

The Moderational Impact of Disclosure Following Trauma

by

Briana Fields

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by

Briana Fields

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April 2010

Graduate Supervisory Committee:

Manuel Barrera, Chair

Kristy Holtfreter

George Knight

Laurie Chassin

ACCEPTED BY THE GRADUATE COLLEGE

ABSTRACT

Contemporary theories of trauma identify the creation of a coherent trauma narrative and therapeutic exposure to trauma memories as potential recovery mechanisms. These factors are often inherent to the disclosure process, resulting in a parallel theoretical framework for experimental research that conceptualizes disclosure as a therapeutic intervention. The present investigation examined the moderational impact of disclosure following trauma on the link between trauma severity and symptoms of Posttraumatic Stress Disorder (PTSD). Disclosure status (discloser or nondiscloser), highest extent of disclosure, and length of delay to first disclosure were tested in a series of moderated regression models among a sample of female physical and sexual assault victims (N = 1087). Findings indicate that engaging in more detailed disclosure is associated with a modest beneficial impact on PTSD, but that the majority of nondisclosers have lower symptom levels than disclosers. There is also evidence for a small subset of nondisclosers that remain at heightened distress. A unique effect was found for disclosure delay, such that for physical assault, delaying disclosure is associated with a progressively weakening negative relation between time since the trauma and PTSD. At extreme delays, the association may become positive. Findings have implications for theories of trauma recovery and therapeutic interventions, including concerns about early interventions that emphasize disclosure. Future research may benefit from focusing on nondisclosing trauma victims to gain greater insight into recovery processes.

For my family – the greatest blessing of my life.

Thank you for your humor, support, and love.

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Strong interest in the psychological impact of trauma has emerged in the wake of increased public awareness of individual traumatic events (e.g., sexual assault) and high-profile mass traumatic events (e.g., terrorist attacks). Although once considered outside the realm of normal experiences (1%: Helzer, Robins, & McEvoy, 1987; see also DSM-III-R; American Psychiatric Association (APA), 1987), research on community samples has found that between 40 to 80% of the population has experienced a traumatic event (Breslau et al., 1991; Kilpatrick et al., 1987; Koppel, 1987; Norris, 1992; Resnick, Kilpatrick, Dansky et al., 1993). Trauma is associated with both acute and chronic mental health problems. Compared to nonvictims, victims of trauma are at higher risk for a range of psychiatric disorders, have lower levels of life satisfaction, and are more likely to report suicidal ideation and attempts (Chermack, Booth & Curran, 2006; Demaris & Kaukinen, 2005; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995; Kilpatrick et al., 1985; Kilpatrick et al., 1992; Kilpatrick et al., 2003; Nixon, Resick & Griffin, 2004; Resick, 1993; Saunders et al., 1992).

Trauma puts individuals at-risk of developing posttraumatic stress disorder (PTSD). Symptoms of PTSD involve re-experiencing or reliving elements of the trauma (e.g., intrusive thoughts), an intentional and persistent avoidance of trauma-related stimuli (e.g., places, thoughts), and increased physiological arousal (e.g., elevated heart rate: DSM-IV-TR, APA, 2004). Prevalence studies demonstrate that most victims of trauma experience these symptoms of posttraumatic stress, at least in the short-term. Many show substantial improvement within a few months of the traumatic experience (Kilpatrick et al., 1985; Norris et al., 1997), but even several years later some victims

remain significantly different from nonvictims on a range of mental health indices (e.g., Boudreaux et al., 1998; Fields, 2006; Frieze, Hymer & Greenberg, 1987; Kilpatrick et al., 1987; Norris & Kaniasty, 1994). Given the variation in outcome, it is essential to identify processes that facilitate recovery following trauma.

Disclosure, the acts of individuals expressing cognitions, affective states, or factual descriptions related to their traumatic experience, may reflect a mechanism that promotes recovery. Research on naturalistic trauma disclosure has primarily conceptualized it as a social act, but as more sophisticated theories of trauma have developed they suggest that disclosure may impact cognitive processes related to recovery. Although there has been some investigation of these models in experimental research, inconsistent findings suggest that aspects of disclosure may moderate its impact on outcome. Further, there have been few attempts to understand naturally occurring disclosure following trauma. Thus, the aim of the present study was to examine the relationship between trauma and disclosure. Specifically, it investigated how characteristics of disclosure might moderate the link between trauma severity and the symptoms of posttraumatic stress.

Cognitive Theories of Trauma

Understanding the potential role of disclosure in recovery first requires a working theoretical knowledge of how posttraumatic stress develops and how these symptoms may be resolved. Contemporary theories of trauma have integrated much of the underlying premises of early work and have become more comprehensive and nuanced in their explanations of how psychopathology develops following traumatic experiences.

Several of the most prominent contemporary theories offer detailed frameworks for understanding how memory and cognitive processing are uniquely related to the etiology of posttraumatic symptomatology.

Theories of associative memory networks propose that sensory and conceptual information from an experience are interconnected in memory; the activation of any aspect of that information is believed to activate the entire memory network. Building off the work of Lang (1977; 1979), Foa proposed that, in contrast to ordinary experiences, the severity of a traumatic experience leads to the creation of an associative fear network (Foa et al., 1989; Foa & Riggs, 1993; Foa & Rothbaum, 1998). Fear networks have stronger associative connections, a lower threshold for activation, and heightened psychophysiological responses compared to typical memory networks. The stimulus-response associations within these fear networks are sensitive to even vague indicators of threat. For example, a woman assaulted in her car might form associations between the car, fear, and her responses to the assault. Having to ride in a similar car would activate this memory network, resulting in posttraumatic symptoms of hypervigilance (arousal), recall of traumatic stimuli (intrusions), and efforts to escape it (avoidance).

Within an associative memory network, the stimulus-response associations responsible for producing posttraumatic stress symptoms can be weakened by integrating the associative fear network with nontraumatic memories. The binding of traumatic memories with ordinary memories is achieved by reducing avoidance, activating the fear network, and then modifying it with incompatible (i.e., nonthreatening) information. The woman assaulted in her car may discuss the trauma while sitting with a supportive friend

in the safety of her own home; the nonthreatening context is incompatible with the fear she associates with the assault. Thus, future contact with trauma-related stimuli should activate nonthreatening memories of the discussion with her supportive friend, in addition to the fear network, thereby weakening her response to it. Through sufficient exposure to trauma-related stimuli in a nonthreatening context, the associative network is modified and the fear response is extinguished. This theoretical foundation for recovery has resulted in effective and empirically supported treatments for patients suffering from PTSD (Foa et al., 1991; Foa et al., 1999). A crucial component of these treatments is exposure to the traumatic event, such as discussing the trauma or aspects of the trauma in a nonthreatening context. Doing so is theorized to diminish posttraumatic stress symptoms, such as avoidance and arousal, by weakening the stimulus-response association between fear and traumatic memories (Foa & Rothbaum, 1998).

Despite the appealing parsimony of a single associative memory network, advances in cognitive psychology suggest that multiple memory systems are involved in the etiology of posttraumatic stress symptoms. Multiple memory system theories propose that posttraumatic psychopathology is a reflection of trauma memories failing to be processed into the ordinary memory system. Specifically, sensory information may be encoded and stored differently than stimuli receiving conscious attention and processing. These memories can contain visual, olfactory, and auditory information, as well as affective and psychophysiological responses (e.g., bodily sensations). Instead of being processed into long-term memory storage, these aspects of the trauma memory are

theorized to exist in a separate memory system where they are prone to activation resulting in intrusions and subsequent arousal and avoidance.

Brewin and colleagues (1996; 2001) outlined a multiple memory system theory in which the form of the memory determines the quality of its retrieval. Typical memories are theorized as having a linguistic, narrative form that includes autobiographical content and context (e.g., temporal order). These memories are verbally encoded and subsequently stored in long-term memory where they can be deliberately retrieved and communicated to others. Although a range of information is processed during a traumatic event, Brewin suggested that the severity of a traumatic experience prevents some information from being incorporated into verbal memory and it is consequently stored in another memory system. The secondary system contains sensory information that was perceived too briefly or under too much distress to be processed into the verbal memory system. As these memories lack a verbal code, they are difficult to communicate and are poorly integrated into autobiographical, long-term memory. Without autobiographical content and context, these sensory memories create a sensation of immediate threat to the individual when they are activated (originally proposed by Ehlers & Clark, 2000). Their failure to be stored in long-term memory also means that they are easily and involuntarily triggered by trauma-related stimuli. These memories constitute the intrusive symptoms reported following traumatic events and are accompanied by psychophysiological arousal and avoidance.

Ehlers and Clark (2000) also proposed a multiple memory system model of trauma. They emphasized the encoding process and drew on research in cognitive

psychology that identified distinctions in data driven and conceptual processing (e.g., Roediger, 1990; Roediger & McDermott, 1992). Conceptual processing focuses on elements of context, organization, and themes or meaning, and Ehlers and Clark suggested that it is the mechanism by which trauma memories are integrated into autobiographical, long-term memory. Conversely, data driven processing comprises primarily sensory information and reflects heavy perceptual priming with weak pathways for intentional recall. An overreliance on data-driven processing is theoretically a result of the overwhelming nature of the traumatic event; the more severe or distressing the trauma the greater the reliance on data-driven processing. Consistent with this perspective, evidence suggests that even after controlling for severity, quality of processing predicts symptoms of posttraumatic stress (Ehlers & Clark, 2000; Halligan et al., 2003). Intrusive symptoms are traumatic stimuli that received data-driven processing, but failed to receive sufficient conceptual processing; thus, they are easily triggered and lack the temporal context that is associated with autobiographical memory. As noted previously, a lack of temporal context is believed to underlie the current sense of threat experienced during intrusive symptoms and the subsequent production of hyperarousal and avoidant symptoms.

Comparable to interventions derived from associative memory theory, interventions rooted in multiple memory system frameworks also call for activation of the traumatic memory in a nonthreatening context. Further, they suggest that adaptive cognitive processing of the trauma memory facilitates recovery and reduces the presentation of posttraumatic stress. Brewin (1989) advocated for deliberate processing

of traumatic stimuli such that sensory memories are converted into memories with a verbal code. Although sensory memories are not directly modified, Brewin suggested that parallel, verbal memories are created and thereby introduce retrieval competition. Verbal memories retain a retrieval advantage because they can be intentionally recalled and communicated and, as they are repeatedly accessed, inhibitory pathways develop that undermine posttraumatic stress responses. Verbal memories also contain the temporal context that places the threat in the past, further undermining psychophysiological responses to trauma-related stimuli. Similarly, Ehlers, and Clark (2000) linked recovery to the conceptual processing of traumatic stimuli. That is, by activating the traumatic memory and developing elements of context, organization, and meaning, traumatic stimuli are processed and stored in autobiographical, long-term memory.

Autobiographical memory creates a temporal context (placing the threat in the past) and reduces the likelihood of unintentional retrieval (Conway & Pleydell-Pearce, 2000; Ehlers & Clark, 2000). These theoretical frameworks have been translated into validated psychotherapeutic interventions for trauma in which disclosing and discussing trauma is the essential feature of treatment (e.g., Trauma-Focused Cognitive Behavioral Therapy: Cohen & Mannarino, 1996). As trauma victims recount their experiences, they are forced to present the information in a logical, related account and concurrently they create a verbal code for the memory and process it into long-term storage.

