such that individuals with a history of sexual assault exhibited greater EMG reactivity consistent with disgust-relevant reactivity (Chapman et al., 2009; Vrana, 1993) as compared to the physical assault group, which was broadly consistent with self-report measures described above. Moreover, when examined as a ratio of disgust-relevant and fear/anxiety-relevant reactivity, a pattern emerged that was consistent with the hypothesis that reactivity to reminders of physical assault should be characterized by predominantly fear or anxiety-related reactions, while reactivity to reminders of sexual assault should involve elevated levels of both fear/anxiety and disgust.

In addition to demonstrating additional support for the hypothesis of increased sexual assault-related disgust-based reactivity, results of the physiological assessment provide preliminary evidence of the utility of utilizing relative predominance of EMG

reactivity as a tool for distinguishing between disgust- and fear/anxiety-based reactivity in a laboratory setting. It is, however, important to highlight the limitations inherent to relying on peripheral measures of physiological affective reactivity (i.e., EMG). For example, increasing evidence points to the importance of central physiological mechanisms such as the complex interplay between hyperactivity of the amygdala and hypoactivity of the ventromedial prefrontal cortex in elucidating the mechanisms underlying trauma and PTSD-related affective reactivity and regulation (see Koenigs & Grafman, 2009 for a review). This literature would likely benefit from examination of the role of the insula, given that activation of this neural substrate has been linked to disgust and has been shown to differ from fear activation which is primarily mediated by the amygdala (see Cisler et al. [2009] for a review).

Behavioral Responding

Finally, consistent with previous research examining behavioral correlates of laboratory-induced sexual assault-relevant mental contamination (Herba & Rachman, 2007), group differences in rates of hand washing behavior were examined as an index of disgust and contamination-based responding following the script-driven imagery procedure. Consistent with hypotheses, individuals with a sexual assault history were significantly more likely to engage in hand washing behavior after the script-driven imagery procedure as compared to those with a history of physical assault. This relation maintained even after accounting for PTSD symptoms and negative affect. However, counter to hypotheses, participants in the sexual assault and control groups did not differ in terms of rate of washing. Reasons for this elevated rate of washing in the control group are unclear, although some possibilities are presented below in a discussion of limitations

of the control group included in the current study. Furthermore, although additional empirical inquiry into possible mechanisms underlying this finding are limited by the relatively small sample of participants engaging in washing, an examination of self-reported reasons for washing after the script-driven imagery paradigm may provide some insight into this issue. In particular, 100% of participants who engaged in hand washing in the physical assault and control groups identified washing exclusively to remove electrode gel resulting from the physiological monitoring equipment. This can be contrasted with only 30% of those who washed in the sexual assault group identifying wishing to remove electrode gel as the sole reason for washing. The remaining sexually assaulted participants reported washing for a combination of reasons that included removing electrode gel, feeling dirty, and/or feeling unsure of the reason. This difference suggests features of the study design (i.e., use of physiological monitoring equipment) may have contributed to the failure to detect differences in rates of washing between the sexual assault and control group.

Further limitations of this approach might be overcome by considering alternative ways of measuring washing behavior. For example, future research might examine duration of washing (e.g., Jones & Menzies, 1997) or quantity of soap used while washing. It also will be important to examine the utility of assessing other cleansing behaviors in relation to mental contamination including drinking, rinsing of the mouth, or washing the face or other areas of the body. Moreover, behavioral avoidance tests (BATs), or procedures designed to assess approach and avoidance behavior in the laboratory, have been extensively used in disgust research (for a review see Woody and Tolin [2002]) and may hold promise in the area of traumatic event-related affective

reactivity. For example, participants could be given the option of voluntarily terminating exposure to traumatic event-relevant stimuli or be given the opportunity to behaviorally demonstrate willingness to engage in repeated exposures. Despite the relative limitations of the behavioral index utilized in the current study, the data do suggest there may be important behavioral correlates of traumatic event-related disgust and contamination-based reactivity that should be examined further in future research.

Integrative Summary and Implications

Broadly, findings of subjective and physiological reactivity as well as behavioral responding to the script-driven imagery procedure provided support for the hypotheses that increased feelings of disgust and mental contamination in response specifically to reminders of a traumatic event should be uniquely associated with experiences of sexual assault as compared to both physical assault and non-traumatic stressful experiences. Moreover, a pattern of specificity emerged, suggesting that consistent with prior theoretical and empirical work (Amstadter & Vernon, 2008; Dagleish & Power, 2004; Feldner et al., 2010), anxiety-based reactivity to traumatic event cues may be central to various traumatic experiences, while disgust reactivity and increases in mental contamination may be unique to experiences involving sexual violation. Importantly, the finding of differential subjective emotional reactivity to the traumatic event between sexually and physically assaulted women persisted even after accounting for psychopathology-relevant factors, further lending support to the supposition of unique associations of sexual assault, per se, with disgust and mental contamination.

These findings may have important implications, particularly the assessment of the affective landscape associated with sexual assault. Research on the experience and

correlates of traumatic events frequently groups various traumatic event types into one general category involving traumatic event exposure broadly. Although researchers have criticized the almost exclusive focus on fear, helplessness, and horror in attempting to elucidate the affective correlates of traumatic events (e.g., Brewin et al., 2000), there has been little discussion of how traumatic event-relevant affect may vary across different traumatic experiences.

Increased recognition of the need to apply an ideographic approach toward assessment of traumatic event-relevant affective experiences may also have important implications for understanding the development and maintenance of maladaptive posttraumatic outcomes. Although not central to the hypotheses of the current study, the finding that PTSD symptoms significantly predicted increases in disgust, feelings of dirtiness, and trended toward predicting increases in urges to wash ($\eta^2 = .09$) in addition to increases in anxiety after exposure to the traumatic event script among both assault groups highlights the importance of further examining the relevance of disgust and mental contamination as it relates to PTSD. Although results of this study suggest reactivity of disgust and mental contamination appear to be uniquely elevated among sexual assault victims, a growing literature has begun to document a role for disgust in the etiology and maintenance of PTSD that is independent of fear and anxiety across a number of different traumatic event types (e.g., Engelhard, Olatunji, & de Jong, 2011; Olatunjji, Babson, Smith, Feldner, & Connolly, 2009). Combined with the current findings, this highlights the need to further elucidate the role of disgust as it relates to various traumatic events and the development of posttraumatic psychopathology. Within the context of sexual assault, it is possible that the frequent experience of traumatic

event-related disgust and feelings of mental contamination may combine with fear/anxiety in an additive fashion to increase risk for PTSD development, thus contributing to the greater conditional probability among women of developing PTSD following sexual assault relative to any other traumatic experience (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995; Tolin & Foa, 2006).

Despite increasing recognition of the association between elevated PTSD symptoms, disgust (Engelhard et al., 2011; Olatunji et al., 2009; Shin et al., 1999), and mental contamination (Fairbrother & Rachman, 2004; Olatunji et al., 2008), the importance of these constructs within the context of treatment for PTSD, and particularly of sexual assault-related PTSD, has yet to be examined. This line of research may be especially needed in light of evidence demonstrating conditioned disgust-based reactions in other anxiety disorders may be relatively resistant to extinction as compared to fear (McKay, 2006; Olatunji, Smits, Connolly, Willems, & Lohr, 2007, Smits, Telch, & Randall, 2002). For example, among spider phobics, whose reactions to spiders include both fear and disgust (Davey, 1994), 30-mins of *in vivo* exposure resulted in less extinction of disgust as compared to fear after controlling for baseline levels of each (Smits et al., 2002). Similar patterns have been observed in response to exposure among people with blood-injection-injury phobia (Olatunji et al., 2007b) and contamination-based obsessive-compulsive disorder (McKay, 2006). These findings are critical given that exposure-based procedures are integrated into the most well established prevention programs and treatments for PTSD (Feldner, Monson, & Friedman, 2007; Institute of Medicine [IOM], 2008; Resnick et al., 2007). Although exposure-based interventions are effective, a significant minority of individuals receiving such interventions do not appear

to benefit, and even those responding well commonly report some level of residual symptoms (Feldner et al., 2007; IOM, 2008). Future studies should assess the degree to which persistent disgust and mental contamination-related reactivity 1) are amenable to exposure-based treatment and 2) might interfere with the effectiveness of traditional treatment approaches.

Limitations and Future Directions

There are a number of limitations to the current study that warrant attention. First, while the inclusion of a non-traumatic event-exposed control group lends additional confidence that observed differences in reactivity to the script-driven imagery procedure were due to traumatic event-relevant processes as opposed to general stress reactivity, this group introduced a degree of variability in stressful script content that was absent from the two assault groups. For example, the degree of intimacy or interpersonal relevance of the stressful experiences varied widely (e.g., terminating relationship due to infidelity versus receiving a speeding ticket), and several experiences involved aspects of sexuality (e.g., struggling with sexual orientation, concerns over contracting a sexually-transmitted disease) that could potentially confound comparisons with the sexual assault group by increasing certain aspects of disgust-based reactivity (e.g., as a result of conflicts with perceptions of morality or social convention) in a way that led to a pattern similar to the reactivity seen in the sexual assault group. This pattern may have differed if there had been a greater degree of homogeneity in experiences. Future studies should consider these issues in selecting a control group. A more appropriate control group might be one that requires all participants to recall a similar (non-traumatic) experience. Moreover, there may be added utility in including an additional traumatic event-exposed

group with a history of non-interpersonally relevant traumatic experiences (e.g., accidents, natural disasters) in order to assess whether the interpersonal nature of traumatic events (e.g., sexual, physical assault) differentially contributes to traumatic event-relevant disgust and mental contamination-based reactivity (e.g., Badour et al., in press).