Although contemporary models of trauma differ on substantial points, there are significant similarities in their explanations of posttraumatic stress symptoms and mechanisms for recovery. Cognitive theories of trauma posit that the severity of a

traumatic event modifies normal processing mechanisms and creates maladaptive representations of the trauma memory. The result is trauma memories that are hypersensitive to activation (i.e., intrusions), create a sensation of immediate threat, and are consequently accompanied by psychophysiological arousal and avoidance. Efforts to suppress or escape intrusive symptoms paradoxically maintain them. Importantly, these theories also propose that symptoms of posttraumatic stress are ameliorated through deliberate cognitive activation and manipulation of traumatic memories. It is this action that is theorized to moderate the relation between a severe traumatic event and the occurrence of posttraumatic stress symptoms. Activation and manipulation in the form of incorporating incompatible (i.e., nonthreatening) information into the trauma memory (Foa & Rothbaum, 1998), creating a verbal representation of the trauma (Brewin et al., 2001), and processing the trauma into long-term memory (Ehlers & Clark, 2000) may each promote recovery. The ability to engage these recovery mechanisms may also be surprisingly accessible, as each can be achieved via linguistic expression. Linguistic expression, the use of verbal or written language to convey meaning, is the implicit cornerstone of most therapeutic interventions for trauma. Discussing a traumatic event can activate and manipulate the trauma memory in ways that are consistent with both the associative memory perspective and multiple memory system models of trauma and recovery. Given these factors, disclosure of a traumatic event may moderate the relation between trauma and the etiology of posttraumatic stress, even in the absence of a formal psychotherapeutic intervention.

Disclosure

Although most victims of trauma experience acute posttraumatic symptoms, the majority spontaneously recover within a short time frame and without formal psychotherapeutic interventions (Kilpatrick et al.; 1985; Norris et al., 1997). The resolution of acute symptoms may be reflective of natural processes that follow traumatic experiences. Negative life events compel most people to disclose their experience to others and disclosure of stressful events has been identified as an essential coping method (Pennebaker, 1993; Rime, 1999; Tait & Silver, 1989; Wortman & Silver, 1989). Therefore, it is hypothesized that, as victims of trauma engage in disclosure, this act of linguistic expression may alleviate symptoms of posttraumatic stress.

Investigations of disclosure as a process facilitating recovery have primarily developed out of the experimental literature. Pennebaker and Beall introduced an experimental disclosure protocol in which participants are randomly assigned to an experimental condition where they are instructed to write about (i.e., disclose) a traumatic event or to a control condition in which they write about a neutral topic. In Pennebaker and Beall's first study (1986), participants were assigned to one of the following conditions: (1) emotion writing – participants wrote only about the emotions of the traumatic incident, (2) factual writing – participants wrote only about the facts of the traumatic incident, (3) combined writing – participants wrote about the emotions and facts of the traumatic incident, or (4) control writing – participants wrote about an emotionally neutral event. Results demonstrated that participants in the combined writing group reduced their healthcare utilization in the weeks following the intervention.

A substantial body of research on experimental disclosure followed the intriguing findings from Pennebaker and Beall's early study. Over two hundred studies have examined experimental disclosure as a therapeutic intervention for a range of outcomes, with meta-analyses documenting significant overall effect sizes ($r = .075$, 48% unpublished studies: Frattaroli, 2006; $d = .257$, 23% unpublished studies: Smyth, 1998). Markers of physiological health demonstrate that the disclosure paradigm is helpful for immune system functioning, including improved liver function, HIV viral load, and dopamine levels (Frattaroli, 2006). It has also produced beneficial effects for general functioning, such as decreased time to securing employment (Spera, Buhrfeind, & Pennebaker, 1994) and improvement in grades (Pennebaker & Francis, 1996). Psychological health has been assessed in many of these studies and meta-analyses indicate a conservative overall r -effect size of .056 for mental health outcomes (Frattaroli, 2006). Examined more closely, significant improvements have been attained for anxiety, anger, depressive symptoms, well-being, and psychological distress, as well as marginally significant reductions in PTSD symptoms (Frattaroli, 2006). These results have led many researchers and clinicians to suggest that the trauma disclosure procedure is a viable psychotherapeutic intervention that positively impacts a range of functioning domains.

Several theories have been proposed to account for the beneficial effects of Pennebaker's trauma disclosure paradigm. Early models suggested that the primary mechanism of change was the expression of previously inhibited emotions (e.g., Pennebaker & Beall, 1986). Similar to the concept of catharsis, this theory posited that

withholding emotional expression creates psychophysiological stress and that disclosing provides relief from this stress. Nevertheless, as research on trauma disclosure has progressed, this hypothesis has proven insufficient and several reconceptualizations of the underlying mechanism have been proposed. Of the contemporary theories, a cognitive model of disclosure – one that draws on principles of classical conditioning and advances in cognitive psychology – most closely parallels the recovery mechanisms outlined by the major cognitive theories of trauma.

Consistent with the concept of an associative memory network for traumatic events, disclosure may function at a basic level to reduce the stimulus-response associations between trauma memories and psychophysiological threat responses. Following principles of learning and behavior, a sufficiently severe traumatic event produces conditioned responses to previously neutral stimuli. Subsequent contact with conditioned stimuli activates the associative memory network creating intrusions and evoking psychophysiological arousal and avoidance. Disclosure can serve to extinguish the threat response associated with aspects of the trauma memory. Under optimal conditions, disclosure activates the trauma memory in a nonthreatening context, prevents avoidance of the stimuli, and cognitively manipulates the memory by introducing new information (i.e., that the memory is not threatening). The process of disclosing consequently reduces the strength of the associations within the memory network. Analogous to exposure and desensitization procedures that have been used to successfully treat anxiety disorders such as PTSD, disclosure is theorized to modify the associative memory network resulting in reduced symptoms of posttraumatic stress.

Disclosure is also congruent with the cognitive recovery mechanisms proposed in trauma models implicating multiple memory systems (Brewin et al., 2001; Ehlers & Clark, 2000). The severe and distressing nature of a traumatic event overwhelms normal cognitive processing mechanisms that are responsible for converting mentally active stimuli into autobiographical, long-term memory. Thus, trauma memories fail to be fully stored in long-term memory and remain active. Sustained, repetitive activation results in the intrusive symptoms and related arousal and avoidance of posttraumatic stress; it also diverts resources from other cognitive processes that facilitate recovery, such as problem-solving or coping. Disclosure forces the processing and storage of active trauma memories. Rather than simply reducing stimulus-response associations, it may manipulate the quality of trauma memories allowing them to be stored in autobiographical, long-term memory.

Several aspects of disclosure have been proposed as potential markers of cognitive processing, including coherence, organization, and meaning/understanding of the trauma memory. Discussing the traumatic event with others may naturally force a victim to develop these elements when they disclose. Indeed, limited research on trauma narratives suggests that increased organization, reduced fragmentation, and increased coherence are associated with better outcomes (Foa, Molnar, & Cashman, 1995; Pennebaker, 1993). Once processed, trauma memories are integrated into long-term memory where they are no longer active and resources that were diverted to them can be redistributed to other psychological functions. For example, Klein and Boals (2001) found that disclosure of trauma was linked to increases in working memory.

A cognitive model of disclosure suggests that it directly impacts symptoms of intrusions, arousal, and avoidance by weakening stimulus response associations and by processing the trauma memory into a more adaptive form. Experimental studies have provided support for the concept of disclosure as a cognitive-processing mechanism. Schoutrop and colleagues (2002) found that trauma writing groups showed significantly fewer intrusions and avoidance from pre-treatment to six week follow-up compared to a wait-list control group. This is consistent with a number of other studies (Bernard, Jackson, & Jones, 2006; Bragdon, 2007; Morris, Linkemann, & Kroner-Herwig, 2006; Sloan, Marx, & Epstein, 2005; Sloan, Marx, Epstein, & Lexington, 2007). Nonetheless, some research has failed to find a relation between disclosure and measures of posttraumatic symptoms (e.g., Smyth, Hockemeyer, & Tulloch, 2008). A meta-analysis by Frattaroli (2006) found that experimental disclosure marginally reduces PTSD symptoms and the author suggested that the small number of studies examining PTSD, combined with small sample sizes, may have made significant effects difficult to detect. Given the theorized relation of disclosure to posttraumatic stress, this outcome may be crucial to advancing contemporary models of trauma and recovery.

Moderators of Disclosure

The varied and sometimes conflicting findings for experimental disclosure imply that the relationship between disclosure and outcome is likely complex. A cognitive perspective on trauma and disclosure suggests that disclosure moderates the relationship between a severe traumatic event and the occurrence of posttraumatic stress. It also outlines the conditions under which disclosure produce the greatest impact on recovery;

yet, these moderational characteristics of disclosure have received only limited examination in previous research. Two prominent and theoretically relevant features of disclosure that warrant further investigation are the extent and timing of disclosure.

The extent or “dose” of disclosure is an important factor in recovery; it reflects the degree to which an individual expresses cognitive, affective, and factual information related to the traumatic event. Defined experimentally as the duration and/or number of disclosure sessions, it is theoretically related to a reduction in PTSD symptomatology. A higher extent of disclosure is expected to facilitate the extinction of stimulus-response associations by providing sufficient exposure to traumatic stimuli (i.e., trauma memories) in a nonthreatening context. Further, adaptive cognitive processing of trauma memories from active forms into long-term memory is also reliant on the extent of disclosure; a greater degree of disclosure can create a more comprehensive and integrated trauma memory. Conversely, at low levels of disclosure, the exposure to traumatic stimuli and processing of trauma memories may be ineffectual. Consistent with this, for experimental disclosure a greater number of disclosure sessions (i.e., 3 or more) has been shown to moderate the effect of disclosure on psychological health and subjective impact (Frattaroli, 2006; see also, Smyth, 1998). Length of disclosure sessions (i.e., 15 minutes or more) also moderates the effect of disclosure on overall outcome (Frattaroli, 2006: but no effect for psychological health). Further, when the content of experimental disclosure has been examined, there is additional evidence that the extent of disclosure is a critical feature. Sloan, Marx, and Epstein (2005) assigned individuals with a trauma history and moderate posttraumatic stress symptoms to write repeatedly about the same trauma, write

about different traumas, or write about nontraumatic events. Participants who repeatedly wrote about the same trauma – producing a higher extent of disclosure – were significantly different than the other groups on measures of depression and PTSD at follow-up. Notably, writing repeatedly about the same trauma resulted in a nearly 70%, clinically meaningful, reduction in PTSD symptoms. These findings are consistent with a cognitive theory of trauma and disclosure that emphasizes the processing of trauma-specific stimuli as directly related to recovery.

Nonetheless, it is difficult to draw strong conclusions regarding extent of disclosure's impact on recovery because of substantial methodological variation in the experimental disclosure literature. Studies vary significantly in the number of sessions, length of sessions, and even the content of the disclosure (Smyth & Pennebaker, 2008). Cognitive theories of trauma and disclosure both frame recovery as activating and manipulating memories of a traumatic experience. Implicit in this is the assumption that disclosure focuses on a single, traumatizing experience. Yet, standard experimental instructions frequently allow participants (at their own discretion) to vary the writing topic both within and between sessions. Doing so undermines the construction of a coherent account of the trauma, a critical element in converting active trauma memories into long-term memory. It also reduces the frequency and extent of exposure to traumatic stimuli that are responsible for weakening conditioned associations. Thus, varying the disclosure topic can considerably dilute the “dose” of disclosure received, rendering it impotent. From a methodological perspective, it also makes accurately assessing the extent of disclosure and its impact on outcome a near impossibility.