Moreover, the decision to exclude participants with a history of both sexual and physical assault limits the generalizability of these findings to the broader population. Although deemed necessary to parse apart the unique affective experience associated with sexual and physical assault in the current study, epidemiological research suggests a high degree of overlap in sexual and physical assault histories, such that past assault is one of the most robust predictors of future assault, and women with a history of assault are more than four times more likely to be assaulted a second time (See Kilpatrick and Acierno [2003] for a review). Indeed, participant recruitment for the current study yielded 84 interested individuals who were ineligible for the current study based on a history of both sexual and physical assault. These selection criteria likely reduced the chronicity and potential severity of assault and abuse histories (Acierno, Resnick, & Kilpatrick, 1997) as well as severity of psychopathology (Kilpatrick & Acierno, 2003) among participants included in this study. Generalization is also limited by the homogeneity of the sample, which was comprised of primarily Caucasian individuals with a relatively high degree of education. Furthermore, exclusive inclusion of women in the study also precludes examination of gender differences, which will be important to investigate in future studies based on research documenting gender differences in traumatic event-related disgust reactivity (Olatunji et al., 2009).

The quasi-experimental nature of the current design limits the ability to confidently conclude that observed differences are attributable to the group categorizations. It is possible that other factors differing between participants in the sexual and physical assault groups may have accounted for the findings herein. For example, it is possible that sexually assaulted individuals may encounter increased stigma associated with their assault and this negative social feedback may actually increase feelings of disgust and contamination over time. Future research is needed to investigate possible mediating and moderating factors in the between-group differences observed here. The use of a quasi-experimental design also precludes randomization to experimental condition, thus allowing for the possibility of experimenter-introduced demand characteristics. Future research would benefit from assessing for possible effects of such methodological confounds.

Additionally, although the real-time assessment of affective reactivity assessed in the laboratory overcomes limitations inherent to retrospective self-report of traumatic event-relevant affective reactivity, it will be important for future studies to assess peritraumatic or immediate posttraumatic affective reactions and follow participants in a longitudinal design in order to understand the temporal trajectory of peritraumatically-conditioned affective responses. Moreover, although increases in disgust and mental contamination in response to the traumatic event script were related to PTSD symptoms among individuals with a history of sexual and physical assault, the correlational nature of the study precludes an analysis of the role of disgust and mental contamination involved in the development and maintenance of such symptoms.

Finally, continued research in this domain should strive to develop increasingly sophisticated ways of assessing disgust reactivity within the context of traumatic events. In particular, basic research suggests disgust reactions may fall into four distinct domains (Olatunji & Sawchuk, 2005; Rozin et al., 2000), and research would benefit from examining other traumatic event types where different domains of disgust may play an important role. For example, exposure to combat may involve stimuli capable of eliciting animal reminder disgust (e.g., in response to mutilated bodies) as well as interpersonal or sociomoral disgust (e.g., in response to taking a life, encountering human atrocities). Relatedly, a single item rating (i.e., SUDS rating) of the degree to which a respondent broadly feels disgusted may fail to capture important distinctions regarding the nature or quality of the response. Finally, further examination of the focus of disgust reactions may be warranted. Within the context of sexual assault for example, feeling disgust toward a perpetrator may differ qualitatively from the experience of internally focused feelings of disgust, which may perpetuate posttraumatic feelings of shame and guilt (Barret et al., 1993; Power & Dalgleish, 1997).

Future research should also begin to distinguish the unique mechanisms underlying traumatic event and PTSD-relevant disgust and mental contamination versus fear/anxiety reactivity to determine whether common or unique processes are involved. For example, preexisting trait-like vulnerabilities might predispose an individual to experience a heightened degree of disgust peritraumatically (e.g., disgust propensity) or to be particularly distressed by the experience of disgust (e.g., disgust sensitivity; van Overveld, de Jong, Peters, Cavanagh, & Davey, 2006). Moreover, while fear is likely to be elicited in any situation involving potential danger (Dalgleish & Power, 2004),

disgust, and interpersonal disgust in particular, might be particularly strongly evoked during traumatic events that challenge existing perceptions of morality or social standards (Rozin et al., 2000) highlighting the need to assess preexisting differences on potentially relevant social and cognitive factors.

Moreover, while fear may be most intensely experienced during the traumatic event when life threat is greatest and the demand for a fight or flight response is present (Amstadter & Vernon, 2008; Barlow, 2002), disgust-relevant emotions of shame and guilt have been shown to increase in the immediate hours or days after a traumatic event (Amstatder & Vernon, 2008), suggesting a possibly unique temporal pattern of disgust-based emotional reactivity. Such a pattern might involve automatic elicitation of disgust in response to stimuli present during a traumatic event (similar to fear), which might then become increasingly associated with traumatic event cues via a process of additional cognitive elaboration and appraisals (e.g., Dalgleish & Power, 2004; Eisenberg, Fabes, & Losoya, 1997).

Conclusion

The current limitations not withstanding, the present study provides an important and unique extension to the emerging body of literature that has begun to outline the importance of disgust and mental contamination to experiences of traumatic sexual assault. Results of the current study provide relatively robust support suggesting that sexually assaulted individuals exhibit elevated disgust and mental contamination reactivity in response to reminders of their assault as evidenced by subjective, physiological, and behavioral indices. Moreover, PTSD symptoms among both sexually and physically assaulted women predicted increased reactivity of disgust and mental

contamination in addition to anxiety in response to traumatic event reminders, highlighting the need for future research to explore the mechanisms underlying the role of disgust, mental contamination, and negative posttraumatic outcomes both in the context of sexual assault and other traumatic events.

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Table 1. *Zero-Order Relations among Selected Predictor and Criterion Variables*.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	--	.03	-.12	.02	.00	-.15	-.08	-.11	.03	.03	-.10	-.03	-.06	-.08	-.07	-.10	-.09
2	--	--	.67**	-.03	.07	.11	.53**	.23*	.56**	.17	.42**	.04	.37**	.03	.08	.05	-.03
3	--	--	--	-.16	-.12	.20	.33**	.29**	.52**	.14	.24*	.08	.30**	-.20	-.13	-.02	-.13
4	--	--	--	--	.48**	-.03	.07	.06	.03	-.04	-.07	-.03	-.05	-.03	-.03	.11	.10
5	--	--	--	--	--	.08	.30**	.16	.19	.15	.19	.14	.17	-.12	-.09	.13	.12
6	--	--	--	--	--	--	.25*	.42**	.29**	.07	.30*	.30*	.22	.00	-.03	-.15	-.18
7	--	--	--	--	--	--	--	.39**	.48**	.05	.44**	.05	.34**	.00	.03	.06	-.07
8	--	--	--	--	--	--	--	--	.56**	.03	.22	.12	.19	.01	.04	.06	-.03
9	--	--	--	--	--	--	--	--	--	.00	.29*	.05	.35**	.00	.07	-.11	-.14
10	--	--	--	--	--	--	--	--	--	--	.58**	.76**	.57**	-.12	-.01	-.08	-.05
11	--	--	--	--	--	--	--	--	--	--	--	.46**	.83**	.04	.12	-.10	-.11
12	--	--	--	--	--	--	--	--	--	--	--	--	.68**	.16	.24	-.08	-.09
13	--	--	--	--	--	--	--	--	--	--	--	--	--	.13	.24	.03	.03
14	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.91**	-.03	-.05
15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.08	-.07
16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.91**
17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Note: 1 = age; 2 = PTSD symptoms; 3 = negative affect; 4 = neutral script vividness; 5 = traumatic/stressful script vividness; 6 = neutral script disgust; 7 = traumatic/stressful script disgust; 8 = neutral script anxiety; 9 = traumatic/stressful script anxiety; 10 = neutral script feelings of dirtiness; 11 = traumatic/stressful script feelings of dirtiness; 12 = neutral script urges to wash; 13 = traumatic/stressful script urges to wash; 14 = neutral script frontalis EMG activity; 15 = traumatic/stressful script frontalis EMG activity; 16 = neutral script levator labii EMG activity; 17 = traumatic/stressful script levator labii EMG activity

Table 2. *Descriptive Data for Demographic Variables and Potential Covariates as a Function of Group*

	Sexual Assault *M* or *n* (*SD* or %)	*Physical Assault* *M* or *n* (*SD* or %)	*Control* *M* or *n* (*SD* or %)
Demographics			
Age	28.52 (15.21)	28.00 (13.11)	24.30 (11.36)
Ethnicity			
Hispanic	2 (7.4%)	2 (8.0%)	1 (3.3%)
Race			
Caucasian	24 (88.9%)	19 (76.0%)	23 (76.7%)
African-American	1 (3.7%)	2 (8.0%)	3 (10.0%)
Asian	0 (0.0%)	0 (0.0%)	2 (6.7%)
American Indian/Native Alaskan	0 (0.0%)	2 (8.0%)	1 (3.3%)
Multi-Racial	2 (7.4%)	1 (4.0%)	0 (0.0%)
Other	0 (0.0%)	1 (4.0%)	1 (3.3%)
Education Completed			
High School or Equivalent	2 (7.4%)	1 (4.0%)	6 (20.0%)
Some College	16 (59.3%)	14 (56.0%)	16 (53.3%)
2-Year College	1 (3.7%)	3 (12.0%)	0 (0.0%)
4-Year College	0 (0.0%)	4 (16.0%)	2 (6.7%)
Some Postgraduate Education	4 (14.8%)	2 (8.0%)	3 (10.0%)
Completed Postgraduate Education	3 (11.1%)	1 (4.0%)	3 (10.0%)
Symptom Severity/Diagnoses			
PTSD Diagnosis	8 (29.6%)	11 (44.0%)	--
PTSD Symptom Severity	30.00 (20.73)	38.64 (21.57)	10.57 (8.39)
Negative Affectivity	19.50 (6.63)	23.08 (6.23)	16.00 (5.42)
Traumatic Event Script Topics			
Neutral Script Vividness	77.77 (15.62)	73.18 (19.53)	79.59 (18.94)
Traumatic/Stressful Script Vividness	85.22 (13.80)	78.23 (24.90)	79.62 (14.14)

Table 3. *Raw Means, Standard Deviations, Adjusted Means, and Standard Errors for Subjective Reactivity to the Script-Driven Imagery Procedure as a Function of Group*

	Neutral Script				Traumatic/Stressful Event Script			
	Mean	*SD*	*Adj. Mean*	*SE*	*Mean*	*SD*	*Adj. Mean*	*SE*
Sexual Assault								
Anxiety	16.48	22.65	15.24	3.12	44.78	32.50	41.27	4.63
Disgust	2.65	5.18	2.80	1.04	51.88	32.38	51.14	5.48
Feelings of Dirtiness	1.24	0.44	1.16	0.07	2.28	1.37	2.17	0.16
Urges to Wash	1.18	0.38	1.20	0.06	1.83	1.18	1.94	0.13
Physical Assault								
Anxiety	13.91	17.35	13.90	3.45	38.92	34.13	41.52	4.90
Disgust	2.65	5.18	2.00	1.09	28.17	31.67	28.21	5.69
Feelings of Dirtiness	1.25	0.44	1.34	0.08	1.65	0.67	1.71	0.18
Urges to Wash	1.19	0.34	1.24	0.07	1.38	0.67	1.46	0.14
Control								
Anxiety	15.53	20.98	16.66	2.96	27.43	26.00	28.51	4.37
Disgust	3.21	4.52	3.39	0.99	13.63	32.76	14.25	5.10
Feelings of Dirtiness	1.18	0.48	1.19	0.07	1.31	0.62	1.37	0.15
Urges to Wash	1.37	0.76	1.31	0.06	1.47	0.93	1.32	0.12

Table 4. *Adjusted Means and Standard Errors for Subjective Reactivity to the Script-Driven Imagery Procedure as a Function of Group After Accounting for Posttraumatic Stress Symptoms and Negative Affect*

	Neutral Script		Traumatic Script	
	Adj. Mean	*SE*	*Adj. Mean*	*SE*
Sexual Assault				
Anxiety	15.41	3.12	44.09	4.53
Disgust	3.21	1.20	53.69	5.51
Feelings of Dirtiness	1.15	0.07	2.22	0.18
Urges to Wash	1.21	0.04	1.84	0.14
Physical Assault				
Anxiety	13.65	3.41	37.36	4.73
Disgust	1.91	1.22	25.20	5.63
Feelings of Dirtiness	1.31	0.07	1.58	0.20
Urges to Wash	1.15	0.04	1.21	0.16

Table 5. *Raw Means, Standard Deviations, Adjusted Means, and Standard Errors for Physiological Reactivity to the Script-Driven Imagery Procedure as a Function of Group*

	Neutral Script				Traumatic/Stressful Event Script			
	Mean	*SD*	*Adj. Mean*	*SE*	*Mean*	*SD*	*Adj. Mean*	*SE*
Sexual Assault								
Frontalis EMG Activity	3.47	3.90	3.43	0.36	3.55	3.65	3.55	0.24
Levator Labii EMG Activity	4.03	4.73	4.66	0.47	4.31	4.51	5.50	0.38
Predominance of EMG	-0.36	3.21	--	--	-0.58	1.74	--	--
Physical Assault								
Frontalis EMG Activity	2.99	1.35	3.59	0.39	3.37	1.99	4.02	0.26
Levator Labii EMG Activity	4.73	5.15	4.24	0.49	4.51	5.13	4.24	0.41
Predominance of EMG	0.50	1.99	--	--	1.08	2.13	--	--
Control								
Frontalis EMG Activity	4.31	4.54	3.58	0.45	4.95	5.04	4.07	0.31
Levator Labii EMG Activity	4.47	4.63	4.16	0.60	5.93	8.57	4.41	0.49
Predominance of EMG	0.93	2.85	--	--	0.90	2.13	--	--

Table 6. *Adjusted Means and Standard Errors for Physiological Reactivity to the Script-Driven Imagery Procedure as a Function of Group After Accounting for Posttraumatic Stress Symptoms and Negative Affect*

	Neutral Script		Traumatic Script	
	Adj. Mean	*SE*	*Adj. Mean*	*SE*
Sexual Assault				
Frontalis EMG Activity	3.07	0.38	3.03	0.25
Levator Labii EMG Activity	4.97	0.41	4.85	0.37
Predominance of EMG	-0.77	0.55	-0.68	0.40
Physical Assault				
Frontalis EMG Activity	3.07	0.40	3.77	0.27
Levator Labii EMG Activity	3.83	0.41	3.60	0.39
Predominance of EMG	0.74	0.58	1.21	0.43

Figure Captions

Figure 1. Self-reported anxious reactivity during the script-driven imagery procedure.

Figure 2. Self-reported anxious reactivity during the script-driven imagery procedure after accounting for PTSD symptoms and negative affect.

Figure 3. Self-reported disgust reactivity during the script-driven imagery procedure.

Figure 4. Self-reported disgust reactivity during the script-driven imagery paradigm after accounting for PTSD symptoms and negative affect.

Figure 5. Self-reported changes in feelings of dirtiness during the script-driven imagery procedure.

Figure 6. Self-reported changes in feelings of dirtiness during the script-driven imagery paradigm after accounting for PTSD symptoms and negative affect.

Figure 7. Self-reported changes in urges to wash during the script-driven imagery procedure.

Figure 8. Self-reported changes in urges to wash during the script-driven imagery paradigm after accounting for PTSD symptoms and negative affect.

Figure 9. Frontalis EMG reactivity during the script-driven imagery procedure.

Figure 10. Frontalis EMG reactivity during the script-driven imagery procedure after accounting for PTSD symptoms and negative affect.

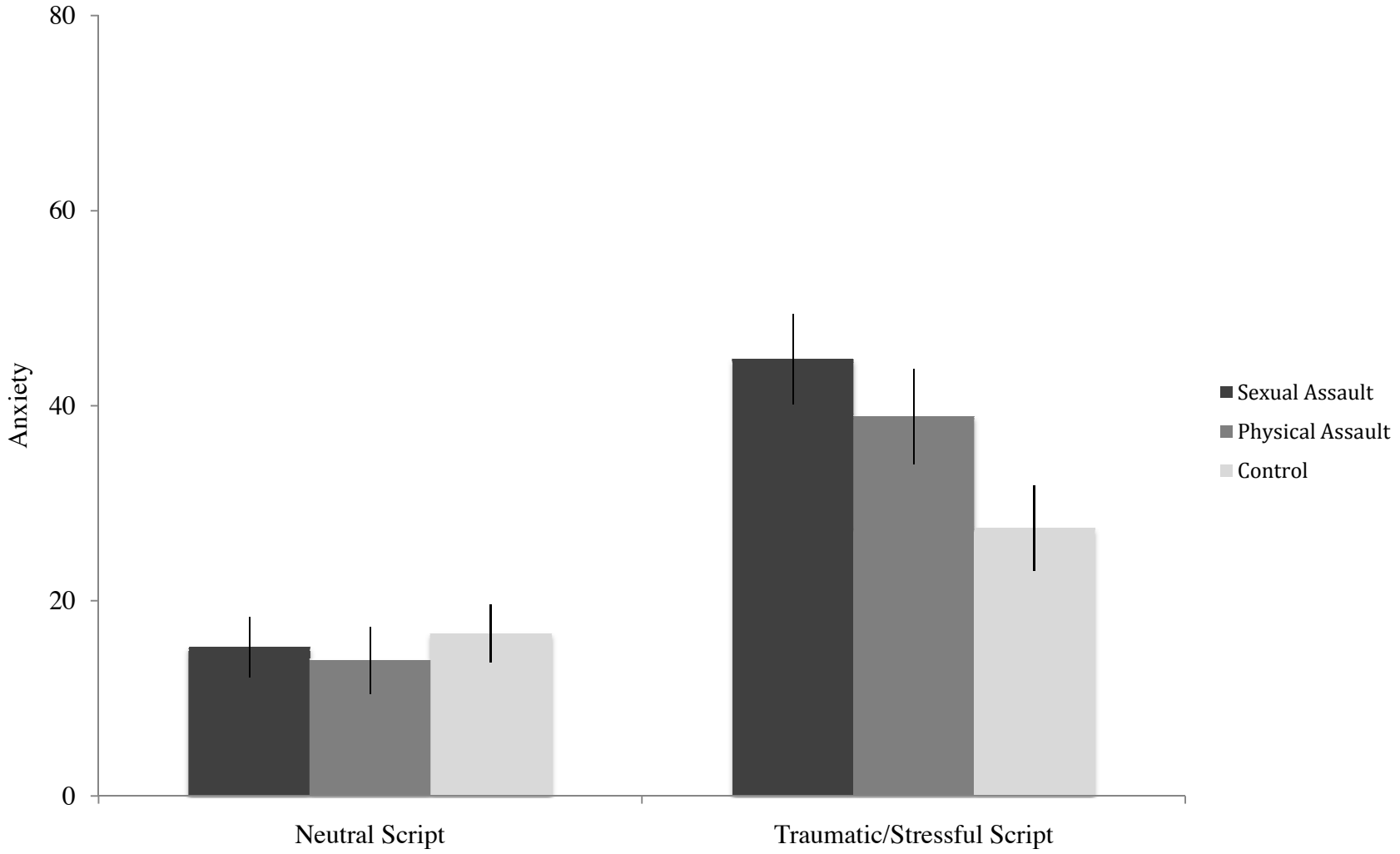
Figure 11. Levator Labii EMG reactivity during the script-driven imagery procedure.

Figure 12. Levator Labii EMG reactivity during the script-driven imagery procedure after accounting for PTSD symptoms and negative affect.

Figure 13. Predominance of EMG reactivity during the script-driven imagery procedure.