The timing of disclosure – particularly the first time a trauma is disclosed – also has strong theoretical implications. Disclosure delay, the length of time elapsed from when the trauma occurred until the victim first discloses, may be related to recovery in several ways. Delayed disclosure may be associated with avoidant coping strategies such as thought suppression. Cognitive efforts to avoid thinking about the trauma likely prevent the processing of trauma memories and consequently maintain symptoms over time. Repeating cycles of symptoms could result in stimulus response associations (i.e., fear responses) that are resistant to modification. Consistent with this, avoidance has been related to slower recovery in some research (Dunmore et al., 2001; Ehlers et al., 1998). Although delayed disclosure is not necessarily synonymous with avoidance, it denotes that these individuals neither received nor sought trauma-specific support, resources, or interventions – thereby limiting opportunities for adaptive cognitive processing of trauma memories. Additionally, longer disclosure latencies may have a reduced impact on posttraumatic stress due to degradation of memory for the event. Research on memory suggests that, over time, less information is remembered for a specific event and more cues may be required to elicit features of the memory (e.g., Ebbinghaus, 1964; Hudson & Fivush, 1991). Thus, long disclosure delays may result in deteriorated memories that undermine the development of a comprehensive and integrated account of the trauma, which is necessary for effective storage in long-term memory. Although minimal research exists on long-term trauma recovery, meta-analytic research suggests that length of time from trauma to the experimental disclosure intervention significantly moderates

overall and psychological health, such that there is a larger effect size for shorter disclosure delays than for longer disclosure delays (Frattaroli, 2006).

There is also reason to believe that the relationship between disclosure delay and outcome may be complex and nonlinear. Emerging research on early interventions for PTSD suggests that focusing on disclosure in the immediate aftermath of trauma may be ineffective or even detrimental (Ehlers & Clark, 2003). A factor that may account for this is the acute psychophysiological distress that persists after a trauma and its impact on functioning (e.g., pain, work/school absences, relationship conflicts). These complications may prevent adaptive cognitive processing by influencing the temporal context of the trauma and impeding extinction of fear responses. Adaptive cognitive processing is theorized to require a temporal context that places the trauma in the past – thereby minimizing the sense of immediate threat and related symptoms of posttraumatic stress (Brewin & Holmes, 2003; Ehlers & Clark, 2000). Early disclosure may not function to establish the trauma as a past event, if the heightened distress results in the victim perceiving the trauma as an ongoing incident. Further, acute distress may alter disclosure's ability to act as a therapeutic exposure mechanism. Some research on learning and behavior in animal analog models found that immediate attempts at reducing the stimulus-response association produce temporary but not lasting effects. Milad and colleagues (2006) reported that extinction trials are equally effective when administered immediately after fear conditioning *or* following a short delay. However, the short delay fear reduction trials show significantly stronger extinction; whereas, early reduction trials result in greater spontaneous recovery of fear reactions. Indeed, acute fear has been

shown to facilitate memory retrieval and inhibit extinction by increasing the salience of the memory (Maren & Chang, 2006; Morris et al., 2005). Applying these findings to victims of trauma, early disclosure may not reduce the development of posttraumatic stress. Specifically, at very short disclosure latencies victims may be experiencing acute distress resulting in a curvilinear relation between disclosure delay and recovery. As the implications for intervention and recovery are substantial, further research is needed to clearly delineate how disclosure delay moderates the link between a traumatic event and PTSD symptomatology.

In addition to its limited examination of how extent of disclosure and disclosure delay may moderate the association between trauma and recovery, the experimental literature has also been constrained in its ability to identify what traumatic events derive benefits from the act of disclosure. Participants in most studies are free to choose the stressful or traumatic experience that they disclose, leading to a high degree of heterogeneity in topics. Within a single study, disclosure topics may range from life events such as divorce or beginning a new job to violent traumas such as sexual assault or natural disasters. Due to this, stressful and traumatic events have largely been undifferentiated in experimental disclosure research, despite the considerable differences in the quality of these experiences. Conventionally, trauma is defined by the severe and distressing nature of the event, including the experience of intense affective reactions (e.g., fear, helplessness, horror: DSM-IV-TR, APA, 1994). Stressful events may include features similar to trauma, but fail to replicate the intensity and distress that is theorized to disrupt adaptive cognitive processing. Thus, disclosure may differentially affect

stressful and traumatic events. Even within traumatic events there may be variation in the moderational impact of disclosure. The nature of some trauma types may lead to differences in disclosure behaviors or symptoms (e.g., avoidance). Yet, few experimental studies have directly compared different trauma types, so differences between these trauma victims are largely unexplored.

Social Disclosure

Despite some methodological limitations, experimental disclosure has provided intriguing evidence that linguistic expression of a traumatic experience can have beneficial effects on psychological health. An interesting possibility is that the mechanisms underlying experimental disclosure's impact on recovery may also be implicated in the social disclosure that occurs naturally after a traumatic event. Indeed, the experimental disclosure procedure is based on the implicit and sometimes explicit assumption that these interventions provide a substitute or an alternative for individuals who were unable to engage in sufficient levels of disclosure on their own (e.g., Lepore & Smyth, 2002; Swanbon, Boyce, & Greenberg, 2008; Zakowski, Ramati, Marton, Johnson & Flannigan, 2004). Further, research on experimental disclosure is frequently cited as evidence that social disclosure of trauma promotes recovery (e.g., Foa, 1997, Lepore & Smyth, 2002; Major & Gramzow, 1999). Although Pennebaker's experimental disclosure paradigm was introduced over twenty years ago, there have been few attempts to investigate whether common mechanisms underlie both experimental and social disclosure. Thus, it remains unclear to what extent experimental findings can be

generalized to social disclosure of trauma; however, some inferences regarding social context can be made from the existing experimental literature.

Most experimental disclosure studies are designed to facilitate an intrapersonal cognitive process, but they are not without social context. For example, participants' expectations of an audience to their disclosure may have unintended effects. Frattaroli (2006) conducted a meta-analytic study of experimental disclosure and found that studies in which participants retained their written disclosures, rather than turning them in to an experimenter, had marginally higher psychological effect sizes. Further, in an earlier study, participants who spoke English as a second language were instructed that they could write their disclosures in their primary language. Even when participants expressed a preference for writing in their primary language, the vast majority (99%) of the sample wrote in English (Frattaroli, 2003, as cited in Frattaroli, 2006). The author suggested that the expectation of an audience prompted participants to write in a way that would be comprehensible to their reader and may have influenced other aspects of disclosure. An audience may prompt participants to disclose with greater organization, coherence, and detail than if there is no audience for their disclosure. In doing so, they may inadvertently be engaging in a higher degree of cognitive-processing. Conversely, participants who anticipate an audience may censor their choice of trauma topic or elect to omit information from their disclosure. Concerns about the reactions of others at disclosure are frequently cited in the literature on social disclosure and may carry over into experimental disclosure studies (e.g., Binder 1981; Ullman, 1996b). Under these

conditions, the benefits of disclosure may be muted by restricted content and insufficient exposure.

Directly manipulating the effect of social context on disclosure, some limited research has explored the parallels between experimental and social disclosure by employing a confederate that provides either neutral, empathetic, or invalidating reactions to disclosure. Results are mixed but intriguing. Some studies have demonstrated that individuals who disclose to a supportive confederate – or even imagine disclosing to a supportive confederate – have improved outcomes over those who disclose without a direct audience or who imagine an unsupportive confederate (Cohen, Sander, Slavin, & Lumley, 2008; Donnelly & Murray, 1991; Rodriguez & Kelly, 2006).

Two laboratory studies by Lepore and colleagues provide thought-provoking and conflicting findings about experimental disclosure and social context. In each study, symptoms of posttraumatic stress were induced via a trauma film (i.e., Holocaust, dramatized gang rape) and participants were subsequently assigned to one of four conditions: (1) nondisclosure (control condition), (2) disclose alone, (3) disclose to a validating confederate, or (4) disclose to an invalidating confederate. Validating confederates maintained eye contact, nodded empathetically, reflected statements back to the participant, and agreed with the participant's thoughts and feelings. In contrast, invalidating confederates did not maintain eye contact, told the participant they had trouble paying attention to the disclosure, and disagreed with the participant's thoughts and feelings. Findings from the first study (Lepore, Ragan, & Jones, 2000) demonstrated that participants in the disclose alone and validating confederate conditions had the

lowest levels of intrusions and perceived stress. These results are consistent with theories of trauma and disclosure that suggest a nonthreatening context is necessary to reduce the associations between affective responses and trauma memories. In Lepore's second study (Lepore, Fernandez-Berrocal, Ragan, & Ramos, 2004), participants in the nondisclosure condition had longer reaction times to high-threat words on a Stroop test than participants in any of the disclosure conditions. Consistent with previous research (e.g., Klein, 2001), the authors suggested that this finding reflects unprocessed traumatic stimuli drawing on cognitive resources such as working memory. Although participants in all disclosure conditions of the second study showed modest improvements across emotional, cognitive (i.e., intrusions and avoidance), and physiological outcomes, participants who disclosed to a challenging confederate surprisingly showed the greatest improvements in mood and physiological reactance to the stressor (i.e., heart rate). Though the authors hypothesized that disclosing to an invalidating confederate may have resulted in threat minimization or response modification, it is unclear why this effect was not found in the first study as well.

Although research on confederate and audience effects remains too limited to make strong inferences regarding social disclosure, it does emphasize that the impact of disclosure is to a degree contingent on context. The disclosure process may be more salient when it involves disclosure of a personal trauma rather than a laboratory stressor, or when the disclosure recipient is a personal relationship rather than an unknown confederate. In contrast to experimental disclosure that has focused on cognitive processes, with only recent extensions into social context, research on naturally occurring

disclosure has primarily investigated a social model of trauma disclosure. It has been conceptualized as a mechanism for activating social support and gaining access to resources that promote recovery (e.g., Browne, 1991). Within this framework, considerable attention has been given to understanding patterns of disclosure (who victims tell about the trauma) and reactions to disclosure (how others react to the victim's disclosure). Understanding these variations in disclosure behavior and contextual factors may also be informative in understanding the adaptive benefits social disclosure.

Though most victims of crime and other traumas disclose their experience to others, the practice is by no means universal – simply put, some trauma victims will never disclose. By virtue of their defining feature, research on these nondisclosing victims is scarce. Estimates of nondisclosure following sexual assault suggest that as many as one third of victims fail to disclose (Golding et al., 1989; Koss, 1988; 1987; Ullman, 1996a) and rates of nondisclosure likely vary by characteristics of the traumatic event (e.g., 8% female physical assault nondisclosers, 12% female sexual assault nondisclosers: Fields, 2006). The absence of nondisclosers from the literature creates a vulnerability for contemporary models of both trauma and of disclosure. The assumption that disclosure is salutary has garnered support under experimental conditions; nonetheless, research on nondisclosure outside of the laboratory has been limited by the inherent difficulty of accessing this population. In one of the few studies to directly examine nondisclosure and outcome following trauma, female victims of crime who did not disclose were at no greater risk of depressive symptoms than disclosing victims (Fields, 2006). However, this study did not test theorized markers of cognitive processing

(i.e., posttraumatic stress symptoms) that may be directly impacted by disclosure. Indeed, some researchers have found that actively withholding disclosure reduces opportunities for cognitive processing and is associated with increased avoidant behaviors (Major & Gramzow, 1999; Wenzlaff & Wegner, 2000). Given that disclosure may reduce the occurrence of posttraumatic stress following trauma, the implications of nondisclosure are significant. The impact of nondisclosure may parallel that which has been theorized for long disclosure delays – that is, nondisclosure may maintain symptoms over time, produce stimulus-response associations that are resistant to modification, or result in memory deterioration that undermines processing of the trauma into long-term memory.

The most prominently researched population of nondisclosers is adult victims of childhood sexual abuse, for whom the findings have been mixed. Consistent with the perspective that trauma recovery is to some degree contingent on disclosure, several studies have found that nondisclosers of childhood sexual abuse have higher levels of posttraumatic stress symptoms than early disclosers (Arata, 1998; Ruggiero et al., 2004; Ullman & Fillipas, 2005). Conversely, other research has found no difference in PTSD symptomatology between these groups (Broman-Fulks et al., 2007; Testa, Miller, Downs, & Panek, 1992). While intriguing, it is difficult to compare disclosure behavior from traumas occurring in childhood to those of an adult or even an adolescent. Developmental factors considerably restrict a child's ability to engage in disclosure or even understand the nature of the event. Indeed, children are targets for victimization because these very factors decrease the likelihood that the perpetrator will be caught through a child's intentional act of disclosure. Children also have a smaller network of potential disclosure

recipients that for some may be as limited as just immediate family members; consequently, their opportunities for disclosure are reduced. In contrast, nondisclosure in adolescent and adult trauma victims is less likely to be the result of these factors. In light of these substantive differences, the investigation of nondisclosure outside of childhood trauma populations remains an important objective in understanding recovery following the experience of trauma.