Figure 14. Predominance of EMG reactivity during the script-driven imagery procedure

after accounting for PTSD symptoms and negative affect.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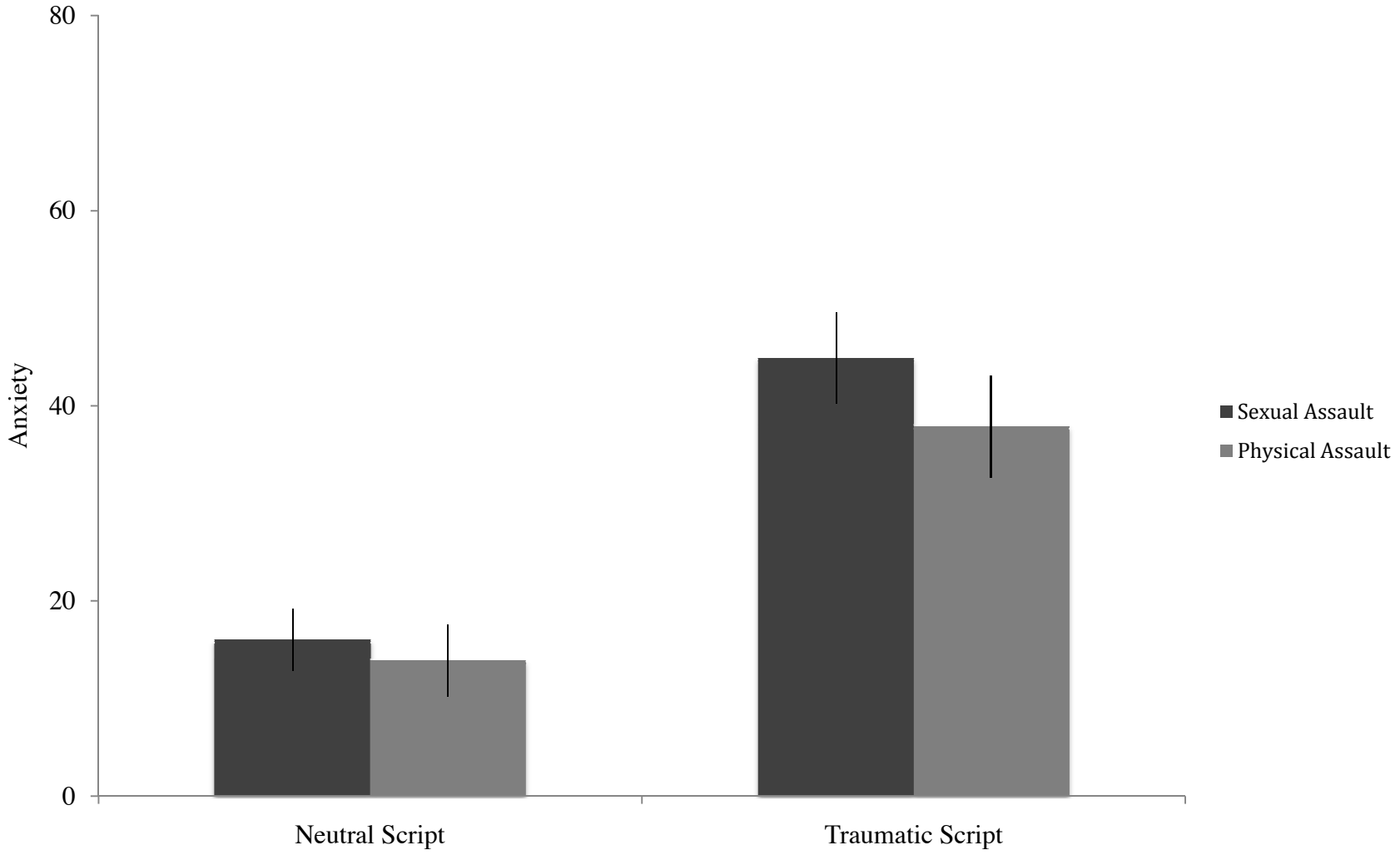
Anxiety
Neutral Script
Traumatic/Stressful Script
Sexual Assault
Physical Assault
Control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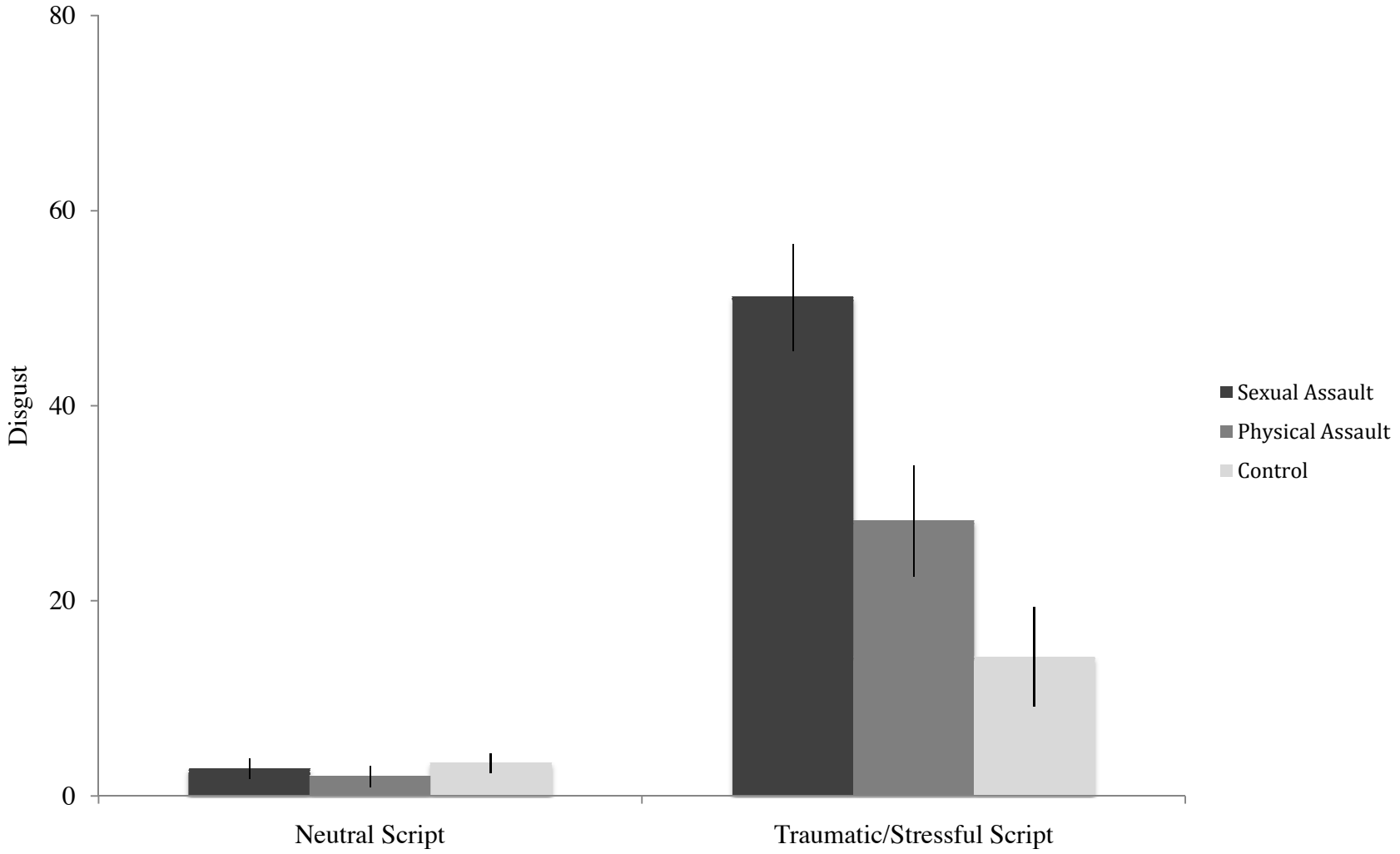
Neutral Script
Traumatic Script
Sexual Assault
Physical Assault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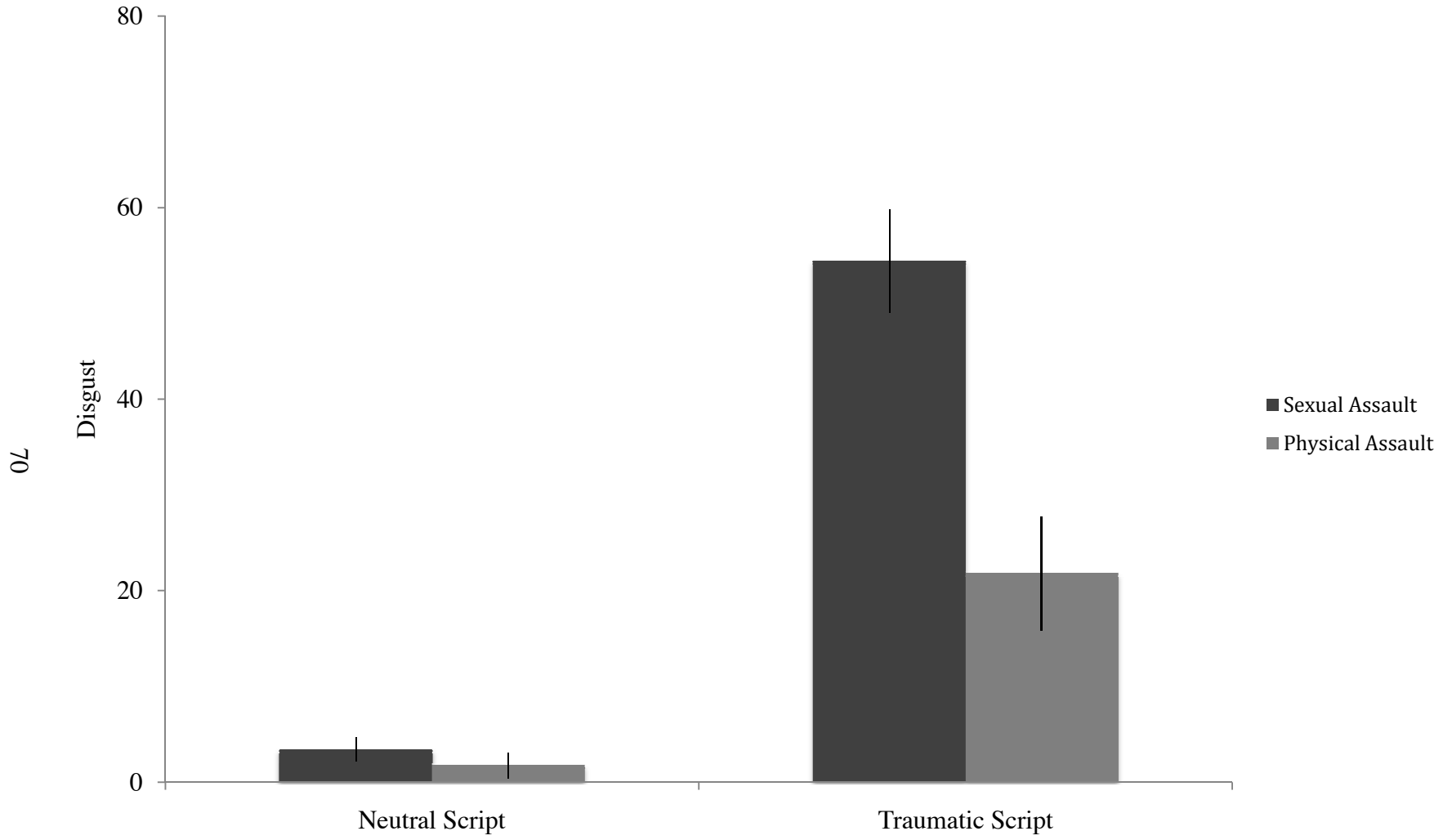
Sexual Assault
Physical Assault
Control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Neutral Script
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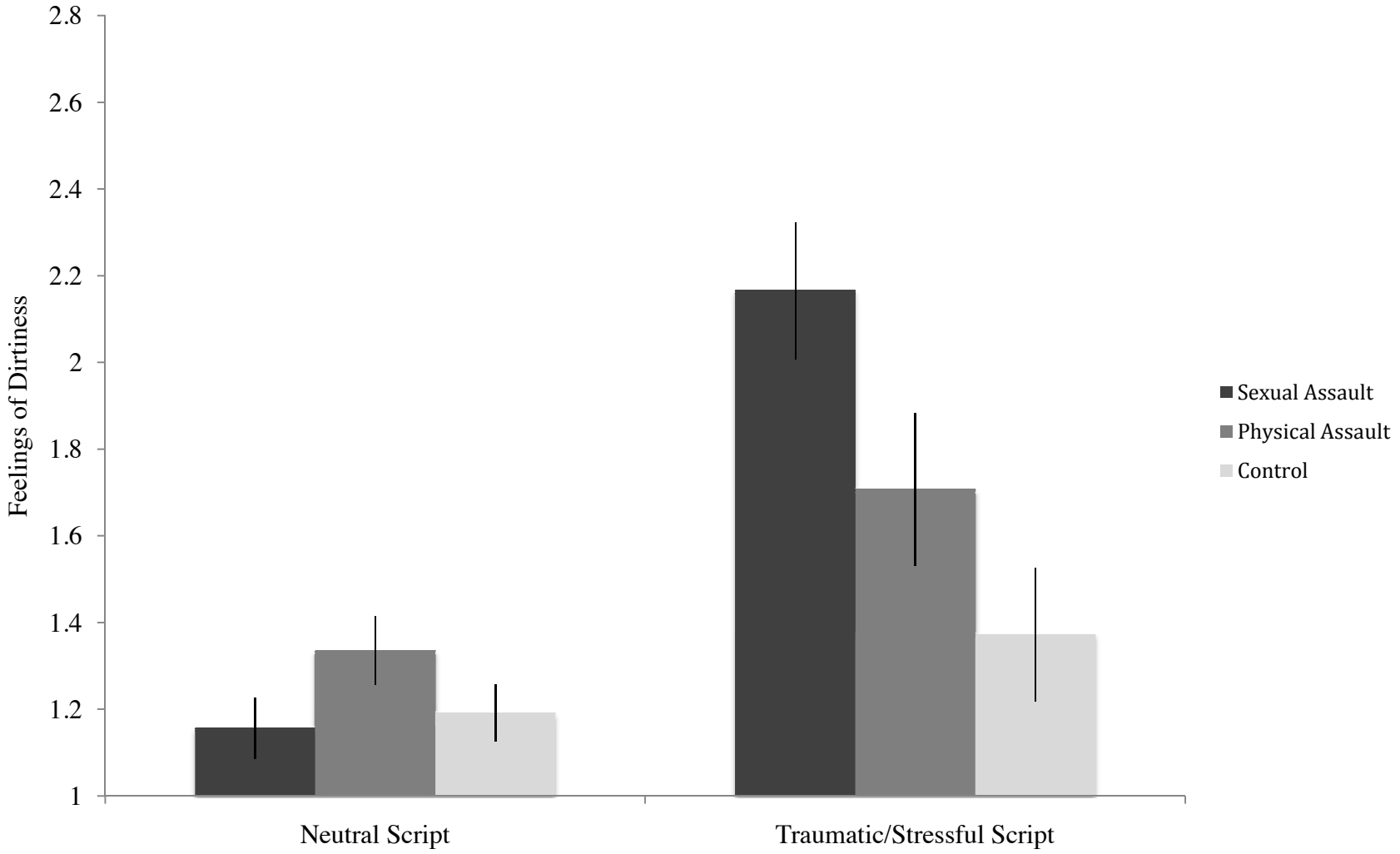
Physical Assault

70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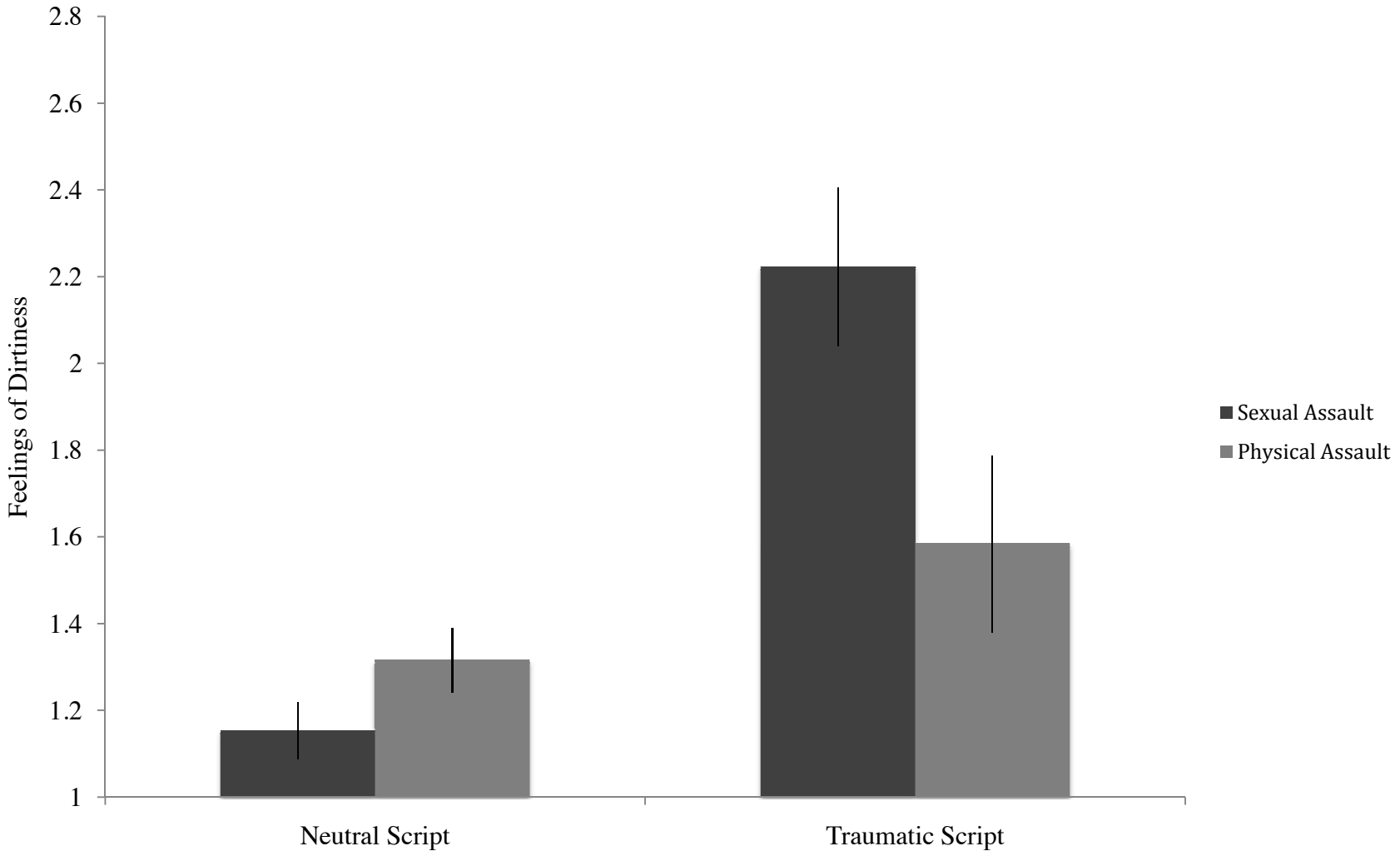
Neutral Script
Traumatic/Stressful Script
Sexual Assault
Physical Assault
Control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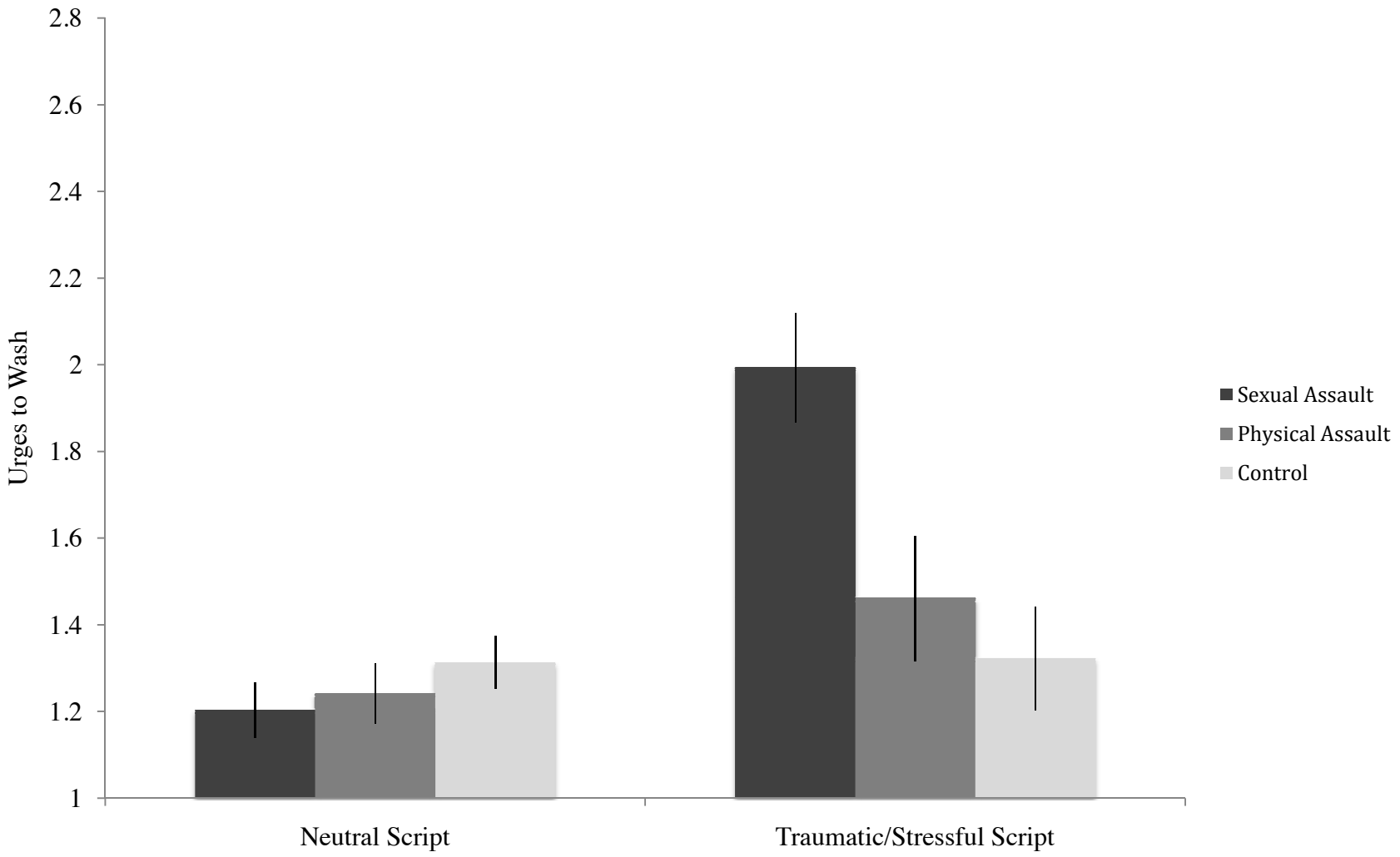
Neutral Script
Traumatic Script
Sexual Assault
Physical Assault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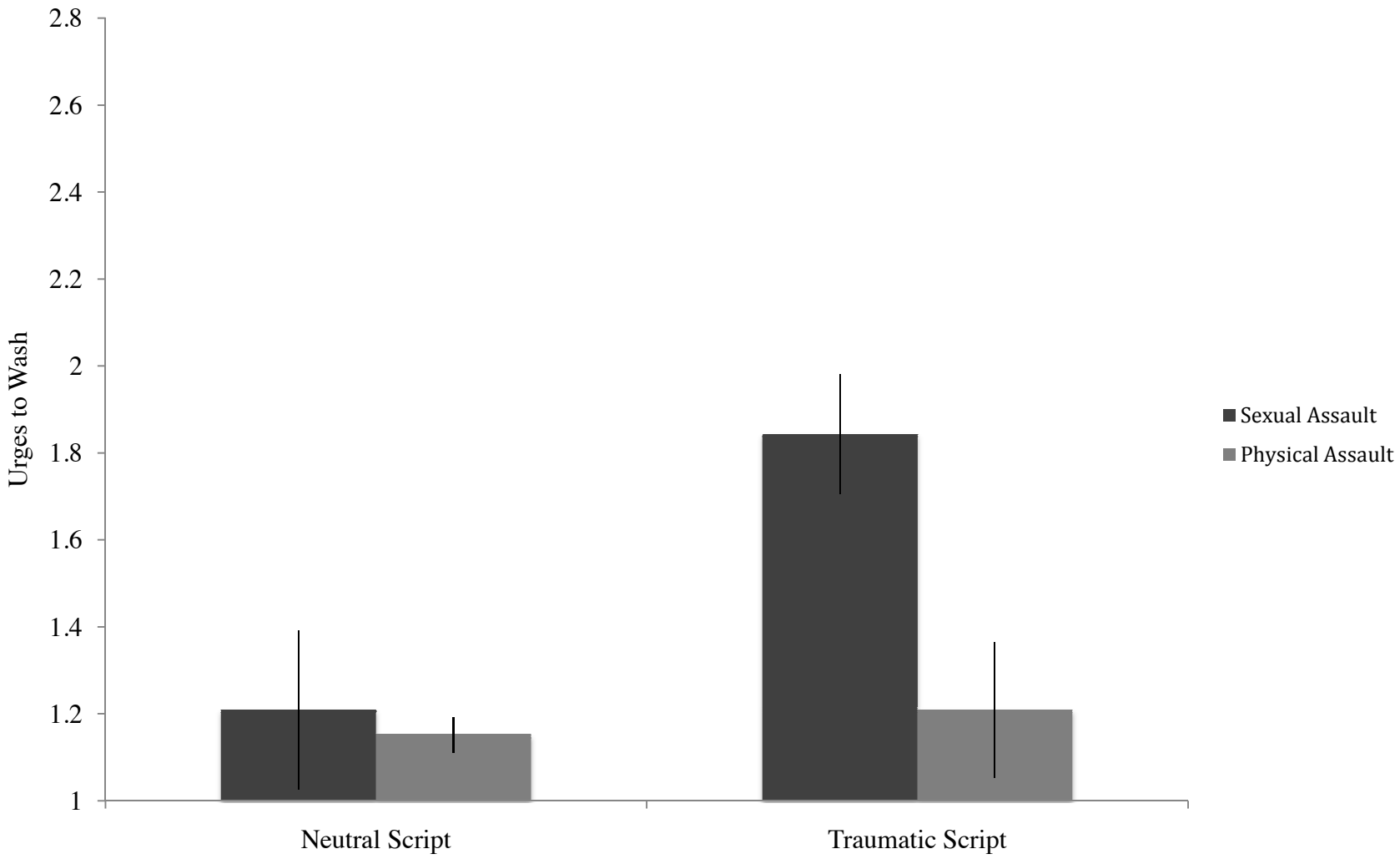
Traumatic/Stressful Script
Sexual Assault