For victims who elect to disclose, the context of that disclosure is a dominant area of research in the study of trauma. Victims disclose to a range of recipients, including both formal (e.g., police, medical personnel) and informal (e.g., family, friends) sources of support (e.g., Norris, Kaniasty, & Thompson, 1997). They also frequently report negative experiences with disclosure recipients, particularly with formal sources of support (Davis, & Brickman, 1996; Davis et al., 1991; Ullman, 1996b). Nevertheless, type of disclosure recipient does not appear to impact long-term adjustment or overall mental health outcomes. Consider that disclosure to law enforcement and the legal system is often characterized by victims as a negative experience (e.g., Campbell et al., 1999; Orth & Maercker, 2004). Yet, studies that examine outcome after disclosing to the legal system typically find that legal system variables account for little or no variance in the mental health outcomes of crime victims (PTSD: Frazier & Haney, 1996; Hammer, 1989; Orth & Maercker, 2004; depression: Tontodonato & Erez, 1994; for an exception when examining subjective impact of the legal system, see: Campbell et al., 1999). One potential explanation is that victims who disclose to formal sources of support are more likely to disclose to multiple recipients. In doing so, the impact of any single disclosure

experience may be mitigated. Consistent with this, a study on female victims of violent crime found that less than 1% disclosed to only a single formal support source and less than .5% disclosed to only law enforcement (Fields, 2006). Research on disclosure recipients has also served to highlight another factor that is crucial to understanding how social disclosure may impact recovery: reactions to disclosure.

The reactions trauma victims receive when they disclose have typically been construed as markers of social support, nonetheless, they may also impact the theorized cognitive-processing mechanism of disclosure. Positive reactions may facilitate recovery in that they provide a nonthreatening context within which traumatic memories are activated and manipulated – a necessary component for reducing the stimulus-fear response associations that underlie symptoms of posttraumatic stress. Although necessary, positive reactions are clearly not sufficient to achieve recovery. Positive reactions such as empathy and tangible support have demonstrated only a modest beneficial impact on recovery, if at all (e.g., Davis, Brickman & Baker, 1991; Kimmerling & Calhoun, 1994; Ullman, 1996b). In contrast, the literature on negative reactions to disclosure illustrates a consistent and detrimental impact on recovery (e.g., Davis & Brickman, 1996; Davis et al., 1991; Ullman, 1996b). These negative reactions encompass responses such as blaming the victim or expressing disbelief and their impact on recovery is present even when other factors known to affect outcome are controlled (e.g., trauma severity, time since trauma: Ullman, 1996c).

Negative reactions undermine the cognitive-processing benefits of disclosure in several ways, including inhibiting future disclosure. A study of sexual assault victims that

initially disclosed and subsequently withheld disclosure found that all participants were dissatisfied with the reactions they received at their initial disclosure (Ahrens, Campbell, Ternier-Thames, Wasco & Sefl, 2007). The authors described negative reactions such as blame and disbelief as “silencing” the victims’ attempts at disclosure. Thus, negative reactions may decrease the extent of disclosure – preventing sufficient exposure to extinguish fear responses or convert the trauma into long-term memory. Further, reactions that reflect blame or disbelief may constitute what has been referred to as “secondary victimization”: reactions that retraumatize the victim (Symonds, 1980). These negative reactions are threatening and may augment the fear and negative affect associated with traumatic memories, leading to a reinforced cycle of posttraumatic stress symptoms. Notably, it does not appear that negative reactions to disclosure are produced by initial levels of PTSD symptomatology, but instead are linked to the subsequent development of PTSD symptomatology (Andrews, Brewin, & Rose, 2003). However, studies examining disclosure as a primary predictor of recovery have generally not controlled for subsequent reactions, so these theorized relations lack strong empirical support. Indeed, several researchers have called for an investigation of this aspect in conjunction with other disclosure variables (e.g., Ruggiero et al., 2004).

The context of social disclosure (e.g., reactions) adds a layer of complexity to the moderational model of disclosure and recovery. It is unclear how context may directly relate to disclosure as, outside of reactions from disclosure recipients, empirical investigations of social disclosure have been limited. To date, these characteristics of social disclosure have been explored in only a small number of studies and have largely

not been studied together. Nonetheless, within this limited data, findings for extent and timing of disclosure have both demonstrated conditional effects on recovery.

Studies of trauma victims have typically defined extent of disclosure as the quantity and quality of the information disclosed. Consistent with findings in experimental disclosure, several studies have demonstrated that the extent of social disclosure is related to improved measures of outcome. In a sample of adult sexual assault victims, Ullman and Filipas (2001) asked adult sexual assault victims about the length and depth at which they had discussed their traumatic experience with others. Results demonstrated that extent of disclosure was marginally associated with reduced posttraumatic stress symptoms, after controlling for negative reactions to disclosure. Major and Gramzow (1999) also directly examined extent of disclosure in a moderational model. The authors followed over 400 women for two years after they had received abortions and examined both secrecy (i.e., withholding disclosure) and extent of disclosure. Results support a cognitive theory of trauma and disclosure: withholding disclosure was positively related to intrusions and avoidance, which were in turn related to heightened psychological distress. Participants were also asked to what extent they had disclosed their emotions about the abortion to others. Although extent of disclosure moderated the association between intrusions and distress, it was unrelated to psychological distress in women who were not experiencing intrusions. These findings are highly consistent with the theory that disclosure facilitates the processing of active trauma memories into long-term memory: to the extent that trauma-related stimuli (e.g., abortion-related cognitions) remain active, disclosure may compel their processing and

subsequently improve outcome. Major and Gramzow's research is the only study to-date that directly examines social disclosure as a cognitive-processing mechanism in the context of adult trauma victims. However, their work only examined extent of disclosure and did not address other theoretically relevant disclosure variables such as reactions to disclosure or timing of disclosure.

As with experimental disclosure delay, the length of time elapsed from the traumatic event until the victim engages in social disclosure may uniquely impact the link between experiencing trauma and the occurrence of posttraumatic stress. Early disclosure when a victim is under heightened distress may not produce beneficial effects, whereas long disclosure latencies may undermine the theorized cognitive processing effects of disclosure. For example, a recent study of adult trauma victims found that early disclosure of thoughts and feelings after trauma was associated with higher levels of PTSD over a 2-year period, compared to those who withheld initial disclosure (Seery, Silver, Holman, Ence, & Chu, 2008). Descriptive research on naturalistic disclosure suggests there may be substantial variation in the timing of initial disclosures. For instance, in a sample of adult sexual assault victims, 33% disclosed immediately, 37% within one year, and 30% delayed disclosure for more than a year (Ullman, 1996a). Disclosure delay may also be influenced by the type of trauma experienced. For instance, victims of physical assault may disclose earlier than sexual assault victims (Fields, 2006). Given the observed variation in timing of initial disclosure and the theorized impact on recovery, disclosure delay warrants investigation.

Within the literature on childhood sexual abuse, several studies have investigated disclosure delay as a major predictor of recovery with mixed results. Consistent with findings in experimental disclosure, three studies found that early disclosure is associated with lower levels of posttraumatic stress symptoms than disclosure occurring after a long delay (Arata, 1998; Ruggiero et al., 2004; Ullman & Fillipas, 2005). In contrast, research by Broman-Fulks and colleagues (2007) and Testa and colleagues (1992) demonstrated no differences between these groups on measures of posttraumatic stress symptoms. In interpreting the conflicting findings for disclosure delay, it is important to note that some of these studies failed to control for contextual factors, such as time since the trauma or reactions to disclosure; although several of the authors suggested that reactions to disclosure may be related to disclosure delay (e.g., Ruggiero et al., 2004). As discussed previously, it is also difficult to generalize findings from research on childhood sexual abuse victims to victims of adolescent or adult traumas. Factors such as the developmental stage of verbal skills and conceptual abilities at the time of trauma may limit a child's capacity to engage in disclosure. Studying adult victims of childhood sexual abuse is also problematic due to the length of time that has elapsed since the traumatic event, which could impact recall and level of prior disclosure.

In addition, the limited scope of focusing disclosure research on predominately sexual victimization has also prevented the application of findings across trauma types. Without comparative research, it is unclear if disclosure functions as a common process or has distinct effects related to characteristics of the traumatic event. For these reasons,

findings on social disclosure need to be replicated and expanded with adult trauma samples that extend beyond sexual victimization.

Current Study

Cognitive theories of trauma and disclosure conceptualize disclosure as a mechanism that facilitates recovery by reducing the strength of the associations between traumatic stimuli and psychophysiological responses, and by converting cognitively active trauma memories into long-term memory. Although experimental studies of disclosure have provided the most direct evidence for its role as a moderator of the relationship between trauma and psychological distress, the conclusions that can be drawn from this literature are limited by considerable methodological variation. Conversely, studies of social disclosure have primarily established contextual factors (e.g., reactions to disclosure) as influential in determining the impact of disclosure on outcome. Yet, social disclosure research has rarely evaluated disclosure as moderator that weakens the link between trauma and posttraumatic stress. The isolated elements of disclosure previously researched have resulted in fragmented and sometimes contradictory contributions to the theoretical development of disclosure and recovery models. Thus, the current study seeks to resolve this existing theoretical disconnect between experimental and social disclosure literatures by investigating a moderational model of disclosure. Via the testing of theoretically relevant moderators (i.e., timing and extent of disclosure) and controlling for contextual factors (i.e., reactions to disclosure, trauma type) it can help to resolve inconsistent findings in previous research and solidify theoretical models of disclosure.

Establishing the effects of naturally occurring disclosure has important implications for practice, as well as theory. Conventional wisdom and common clinical interventions promote disclosure as therapeutic for individuals who have experienced a traumatic event. Despite the intuitive appeal of advocating disclosure, there is surprisingly little empirical evidence to suggest that nondisclosure undermines recovery from traumatic events. Few studies have investigated nondisclosing trauma victims and the present study is able to make a direct and important contribution to our understanding of this population by studying them in comparison to disclosers while controlling other variables known to affect outcome. Further, current empirical support for disclosure as a psychotherapeutic intervention has not established the conditions under which it is beneficial - and there may be circumstances when disclosure has negligible or even adverse effects (e.g., Gidron et al., 1996). Findings for timing and extent of disclosure may be informative in the development or application of intervention programs. For instance, Critical Incident Stress Debriefing has been utilized as a therapeutic intervention for traumatized populations and involves interpersonal disclosure of trauma-related thoughts and feelings as a primary component (Mitchell & Bray, 1990). It combines a high extent of disclosure with almost immediate disclosure (i.e., no disclosure delay). Despite findings that were initially promising, this technique is not uniformly beneficial and has even demonstrated adverse effects (Raphael et al., 1995). Inconsistent findings for the therapeutic benefits of disclosure may reflect a failure to investigate potential moderators of disclosure. Thus, a primary aim of the current study is to identify specifically how timing and extent of disclosure influence recovery from a traumatic event.