Physical Assault
Control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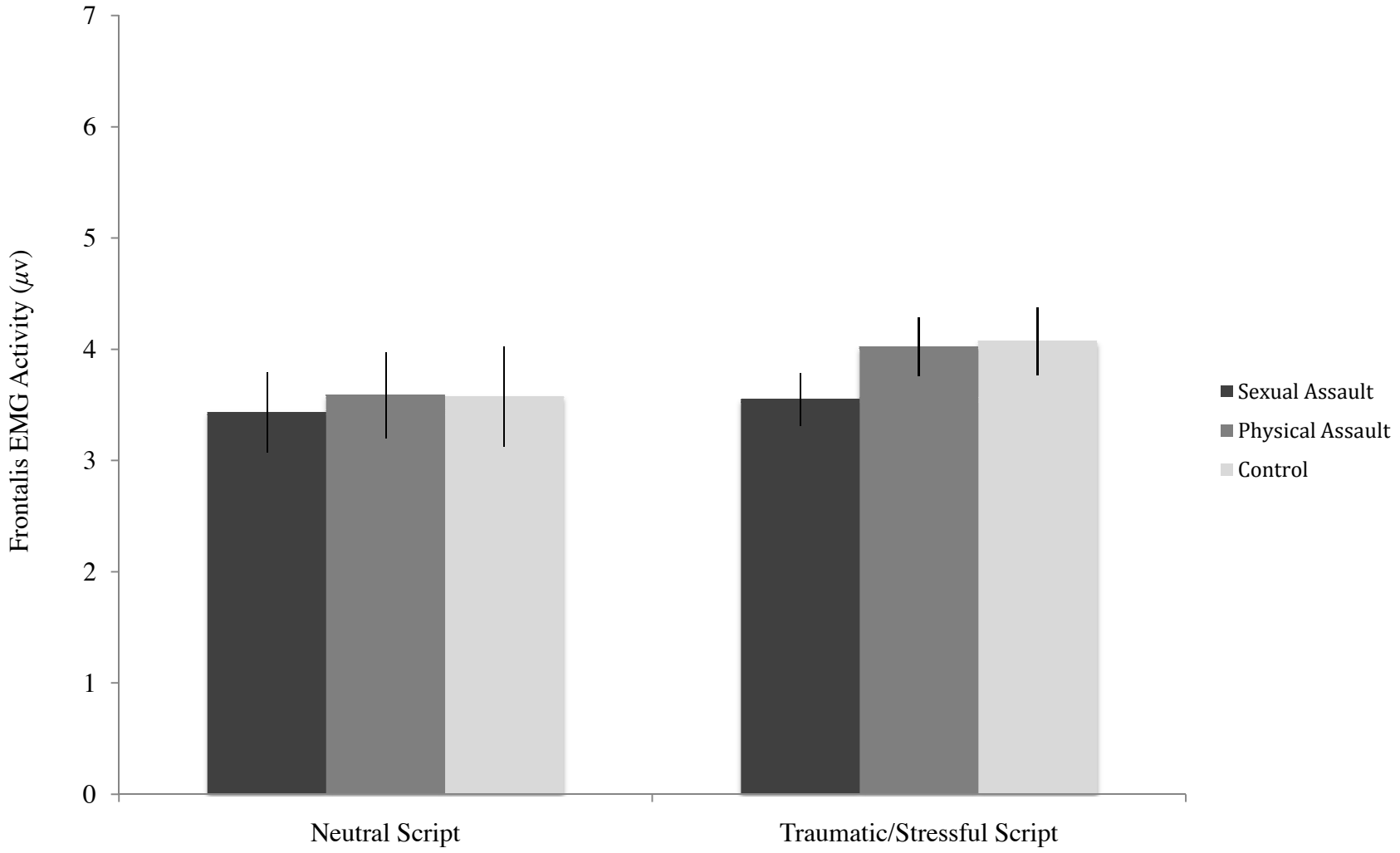
Neutral Script
Traumatic Script
Sexual Assault
Physical Assault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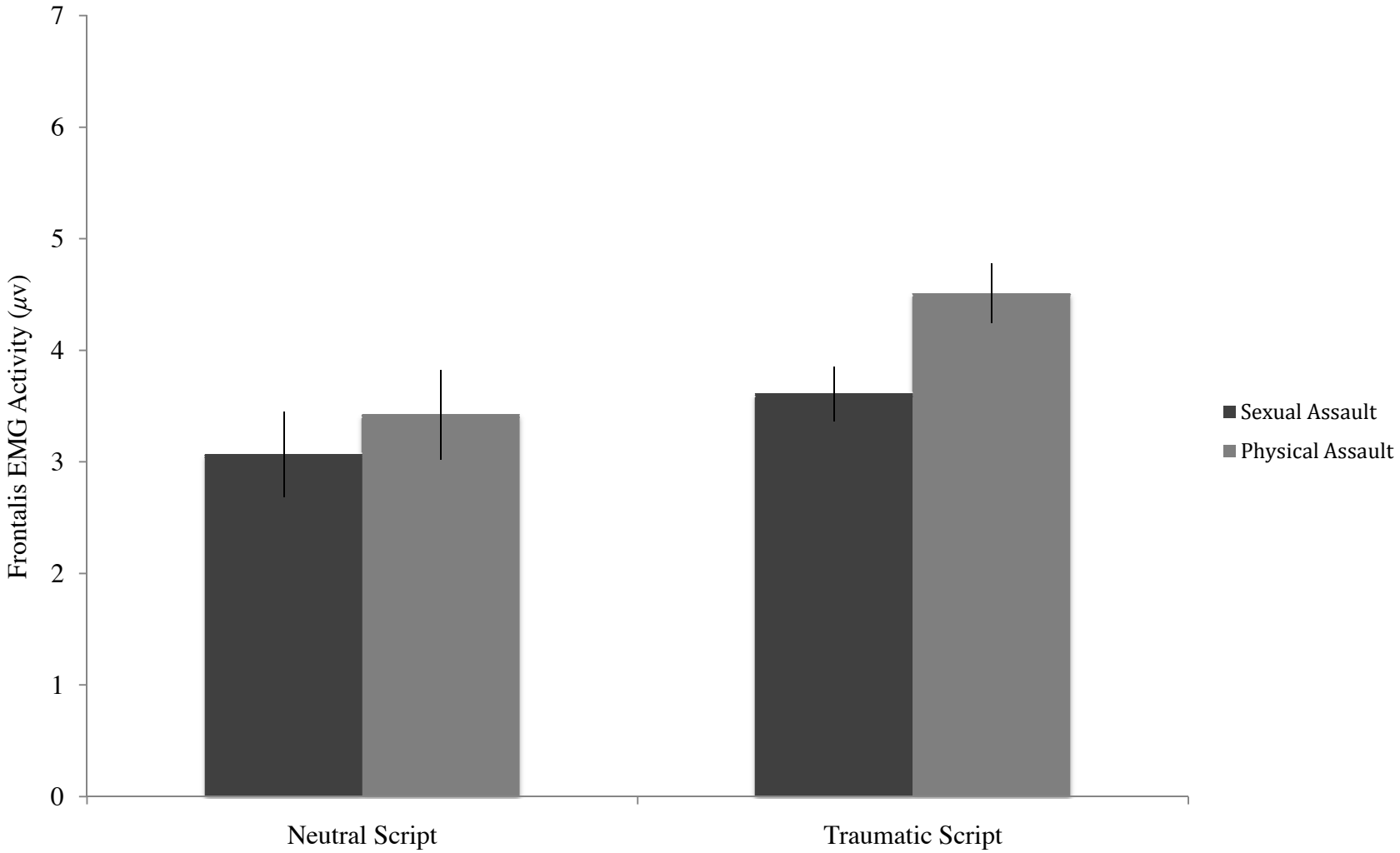
Neutral Script
Traumatic/Stressful Script
Sexual Assault
Physical Assault
Control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Traumatic Script
Sexual Assault
Physical Assault

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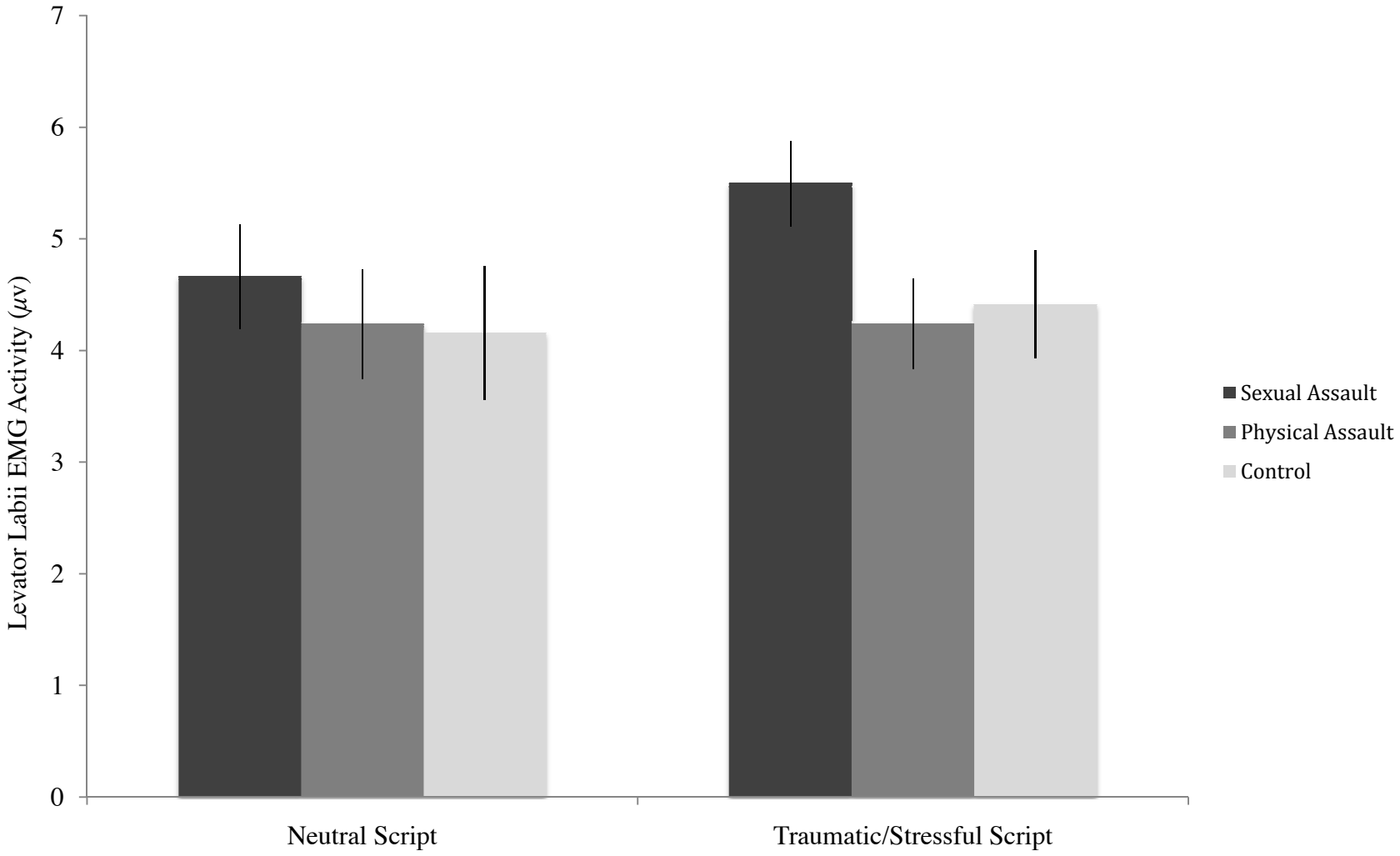
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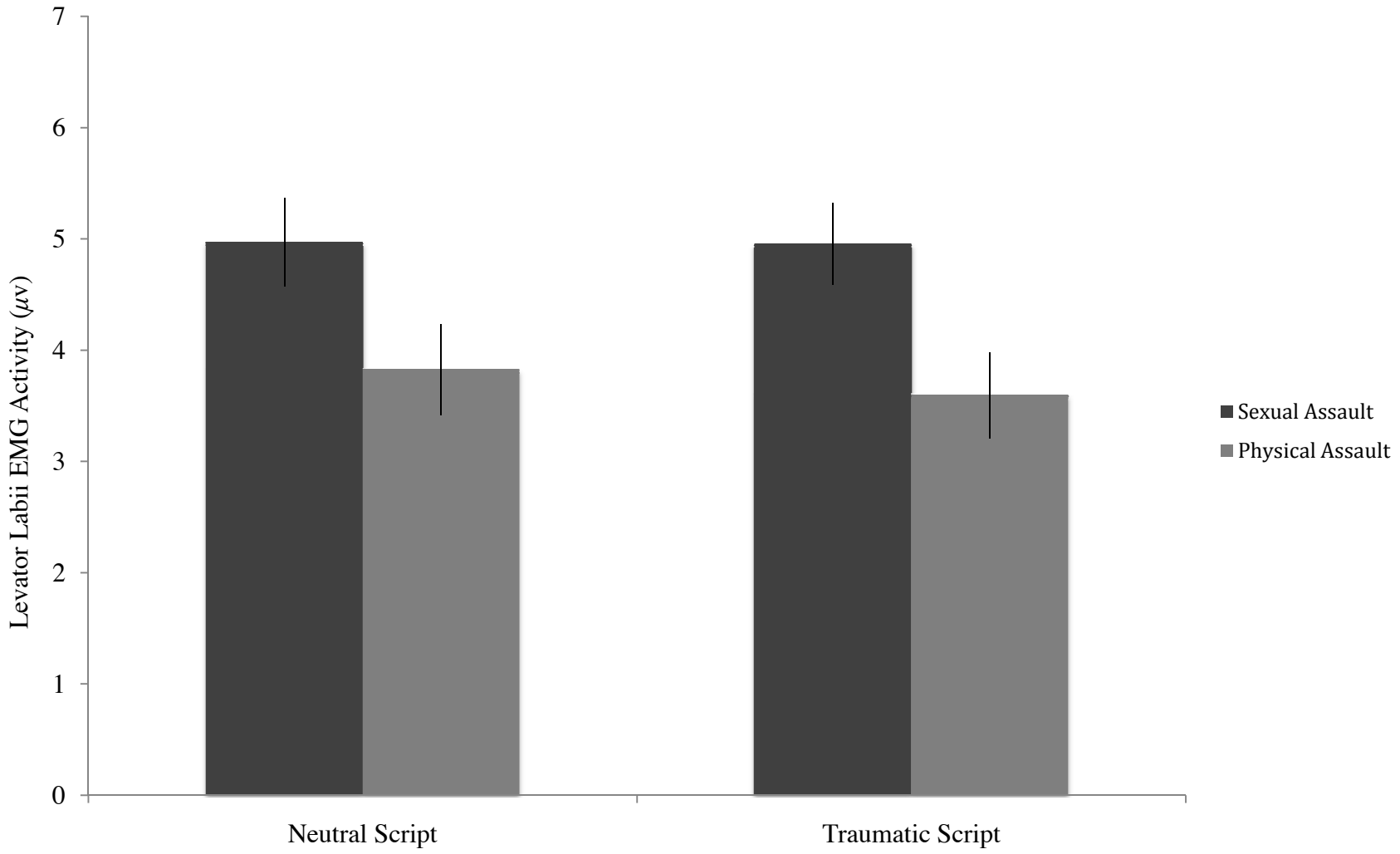
Neutral Script
Traumatic/Stressful Script
Sexual Assault
Physical Assault
Control