The current study is in a strong position to build off of previous research while addressing some of the methodological limitations that have prevented solid conclusions from being drawn regarding disclosure and recovery. Although it is not possible to provide a direct test of cognitive processing, several aspects of disclosure believed to be essential to this function are included and the measured outcome – posttraumatic stress – is commonly accepted as a marker of maladaptively processed trauma. Additionally, current research on nondisclosing trauma victims is extremely limited and the sizeable subsample of nondisclosers in the current study provides a unique opportunity for testing hypotheses related to disclosure. In light of both theoretical and clinical implications of nondisclosure, this population is an essential element of understanding how disclosure influences outcome. Further, a subsample of women victimized by sexual or physical assault as an adolescent or adult (i.e., age 14 and over) was selected for this study and provides several distinct advantages for studying trauma disclosure. Utilizing a sample of non-child trauma victims addresses concerns about generalizing disclosure research from those victimized in childhood who may be limited by developmental factors. The inclusion of both physical and sexual assault also allows for comparison across traumas, an area that has largely been neglected in the research on disclosure of trauma. To the extent that trauma type is related to variations in disclosure experiences, it may predict what traumas derive the greatest benefits from disclosure. Finally, the large sample size employed by the current study affords it sufficient power to simultaneously investigate multiple predictors of outcome and their interactions. Given these factors, it is poised to make a meaningful contribution to the theory and practice surrounding trauma disclosure.

Hypotheses. The current study is a theoretically driven analysis of data from a large study of criminally victimized women attending a major metropolitan university. The study focused on the most distressing incident of sexual or physical assault that participants have experienced and collected information on their disclosure behavior and experiences regarding this traumatic incident. The following hypotheses are proposed:

Hypothesis one: disclosure status. It is predicted that disclosure status will moderate the association between trauma severity and post-traumatic stress symptoms. Specifically, it is expected that the relation between trauma severity and post-traumatic stress symptoms will vary by disclosure status such that nondisclosers will demonstrate a significantly greater positive relation between trauma severity and post-traumatic stress symptoms compared with disclosers.

Hypothesis two: extent of disclosure. It is predicted that extent of disclosure will moderate the association between trauma severity and post-traumatic stress symptoms, after controlling for negative reactions to disclosure. Specifically, it is expected that the relation between trauma severity and post-traumatic stress symptoms will vary by extent of disclosure such that those who report a low extent of disclosure will demonstrate a significantly greater positive relation between trauma severity and post-traumatic stress symptoms compared with those who report a high extent of disclosure.

Hypothesis three: timing of disclosure. It is predicted that timing of disclosure will moderate the association between trauma severity and post-traumatic stress symptoms, after controlling for negative reactions to disclosure. Specifically, it is expected that the relation between trauma severity and post-traumatic stress symptoms

will vary by timing of disclosure such that short delay disclosers will have a weaker relation between severity and PTSD scores than victims who engage in early disclosure or that have a long delay before disclosing.

Method

Participants

Original sample. Participants were from a study of college women and violent criminal victimization (Fields, 2006). The original sample (N=2,972) was recruited using procedures described below and represented approximately 9% of the total female ASU student population (N = 30,923: see Table 1). When compared to the general ASU population, the original sample was found to be equivalent on student status (undergraduate or graduate), age of undergraduates, and campus affiliation. The original sample differed slightly from the ASU population on age of graduate students (the mean age of graduate students was slightly younger for participants than in the ASU population), enrollment status (a greater proportion of participants were full-time students than in the ASU population), and ethnicity (a greater proportion of participants identified themselves as white or Caucasian than in the ASU population). The large proportion of full-time students from ASU's Main (Tempe) campus suggests that the majority of the study's participants were degree seeking. At the time of the study, most non-degree programs and courses were offered at the East and West ASU campuses and full-time students were more likely to be pursuing a degree than part-time students. Comparison data were based on ASU enrollment records for the 2003 student population.

Study subsample. Participants selected for the current study are a subsample from a previous study of college women and violent criminal victimization (Fields, 2006). The subsample was selected to reflect participants from the original sample who identified sexual or physical assault as the most severe trauma that they had experienced as an adult. Participants were excluded from the study subsample if: (a) they were a nonvictim, (b) if they endorsed robbery as their most distressing traumatic event, or (c) they had insufficient data on disclosure variables or the core outcome measure of posttraumatic stress symptoms. These selection criteria resulted in a study subsample of 1,087 participants, which is approximately 37% of the full sample from which it was derived.

When compared to the full sample from which it was derived, the study subsample did not differ significantly on demographics or student characteristics (see Table 1). Approximately equal numbers of participants endorsed sexual and physical assault as their most traumatic experience; however, a sizable proportion had experienced multiple forms of trauma. Fifty-seven percent of the current study's sample can be classified as polyvictimized – that is, they experienced two or more forms of trauma (i.e., robbery, physical assault, or sexual assault) in their history. Consistent with this finding, the National Comorbidity Study interviewed approximately 8,000 Americans between the ages of 15-54 and found that the majority of respondents had experienced 2 or more forms of trauma in their lifetime (Kessler, 1995; Kilpatrick, 2003). On average, the current study sample displayed a mild level of posttraumatic stress symptoms that is slightly lower than studies of other community trauma samples utilizing the same

measure (IES-R with male Vietnam veterans: Creamer, Bell & Failla, 2003). A low number of participants denied experiencing any symptoms (16.5%), whereas, a small proportion of the participants had scores indicative of severe symptoms (18%).

Participants in the severe range had scores similar to Vietnam veterans receiving hospital-based treatment for PTSD (Creamer, Bell & Failla, 2003).

Recruitment and Participation

A recruitment database was compiled from the ASU student directory by selecting every fourth and fifth conventionally female or gender neutral name (names were screened by native speakers from a variety of languages). Students selected using this method (N = 13,532) received an email inviting them to participate in the study. The message described the study, reviewed participation information, and provided a login password for the study website. Several weeks after the initial email, participants received a follow-up email reminding them of their option to participate. At the close of data collection, 22% (2,972 participants) of the recruitment sample had participated in the study. Internet response rates tend to be lower than mail response rates (direct comparison study 21% and 31%, respectively: Kaplowitz, Hadlock, & Levine, 2004; meta-analysis $M=34%$, $SD=15.7%$: Cook, Heath, & Thompson, 2000) and the participation rate of the current study is comparable to other internet-based research.

Procedure

All participants provided informed consent and completed the study survey through a password-protected website hosted by a professional survey management site. Participants enrolling in the lottery for participant incentives were redirected to a separate data page where their identifying information was not tied to their survey responses. Data were maintained behind a firewall and were only accessible by the principal investigator utilizing a secure password and user-id. At the conclusion of data collection, the survey instrument and all data were permanently and irreversibly deleted from the survey website.

Measures

Measures are listed in the order that they appeared in the survey instrument and are presented in full in Appendix B.

Demographics. Demographic characteristics were assessed using self-report items for student characteristics, age, and ethnicity.

Trauma: sexual assault. Sexual assault was defined as attempted or completed vaginal, oral, or anal penetration against consent by force or threat of force, or when the victim was unable to give consent (e.g., due to intoxication) occurring after the age of 14. This definition corresponds with most legal standards for sexual assault and attempted sexual assault while excluding instances that would legally be considered child molestation or statutory rape. Sexual assault was assessed using 18 items from the Sexual Experiences Survey – Short Form for Victims (SES-SFV; Koss, Bachar, & the SES Collaborative, 2004). Cronbach’s alpha for this scale was .86, indicating good reliability.

The prevalence rate for sexual assault in the original sample was 33%, which is comparable to prevalence rates obtained in other samples using the SES (e.g., 27.5%: Koss, 1993). Further, findings from the National College Women Sexual Victimization study projected that 20-25% of college women will be sexually victimized *during* their college career (Fisher, Cullen & Turner, 2000). A longitudinal study of undergraduate women also determined that 69.8% had experienced at least one incident of sexual violence since the age of 14 (Humphrey & White, 2000). Taking into account sexual traumas occurring during and prior to college, the victimization rate found in the current sample of graduate and undergraduate university women is comparable to other prevalence rates.

Trauma: physical assault. Physical assault was defined as a violent physical attack or threat of a violent physical attack with or without a weapon, occurring after the age of 14 and excluding incidents that met the previously specified definition of sexual assault. This definition parallels that of most legal standards for simple and aggravated assault. Physical assault was assessed using 11 items from a modified version of the Conflict Tactics Scale (CTS) with a response format modeled after the SES-SFV (CTS (NVAWS); Tjaden & Thoennes, 2000; SES-SFV; Koss et al., 2004). Cronbach's alpha for this scale was .88, indicating good reliability. The prevalence rate for physical assault in the original sample was 49.5%, which is consistent with prevalence rates obtained in other samples using the CTS (51.9%, NVAWS; Tjaden & Thoennes, 2000). In a national study of undergraduate women, 32% had experienced physical assault by an intimate partner since the age of 14 (White & Koss, 1991). Considering the likelihood of physical

assaults by other assailants (e.g., peers, strangers, relatives), these numbers are comparable to the victimization rate found in the current sample of graduate and undergraduate university women.

Trauma type. Trauma type was assessed through a single item that asked participants to identify which single traumatic incident endorsed on the trauma measures was the most severe and caused them the greatest distress. Based on the response to this item, participants were categorized as traumatized by sexual assault or physical assault (i.e., trauma type). Participants were instructed to reference this specific trauma when responding to the remainder of the survey.

Trauma characteristics. Characteristics of the trauma incident were collected through self-report items assessing subjective trauma severity and time since the trauma. Participants indicated subjective trauma severity on a 5-point scale indicating the extent to which they felt the trauma had been severe or distressing. Time since trauma was calculated in years utilizing the participant reported month and year of the traumatic event.

Posttraumatic stress symptomatology. Symptoms of posttraumatic stress were assessed using the Impact of Event Scale – Revised (IES-R; Weiss & Marmar, 1997; Weiss, 2004). The IES-R is a self-report, 22-item measure, utilizing a 5-point scale to assess symptoms within the past 7 days. Normative data have been collected and clinical cutoffs have been established (i.e., 1.4: Asukai, Kato, Kawamura, Kim, Yamamoto, et al., 2002; 1.5: Creamer, Bell & Failla, 2003;). An IES-R diagnostic cutoff of 1.5 when

compared to the established PTSD Checklist cutoff of 50 (PCL: Weathers, Litz, Herman, Huska, & Keane, 1993) provides a sensitivity of .91, specificity of .82, positive predictive power of .90 and negative predictive power of .84 (Creamer, Bell, & Failla, 2003).

Adjusted for the response scale used in the current study (i.e., cutoff of 2.5), this criterion indicates that approximately 28% of study participants had scores suggestive of clinically elevated posttraumatic stress symptoms. Cronbach's alpha for the full scale was .96, indicating high reliability. Cronbach's alpha for the symptom clusters subscales was: .93 for Intrusions, .90 for Avoidance, and .91 for Hyperarousal.

Disclosure: disclosure status. Disclosure status regarding the trauma was assessed through a dichotomous item asking if the participant had disclosed to anyone prior to the study. Participants indicating that they had not disclosed prior to the study were classified as nondisclosers.

Disclosure: disclosure delay. Length of disclosure delay following the trauma was assessed using an item with 8 ordinal response options ranging from disclosure during the trauma to disclosure more than a year after the trauma. Response options for this item were ordinal, but with varying units (e.g., days, months, years); thus, prior to data analysis disclosure delay was re-scaled to reflect the proportion of days elapsed after the trauma until disclosure.

Disclosure: highest extent of disclosure. Overall extent of disclosure for each type of disclosure recipient was assessed using a 5-point scale where 5 reflects a high extent of disclosure (i.e., "I told them what had happened and we talked about it in great

detail”). The highest level of disclosure endorsed for any disclosure recipient was then coded as the participant’s highest extent of disclosure.

Negative reactions: victim blame. Perceived victim blame was assessed using 6 items from the blame scale of the Social Reactions Questionnaire (SRQ; Ullman, 2000). Scores were averaged across reports for all disclosure recipients to create a continuous variable with higher scores reflecting a greater degree of victim blame. Cronbach’s alpha for this scale was .70.

Negative reactions: disbelief. Perceived disbelief was assessed using 6 items from the belief scale of the Social Reactions Questionnaire (SRQ; Ullman, 2000). As the original scale is intended to assess belief, responses were reverse-coded to reflect disbelief. Scores were averaged across reports for all disclosure recipients to create a continuous variable with higher scores reflecting a greater degree of disbelief. Cronbach’s alpha for this scale was .76.

Results

Preliminary Analyses

Descriptive analyses for all continuous variables are presented in Tables 2 and 3. Time since trauma and disclosure delay were highly and positively skewed (i.e., greater than 2: Curran, West, & Finch, 1996). Frequencies for categorical variables are presented in Tables 4 and 5. A summary of all bivariate correlations between predictor, covariate, and criterion variables is presented in Table 6. Perceived blame failed to correlate with the criterion, PTSD symptomatology. No predictor and covariate correlated higher than r

= .22, suggesting that multicollinearity was unlikely to present a substantial problem within the proposed models. Within the regression models, multicollinearity was assessed formally by examining tolerance. A series of ANOVAs with post-hoc comparisons was conducted to test the relation of the proposed covariate, ethnicity, to the criterion and predictors. There were no significant differences between ethnic groups on PTSD symptomatology or disclosure variables (disclosure status, extent of disclosure, disclosure delay).

Proposed covariates that were significantly related to the criterion, PTSD symptomatology, were retained for further testing. These covariates included time since trauma, disbelief, and trauma type. Blame and ethnicity failed to show a relation to either PTSD or disclosure variables and, consequently, were eliminated from further analysis. Prior to model-testing, a series of preliminary regression analyses were run to assess the effects of potential covariates within the model and are reported separately for each model.

Model-Testing Analyses

A series of hierarchical regression analyses, utilizing ordinary least squares, was used to test main and moderating effects for models examining the interrelations between disclosure, trauma severity, and PTSD symptomatology. Prior to testing the regression models, significant interactions among covariates and predictors were examined for each model utilizing separate analyses; accordingly, significant higher order interaction terms were included in the final models. Variables were entered into the hierarchical regression

equations in the following order: (1) covariate variables; (2) main effect variables; (3) two-way interaction terms, where applicable; (4) three-way interaction terms, where applicable.

Centering and coding of variables. In order to reduce nonessential multicollinearity (correlations between interaction terms and lower order terms) and to ease interpretation of the regression coefficients of lower order terms, all continuous predictor variables were centered prior to inclusion in analyses. Continuous variables were centered by subtracting the mean from each raw score. Dichotomous variables were given dummy codes of 0 and 1, as follows: disclosure status was set at 1 = nondiscloser and 0 = discloser and trauma type was set at 1 = sexual assault and 0 = physical assault.

Multicollinearity and regression diagnostics. Following each regression, the model was examined for evidence of multicollinearity and influential outliers. Problematic influence on the entire regression model was assessed with an examination of DFFITS (in SPSS), and DFBETAS (in SPSS) at a per case level for each model. Due to the large sample size, traditional recommendations that suggest cases be examined if they exceed an absolute value of 1.0 (Neter, Wasserman, & Kutner, 1989), were insufficient for detecting influential cases in the current study. Thus, a separate cutoff score was calculated for both DFFITS and DFBETAS for each model based on the equations and recommendations presented by Cohen, Cohen, West & Aiken (2003), and was applied accordingly. Cases that exceeded the cutoff values were removed, the variables in the model were recentered, and the model was rerun. Outliers were investigated for potentially invalid data that might explain the findings and justify

removal of the case from the model. They were also examined for evidence of extreme values on other variables within the model (e.g., time since trauma, disbelief) or on demographic features (i.e., age). The results of these analyses are reported individually for each of the following regression models.

Additionally, because multicollinearity can produce unstable regression coefficients, larger confidence intervals, and a decreased probability of rejecting the null hypothesis, evidence of multicollinearity was examined for each model (Cohen et al., 2003). As low tolerance levels are considered an indication of problematic multicollinearity, tolerance values were inspected for each individual model to detect potential problems. Where applicable, models demonstrating low tolerance values were investigated further and the results are reported individually for each model below.

Nondisclosure, Severity, and PTSD Symptomatology.

Nondisclosers will demonstrate a significantly greater positive relation between trauma severity and post-traumatic stress symptoms compared with disclosers. A regression analysis was used to test the relation between disclosure status, trauma severity, and PTSD symptomatology. Prior to testing the model, time since trauma and trauma type were tested as potential covariates. Both showed a significant relation to the criterion, PTSD symptomatology. No significant two-way or three-way interactions were found between predictors and covariates. Thus, time since trauma and trauma type were retained as covariates and entered in the first block of the model. Trauma severity and disclosure status were then entered in the second block. A two-way

interaction term between disclosure status and trauma severity was entered in the final block of the regression model.

Results of this analysis, presented in Table 7, did not support the hypothesis that trauma severity would interact with disclosure status ($\beta = -.03, t = -.79, p = .43$). Additionally, disclosure status was not a significant predictor of posttraumatic stress symptomatology ($\beta = -.002, t = -.06, p = .96$). Although the model demonstrated adequate tolerance (.81-.96), regression diagnostics identified 21 cases (2% of the total cases) that had values exceeding the cutoffs set for the final model.

The model was reanalyzed with outliers removed (Table 8). As predicted, a significant interaction was detected between disclosure status and trauma severity; however, contrary to prediction, disclosing victims showed a stronger positive relation between trauma severity and PTSD symptomatology than did nondisclosing victims (see Figure 1). Simple slope analyses were conducted for the regression of PTSD symptomatology on trauma severity at both disclosing and nondisclosing victim levels of disclosure status. At the disclosing victim level, trauma severity showed a significant positive, linear relationship to level of PTSD symptomatology ($\beta = .41, t = 13.73, p < .001; R^2 \text{ change} = .01$). For disclosing victims, a one standard deviation increase in trauma severity predicted a .41 standard deviation increase in symptoms of PTSD. Conversely, at the nondisclosing level, trauma severity was not significantly related to level of PTSD symptomatology ($\beta = .16, t = 1.59, p = .12; R^2 \text{ change} < .01$).

Although the exclusion of outliers from this model significantly improved the fit, results should be interpreted with caution. The majority of the outliers for this model were nondisclosers. These nondisclosing victims accounted for roughly 14% of the nondisclosing sample and may reflect an important subset of victims that deviate from pattern of the majority of nondisclosing victims. Descriptive analyses were conducted revealing that outlying nondisclosers were significantly higher than the nonoutlying nondisclosers on trauma severity ($M = 4.12$ versus $M = 3.36$) and PTSD symptomatology ($M = 2.87$ versus $M = 1.72$); however, there were no significant differences by time since trauma or trauma type.

A post-hoc examination of the PTSD symptom clusters revealed that the majority of nondisclosers had significantly lower levels of intrusions ($M = 1.56$ versus $M = 1.92$) and hyperarousal ($M = 1.42$ versus $M = 1.80$) than disclosers, but there were no differences by avoidant symptoms ($M = 2.19$ versus $M = 2.25$). Comparing means, the outlying nondisclosers had symptoms of intrusions ($M = 2.75$), hyperarousal ($M = 1.80$), and avoidance ($M = 3.17$) that were higher than disclosers.

Extent of Disclosure, Severity, and PTSD Symptomatology.

Victims who report a low extent of disclosure will demonstrate a significantly greater positive relation between trauma severity and post-traumatic stress symptoms compared with those who report a high extent of disclosure. Prior to testing the model, time since trauma, trauma type, and disbelief were tested as potential covariates. All showed a significant relation to the criterion, PTSD symptomatology. No

higher-order interactions between predictors and covariates were significant in the full model. Thus, time since trauma, disbelief, and trauma type were retained as covariates and entered in the first block of the model. Trauma severity and extent of disclosure were then entered in the second block as predictors. The two-way interaction term between trauma severity and extent of disclosure was entered in the final block of the regression model.

Results of this analysis, depicted in Table 9, did not support the hypothesis that extent of disclosure moderates the relation between trauma severity and PTSD symptomatology. The interaction between extent of disclosure and trauma severity was nonsignificant ($\beta = -.04, t = -.91, p = .36$). Extent of disclosure was also not a significant predictor of posttraumatic stress symptoms ($\beta = -.02, t = -.49, p = .63$). The model demonstrated adequate tolerance (.78-.95) and regression diagnostics identified 16 cases (2% of the total cases) with values exceeding model cutoffs.

The model was reanalyzed with outlying cases excluded and results of this analysis, depicted in Table 10, support the hypothesis that extent of disclosure moderates the relation between trauma severity and PTSD symptomatology. As predicted, a significant two-way interaction was detected between extent of disclosure and trauma severity ($\beta = -.08, t = -2.35, p = .02; R^2 \text{ change} = .01$). The interaction was probed following the recommendations of Aiken and West (1991). Results of simple slope analyses (Figure 2) indicate that victims who report a lower extent of disclosure demonstrate a significantly greater positive relation between trauma severity and post-

traumatic stress symptoms ($\beta = .46, t = 9.81, p < .001$) compared with those who report a higher extent of disclosure ($\beta = .31, t = 6.74, p < .001$).

The exclusion of outliers from this model significantly improved the fit of the model without altering the pattern of results. There was no indication of a pattern within the outlying cases or that they were outliers on multiple dimensions (i.e., other variables within the model or demographic features). Descriptive analyses revealed that outliers engaged in a significantly lower extent of disclosure ($M = 3.5$) than nonoutliers ($M = 4.37$). Additionally, outliers perceived significantly higher levels of disbelief from disclosure recipients ($M = 2.99$) than did nonoutliers ($M = 2.45$). Outliers were not significantly different from nonoutliers on trauma severity, trauma type, time since trauma, or PTSD symptomatology.

Disclosure Delay, Severity, and PTSD Symptomatology.

Victims who have only a short delay before disclosing will demonstrate a weaker positive relation between trauma severity and PTSD than those who engage in early disclosure or who have a long delay before disclosing. A regression analysis was used to test the relation between trauma severity, disclosure delay, and PTSD symptomatology. Prior to testing the model, time since trauma, trauma type, and disbelief were tested as potential covariates. All showed a significant relation to the criterion, PTSD symptomatology. Significant three-way interactions were also detected between predictors and covariates. Quadratic disclosure delay and linear disclosure delay both interacted with time since trauma and trauma type producing three-way interactions.¹ No

other significant interactions were found for the full model. Accordingly, time since trauma, disbelief, and trauma type were retained as covariates and entered in the first block of the model. Trauma severity and disclosure delay (linear and quadratic) were entered in the second block of the model. Two way interactions between trauma severity, linear disclosure delay, time since trauma, and trauma type were entered in the third block of the model. Two-way interactions between trauma severity, quadratic disclosure delay, time since trauma, and trauma type were entered in the fifth block. The final block of the model contained three-way interactions between trauma severity, disclosure delay (linear and quadratic), time since trauma, and trauma type.

Results of this analysis do not support the hypothesis that disclosure delay moderates the relation between trauma severity and PTSD symptomatology (linear disclosure delay: $\beta = .24, t = 1.5, p = .14$; quadratic disclosure delay: $\beta = -.24, t = -1.41, p = .16$). As the exclusion of nonsignificant terms can increase efficiency in regression analysis, the final model was estimated with nonsignificant interaction terms between trauma severity and disclosure delay dropped from the analysis. Based on the final model, depicted in Table 11, a marginally significant three-way interaction was detected between quadratic disclosure delay, time since trauma, and trauma type ($\beta = -.1.85, t = -1.75, p = .08$). Due to the inclusion of multiple curvilinear and interactive terms, tolerance values for this model were low (.01-.96). Regression diagnostics were utilized to identify 17 cases (2% of the total cases) that had values exceeding the cutoffs set for this model.