Levator Labii EMG Activity (μv)
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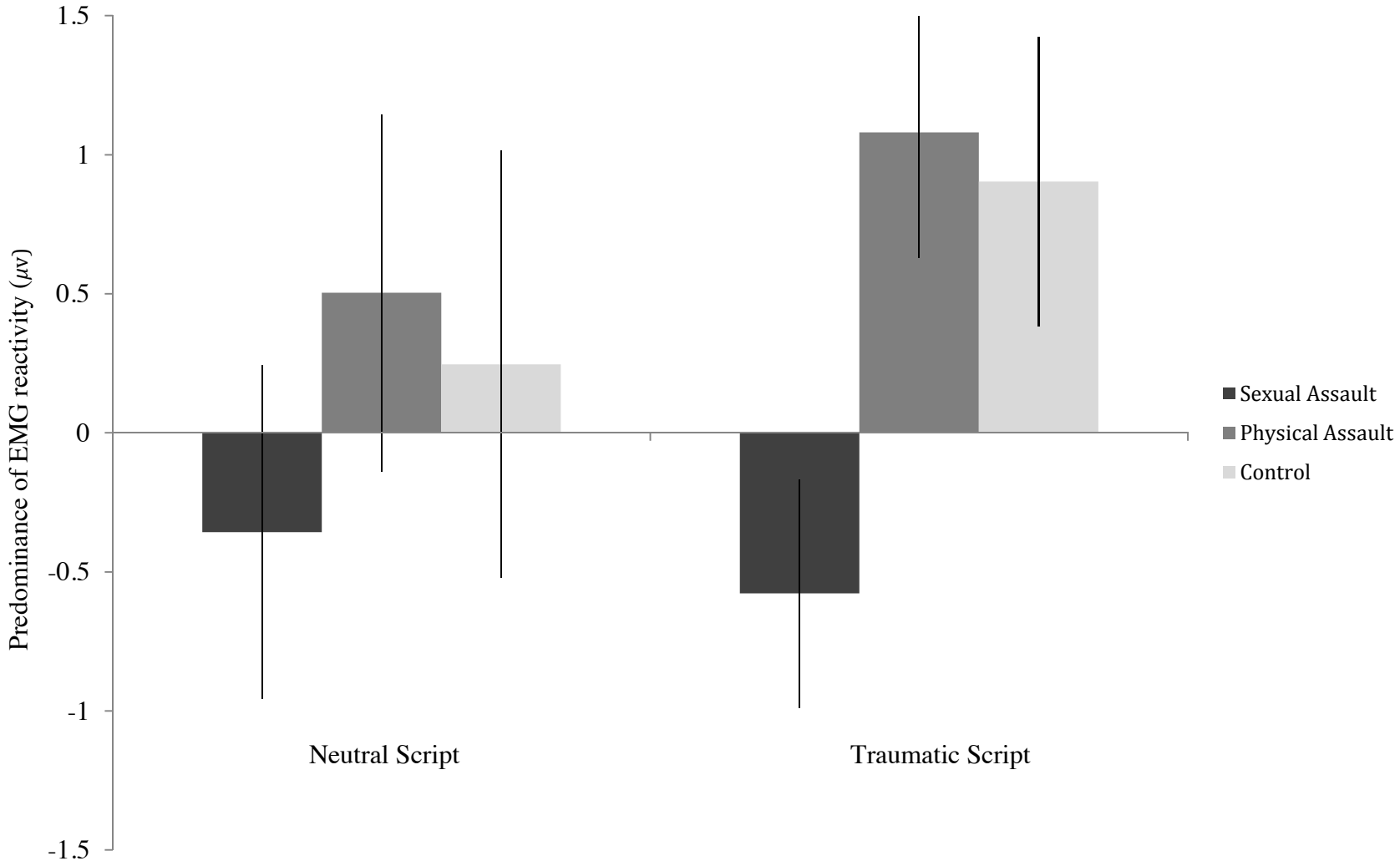
Neutral Script
Traumatic Script
Sexual Assault
Physical Assault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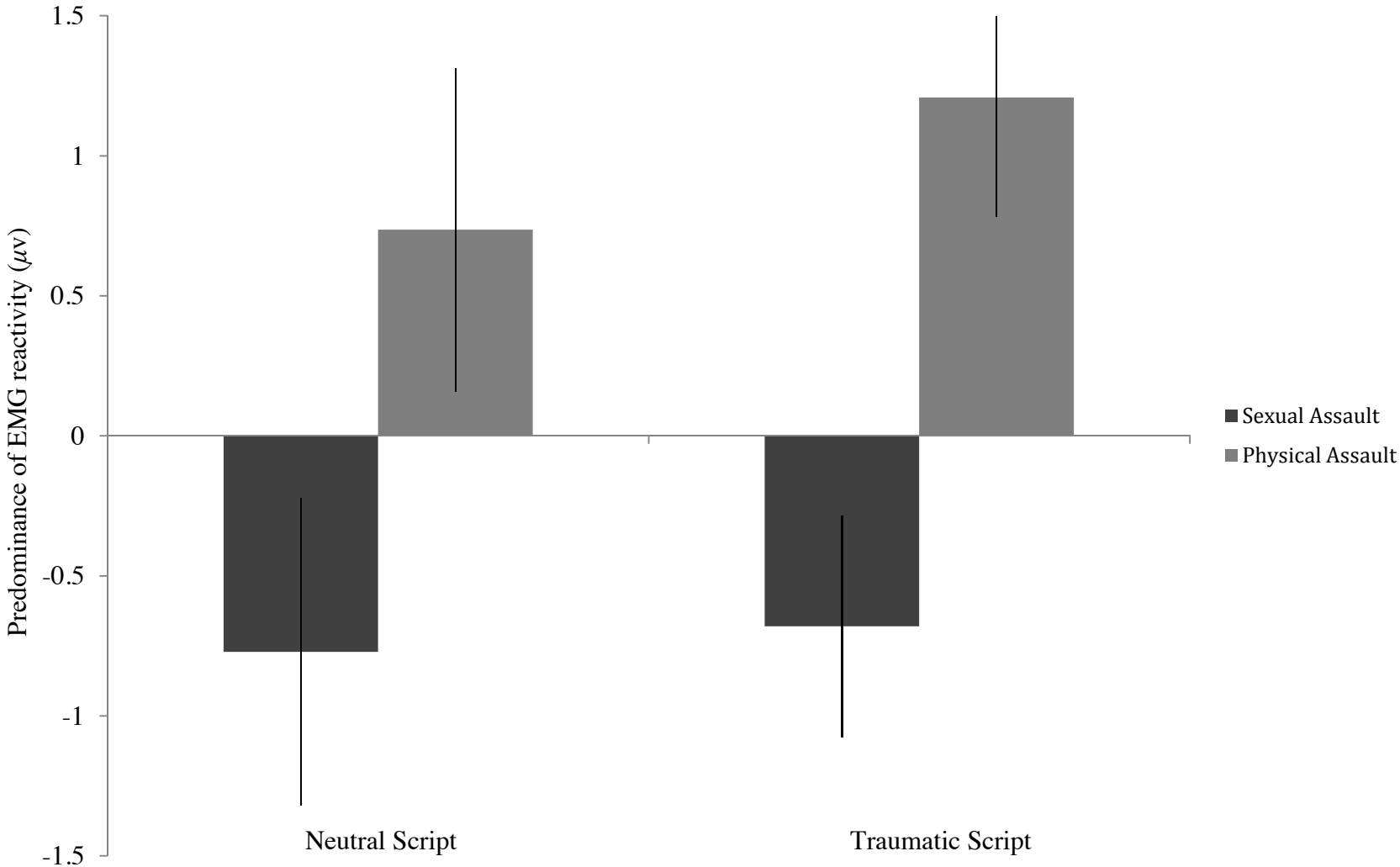
Predominance of EMG reactivity (μv)
Neutral Script
Traumatic Script
Sexual Assault
Physical Assault
Control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Predominance of EMG reactivity (μv)
Neutral Script
Traumatic Script
Sexual Assault
Physical Assault