The model was re-estimated with outlying cases removed. As in the previous estimation of this model, results of this analysis do not support the hypothesis that disclosure delay moderates the relation between trauma severity and PTSD symptomatology (linear disclosure delay: $\beta = .25, t = 1.52, p = .13$; quadratic disclosure delay: $\beta = -.27, t = -1.58, p = .11$). The final model was estimated with nonsignificant interaction terms between trauma severity and disclosure delay excluded and results are depicted in Table 12. A significant three-way interaction was detected between quadratic disclosure delay, time since trauma, and trauma type. The interaction between quadratic disclosure delay and time since trauma was significant at the physical assault level ($\beta = 7.45, t = 4.66, p < .001; R^2 \text{ change} = .04$), but not at the sexual assault level ($\beta = -.35, t = -.52, p = .61; R^2 \text{ change} < .01$) of trauma type. Thus, at the physical assault level of trauma type, PTSD symptomatology was regressed on time since trauma at levels of disclosure delay. Results of these simple slope analyses (Figure 3) revealed that for physical assault victims, as disclosure is delayed, the negative relation between time since trauma and PTSD symptomatology progressively shifts to a positive relation. The earlier a physical assault victim discloses, the stronger the negative relation between time since trauma and posttraumatic stress ($-1SD: \beta = -4.65, t = -4.91, p < .01$); however, at greater disclosure delays the relation between time since trauma and symptoms of posttraumatic stress becomes positive ($+1SD: \beta = .72, t = 3.67, p < .01$). Although a similar pattern of a progressively weakening association between time since trauma and posttraumatic stress was observed in the data for sexual assault victims (Figure 4), it was not statistically

significant and the relation between time since trauma and posttraumatic stress remained negative regardless of the disclosure delay.

The exclusion of outliers from this model significantly improved the fit of the model without altering the pattern of results. No patterns of data were detected within the outlying cases and there was no indication that they were outliers on multiple dimensions (i.e., other variables within the model or demographic features). Descriptive analyses revealed that outliers had significantly higher levels of PTSD symptomatology ($M = 2.54$) than nonoutliers ($M = 1.97$). A significantly longer amount of time since the trauma had passed for outliers ($M = 13.28$ years) than nonoutliers ($M = 6.13$ years) and outliers had significantly longer disclosure delays ($M = 1001.98$ days) than nonoutliers ($M = 205.32$ days). Outliers were not significantly different from nonoutliers on trauma severity, trauma type, or disbelief.

Discussion

Through the integration of empirical evidence for disclosure and dominant cognitive theories of trauma, the current study set a foundation for examining the impact of disclosure on symptoms of posttraumatic stress. The inclusion of multiple trauma types and victim groups not typically studied further positioned it to make meaningful comparisons that advance an overarching model of trauma and recovery – rather than continuing fragmentary lines of research. It was theorized that the severity of a traumatic experience disrupts typical cognitive processing resulting in psychological distress, and that disclosure acts as a recovery mechanism to reduce symptoms of posttraumatic stress.

Consistent with this theoretical framework, trauma severity positively predicted PTSD and aspects of disclosure were conditionally associated with reduced symptomatology.

Specifically, the capacity of disclosure to act as an effective cognitive processing mechanism is dependent on achieving a sufficient level of disclosure (e.g., Sloan, Marx, and Epstein, 2005). In accordance with the argument for larger “doses” of disclosure, the current study found that extent of disclosure moderated the relation between trauma severity and posttraumatic stress symptoms. Engaging in more detailed disclosure was associated with a weaker link between trauma severity and PTSD symptoms – even after controlling for time since the trauma, the type of trauma, and reactions of disbelief. The effect corroborates experimental disclosure research (Frattaroli, 2006; Sloan, Marx, and Epstein, 2005; Smyth, 1998) and some nonexperimental research (Ullman and Filipas, 2001) which demonstrated that a higher degree of disclosure had a beneficial impact on mental and physical health. The finding is also consistent with the belief that higher levels of disclosure produce trauma memories that are adaptively integrated into long-term memory, as well as create sufficient levels of exposure to reduce psychophysiological distress associated with trauma memories. Extent of disclosure’s moderating effect did not vary by trauma type, suggesting that its impact operates as a common mechanism across these forms of interpersonal trauma. Although the effect for extent of disclosure was small and significant only after the removal of outliers, this may be because a single, self-report item was used to detect the degree of disclosure in the current study. A larger effect for extent of disclosure may have been detected if a comprehensive assessment of the construct had been utilized to enhance reliability.

The finding for extent of disclosure lends support to the belief that disclosure has beneficial effects, yet it does not provide evidence that disclosure is adaptive compared to nondisclosure. Disclosure is a common coping strategy following stressful life events (Tait & Silver, 1989; Wortman & Silver, 1989), thus, it is not surprising that research on trauma and disclosure has largely assumed that nondisclosers are more vulnerable to trauma-related psychopathology (Pennebaker & Beall, 1986). Yet, this is an assumption that garners no support from the present investigation. Contrary to prediction, the positive relation between trauma severity and PTSD symptoms was stronger for disclosers than nondisclosers, even after controlling for time elapsed since the initial trauma and trauma type. In fact, a statistically significant association between trauma severity and PTSD symptoms was found only for disclosers. The effect was small and detected only after outliers had been excluded, but even with outliers included, a conservative interpretation of this finding is that nondisclosers are not at *increased* risk for psychopathology. Consistent with this, some lines of research on childhood sexual abuse (Broman-Fulks et al., 2007; Testa et al., 1992), emotional regulation (Bonanno & Field, 2001), and disclosure of disease status (Sherman, Bonanno, Wiener, & Battles, 2000) have also failed to find any negative impact from withholding disclosure.

Upon closer examination, several explanations may account for this intriguing finding. Focused research on the symptom clusters underlying PTSD demonstrates that intrusive symptoms are not consistently distressing (Rachman & de Silva, 1978; Shalev, Schreiber, & Galai, 1993; Steil & Ehlers, 2000). The presence of intrusions may indeed signify that some elements of the trauma failed to be adaptively processed, but the

reexperiencing of those aspects does not universally cause distress. Lepore (1997) went as far as to suggest that disclosure does not reduce symptoms of PTSD, but simply reduces the psychological distress they produce. Such an interpretation provides an alternative understanding to the findings of Major and Gramzow (1999) who documented that disclosure weakened the positive relation between intrusions and general psychological distress. Moreover, avoidant coping methods such as suppressing upsetting thoughts can be applied effectively (Andrews, Troop, Joseph, Hiskey, & Coyne, 2002; Nixon, Flood, & Jackson, 2007; Wegner, 1994). Using a version of the PTSD measure employed in the current study (i.e., IES: Horowitz, Wilner, & Alvarez, 1979), Andrews and colleagues (2002) found that *successful* avoidance of intrusive symptoms was negatively correlated with a measure of social control (i.e., talking about event with others). The authors noted that this correlational finding could indicate that less discussion of the trauma resulted in better suppression of intrusive symptoms, or that increased discussion led to less avoidance of intrusive material.

In light of developing research on avoidance, it may not be surprising that the majority of nondisclosers in the present sample engaged in avoidance at rates equivalent to disclosers, but had significantly lower symptoms of intrusions and hyperarousal. It is plausible then that, although disclosure may promote symptom resolution, withholding disclosure can effectively manage psychological distress following trauma.

Nondisclosure may be adaptive particularly when individuals are not significantly distressed by memories of the trauma or when they are able to successfully manage these symptoms by suppressing trauma memories. It is difficult to draw conclusions given the

modest sample size and cross-sectional data, but this provocative finding supports the contention that nondisclosure need not be deleterious.

Although nondisclosure is not a direct risk factor for increased posttraumatic stress, a notable minority of nondisclosers (14%) presented as outliers with high levels of PTSD. These individuals did not differ appreciably from disclosers on factors related to outcome (i.e., time since the trauma, type of trauma, trauma severity), but they displayed significantly higher PTSD across all symptom clusters. Evidence for a subset of nondisclosers who remain at heightened levels of distress can clarify the contradictory findings observed for nondisclosers of childhood sexual abuse (e.g., Broman-Fulks et al., 2007; Ruggiero et al., 2004). Though the specific conditions under which nondisclosure becomes detrimental are not obvious, these individuals possibly experience intrusive symptoms that are qualitatively more distressing or that are more difficult to effectively suppress. Alternatively, these individuals may engage in pervasive avoidant coping strategies that are not limited to their traumatic experience and, consequently, have cumulative detrimental effects. Unfortunately, these interpretations remain speculative, as the extremely small number of outlying nondisclosers prevents certain assessment of how their characteristics may distinguish them from typical nondisclosers.

Disclosure latency is also implicated as an element that influences the overall impact of disclosure on recovery (Frattaroli, 2006). Following this line of reasoning, it was predicted the timing of disclosure would moderate the positive association between trauma severity and PTSD symptomatology, but this expectation was not met in the current study. Instead, an unexpected three-way interaction presented between the time

elapsed since the trauma, the form of the trauma (i.e., sexual or physical assault), and the length of the disclosure delay. Among physical assault victims, as disclosure is delayed the negative relation between time since trauma and PTSD symptomatology progressively weakens. Interestingly, this association shifts such that at extreme disclosure delays (i.e., a year or more) the relation between time elapsed since the initial trauma and posttraumatic stress becomes mildly positive. Although a similar progressive weakening of the association between time since the trauma and posttraumatic stress is observed among sexual assault victims, it was not statistically significant and it remained negative regardless of disclosure latency.

In examining this effect, early disclosers of physical assault initially present with the highest levels of PTSD and then show a slightly stronger pattern of remittance than observed for delayed disclosers. Given that there is a small positive association between trauma severity and disclosure delay in the current sample, it is unlikely that individuals experiencing the highest levels of distress simply disclose sooner. One plausible alternative explanation is that early disclosure initially exacerbates symptoms, but is also associated with some mildly adaptive qualities. In the immediate aftermath of a traumatic event, individuals are experiencing heightened psychophysiological distress as well as acute effects of the trauma (e.g., medical complications, disruption to daily routines, strained relationships). Though not unique to physical assault, physiological distress and some immediate consequences, such as medical complications, may be greater than those observed for sexual assault victims. These factors potentially impair the victim's ability to process the trauma as a *past* memory rather than an ongoing event. Cognitive theories

of trauma propose that a temporal context for the trauma memory is an essential element in reducing the sense of immediate threat and associated symptoms (e.g., Ehlers and Clark, 2000) – placing the trauma memory in the past may not be achievable through immediate disclosure. Acute distress also impairs the ability of early disclosure to act as a therapeutic exposure mechanism. Indeed, there is evidence to suggest it actually functions to increase the salience of trauma memories and inhibit extinction of fear responses. Research on fear and learning demonstrates that early attempts at extinction are often ineffective (Millad et al., 2006; Morris et al., 2005) and at least two analog studies found that processing trauma memories in the immediate aftermath increases the vividness and recall of the memories compared to participants who avoided thinking about the trauma (Buck, Kindt, & van den Hout, 2009; Ehlers & Steil, 1995). Consistent with these concerns, emerging research on early PTSD interventions documented that immediate facilitation of disclosure may not be beneficial and could even be contraindicated (Bisson, Jenkins, Alexander, & Bannister, 1997; Bryant, 2002; Mayou, Ehlers, & Hobbs, 2000).

There are several potential explanations for the association of early disclosure with slightly stronger remittance of PTSD over time, despite the initial exacerbation of symptoms. Experimental studies document a similar pattern in which disclosure initially produces increased symptoms followed by greater symptom improvements than the control group (Frattaroli, 2006; Smyth, 1998). Thus, some researchers speculate that disclosing may act as a catalyst, simply accelerating the adaptive cognitive processing that would naturally occur over time (Frattaroli, 2006). Although the present study only

examined the timing of the initial disclosure experience, it is also possible that early disclosers engage in greater overall disclosure than delayed disclosers, resulting in cumulative adaptive cognitive processing in the long-term. The present conditional effect of disclosure delay becomes even more complex with evidence that extreme disclosure delays are associated with a slight increase in symptoms of posttraumatic stress.

Prospective research describes PTSD trajectories characterized by mild initial symptom levels that increase over time rather than remit (Norris, Tracy, & Galea, 2009; Orcutt, Erickson, & Wolfe, 2004). It is unclear what factors are related to this phenomenon, but potentially those experiencing chronic trauma engage in long-term suppression (e.g., withholding disclosure) followed by an increase in symptomatology when avoidant coping methods deteriorate or are abandoned (Andrews, Brewin, Stewart, Philpott, & Hejdenberg, 2009; Pickens, Golden, Adams-Deutsch, Nair, & Shaham, 2009), though this fails to account for the unique presentation in physical but not sexual assault victims of the current sample. Perhaps, female victims of physical assault are more likely than sexual assault victims to experience chronic traumas such as intimate partner violence or, as one study documented, severe physical injuries may predict delayed PTSD (Grieger, Cozza, Ursano, Hoge, Martinez et al., 2006). As there is limited understanding of the recovery processes that occur over time following trauma, there is no easy explanation for the unexpected and complex effect of disclosure delay.

Given that early disclosure is associated with both increased short-term symptomatology and a long-term pattern of greater symptom reduction, it is difficult to appraise its overall impact on recovery. The nonexperimental data make it impossible to

assume causal associations between disclosure delay and symptoms, but it should be noted that early disclosers maintained the highest levels of symptomatology even several years following the trauma. Such a pattern suggests that, if disclosure is contributing to the presentation of posttraumatic stress, the detrimental effects may outweigh the long-term benefit of immediate disclosure as it pertains to symptoms of PTSD. Full confidence in this effect depends on replication research, as the effect is small and both time elapsed since the trauma and length of disclosure delay are positively skewed in the present sample.

Strengths and Limitations

The present study conducted theoretically driven analyses grounded in strong methodology. Previous studies of trauma and disclosure have often relied on small, narrow samples that focused on a single trauma group (e.g., sexual assault) and inconsistent methods for assessing victimizations. To address these concerns in the present investigation, a broad sample of participants was recruited, screening criteria were designed to promote the inclusion of populations not typically studied (i.e., nondisclosers), and the detection of trauma was achieved through the use of validated, standardized measures. The result was a large sample that was representative of its base population and uncommon in its ability to examine differences both between and within traumatic events. A central aim of the investigation was to delve into the experiences of trauma victims who fail to disclose to others and this purpose was satisfied. Although a sample of 121 is modest by many standards, it is one of the largest samples of true nondisclosers (i.e., disclosed to no one prior to the study) achieved to date and represents

a notable strength. It was also unique in the multiple dimensions of both trauma and disclosure that were evaluated and the linking of social and experimental disclosure models to broader theories of trauma. These features position the present study to make a strong contribution to the literature on trauma and disclosure.

Despite the advantages of the current study and precautions taken in its development, certain limitations must be acknowledged. The investigation focuses on participants' most distressing traumatic experience with either physical or sexual assault – symptoms of PTSD and disclosure behaviors were assessed in relation to this specific event. Although this approach fits well with event-specific diagnostic criteria for PTSD (DSM-IV-TR, APA, 2004) and models of disclosure as a mechanism for resolving event-specific symptoms (e.g., intrusions related to a particular trauma), it fails to address other potentially important factors. A history of other traumatic events and disclosure experiences could have influenced variables investigated in the current study. Further, the multidimensional nature of disclosure brings with it the challenge of identifying its essential elements and effectively capturing them. Consequently, the present measurement of disclosure may fail to bring some of these features to the surface for analysis. For instance, the frequency of disclosure is unknown and could be involved in recovery if multiple disclosures are needed to achieve the theorized adaptive processing effects. Given the present findings and previous literature that document an inconsistent and often small impact of disclosure, it seems improbable that a more comprehensive examination of disclosure would have resulted in dramatically different results; nonetheless, this possibility cannot be ruled out. Engagement in trauma-specific treatment

was also unmeasured in the present investigation and may account for some variation in outcome.

The study of disclosure also presents a dilemma in that it manufactures the very behavior that it is trying to assess. If disclosure does have some beneficial effect, then assessing participants could reduce variation by exposing all participants to a minimal level. An additional constraint in the present investigation is that it did not employ a direct test of cognitive processing – the method by which disclosure is theorized to effect recovery. Without direct assessment, it is impossible to make strong theoretical conclusions about the cognitive mechanisms involved in disclosure.

A difficulty which plagues most research on trauma and disclosure is the reliance on retrospective and self-report measures. These methods are problematic and prospective research with collateral data, particularly on disclosure, would be ideal. Additionally, though the present sample is large, it is comprised of only female university students, largely between the ages of 18 and 30. Thus, it is not clear if results generalize beyond this population. Finally, a substantial challenge in interpreting these results stems from the inability to draw casual conclusions. Though not unique to the current study, the cross-sectional nature of the data limits the inferences that can be made regarding associations between disclosure and recovery. Nonetheless, the theoretical framework from which the hypotheses were derived as well as the existing experimental literature, both provide a reasonable foundation from which to base conclusions about these associations.

Lastly, as the issue of outliers presents a substantial challenge to all researchers, their treatment in the current study justifies mention. As noted previously, interactions are especially likely to be impacted by the presence of outliers. A single case can mask or create an interaction effect, even within large samples such as the current one. Although the results of each model are reviewed with and without outliers, the interpretation focuses on the final models that excluded outliers. This position is defensible given that a conservative number of cases were excluded and that the direction of effects remained consistent between initial and final models. As noted by Cohen and colleagues (2003), this traditional approach to the handling of outliers is generally comparable to robust regression methods that retain outliers but minimize their impact. From a theoretical standpoint, it also allows for the identification of potentially important groups of cases that differ appreciably from the overarching model and may serve to explain inconsistencies in previous research. It is nonetheless acknowledged that the treatment of outliers remains a debated topic within the scientific community and there is, as of yet, no resolution as to the most prudent method for addressing these cases.

Clinical Relevance

Findings hold promise for understanding natural patterns of recovery following trauma and leveraging this information to inform clinical interventions. The broader literature on trauma illustrates that virtually all victims of trauma experience symptoms of posttraumatic stress in the immediate aftermath of the event and, though many recover on their own, others remain symptomatic for years afterwards (e.g., Boudreaux et al., 1998; Fields, 2006; Frieze, Hymer, & Greenberg, 1987; Kilpatrick et al., 1987; Norris &

Kaniasty, 1994). Present findings confirm this pattern demonstrating that over time the symptoms of PTSD remit, but often persist at subclinical levels for years following the trauma and in a small number of cases may even show an increase.

In light of its uniquely identifiable trigger and the clinical trajectories documenting the potential for long-term symptomatology, posttraumatic psychopathology appears to be an ideal target for intervention efforts. Yet, there is evidence to suggest that the first line of defense against chronic PTSD may simply be time. Disclosure is necessarily tied to treatment-seeking behaviors. Given that neither the majority of nondisclosers nor delayed disclosers are at an increased risk of psychopathology, early engagement in trauma-specific interventions may not be necessary for recovery. Indeed, individuals who delay or altogether withhold disclosure may see symptom resolution through natural cycles of intrusive-avoidant symptoms (Horowitz, 1997), accessing general systems of social support, or even from incidental and indirect methods of processing. Exposure to media depictions, engaging in journaling, prayer, imagining, or discussing someone else's traumatic experience could result in sufficient adaptive processing of their own experience. In light of the propensity for independent recovery, a number of treatment outcome studies have adopted a two-tier approach to selecting participants. First, individuals who are at risk for chronic PTSD are identified and, second, those individuals complete a symptom self-monitoring phase prior to inclusion (see Ehlers & Clark, 2002). Thus, the majority of individuals who have experienced a traumatic event are screened out in the initial step and a proportion of the resulting sample achieves recovery without receipt of treatment. Clinicians and treatment

programs may need to adopt a similar strategy to ensure that therapeutic interventions are targeted to the populations that can benefit from them and ensure that resources are allocated appropriately.

Until recently, the timing of clinical interventions for trauma has received little systematic attention, but there is mounting evidence that early intervention efforts are ineffective and possibly detrimental. Systematic reviews of the early intervention literature describe disappointing results for a number of intervention methods initiated immediately after the trauma (i.e., within 1 month: Ehlers & Clark, 2003; Roberts, Kitchiner, Kenardy, & Bisson, 2009), including CISM, brief CBT, supportive counseling, and structured, self-guided exposure. Researchers speculate that the early emphasis on disclosure may actually be increasing the salience of the trauma memories and preventing the extinction of fear (Ehlers & Clark, 2003; Morris et al., 2005). Findings from the present study offer some parallels in that early disclosure was associated with higher levels of symptomatology among physical assault victims. Although this finding is tentative without replication, it is consistent with the emerging treatment literature.

Considering the information on early universal interventions and the present findings for disclosure, the most effective early intervention protocols may be those that focus on reducing distress and arousal without direct processing of the traumatic event. Early intervention efforts that target post-trauma arousal without integrating disclosure of the traumatic event have found some success (e.g., Resnick, Acierno, Kilpatrick, & Homes, 2005; Zatzick et al., 2004), although there are very few studies of this nature. Future programs may wish to focus on promoting general relaxation methods (e.g.,

progressive muscle relaxation, deep breathing, guided imagery) that reduce psychophysiological arousal. Further, provision of tangible and informational support, such as explaining the investigative process or arranging for transportation to appointments, is likely to ameliorate stress and anxiety (Resnick et al., 2005).

Although appropriate methods for early intervention are still developing, the efficacy of cognitive-behavioral therapies for chronic PTSD is well established (Cohen & Mannarino, 1996; Foa et al., 1999). Within treatment, avoidant coping methods are common targets for clinical intervention and withholding disclosure is often assessed as a marker of avoidance. Although avoidance can be dysfunctional (e.g., Foa & Riggs, 1993; Horowitz, 1976; Pennebaker, 1989), withholding or delaying disclosure may not be a maladaptive method for managing posttraumatic stress. On the contrary, it may have some protective benefits (Seery, Silver, Holman, Ence, & Chu, 2008). Given the possibility that, for some, avoidance and suppression are adaptive, it seems prudent that clinicians evaluate the quality of this coping strategy prior to targeting it for treatment. The critical distinction may lie in clinicians' ability to differentiate between predominantly trauma-specific avoidance embedded within "healthier" coping styles versus avoidance that is a pervasive strategy associated with detrimental effects. An individual who has strong social support and generally employs healthy coping strategies to manage stressors may not derive benefits from trauma disclosure. Conversely, individuals who engage in chronic avoidance, including nondisclosure or delayed disclosure, may derive the most benefit from globally reducing their reliance on avoidance. Perhaps within the current study, the subset of nondisclosers who presented

with high levels of PTSD is characterized by an avoidant coping style that is nonspecific and generalizes to other aspects of their lives.

Victims for whom disclosure is determined to be an appropriate therapeutic element are likely to improve from engaging in detailed disclosures. The present study demonstrates that the “dose” of disclosure moderates the impact of trauma severity on posttraumatic stress. Although the effect was weak for naturalistic disclosure, conceivably the impact of disclosing in a structured, supported manner by a clinician would be much greater. The construction of detailed trauma narratives is an essential feature of several empirically validated treatments (e.g., Cohen & Mannarino, 1996) and results for naturalistic disclosure lend credence to this therapeutic element. Despite support for disclosure as an integrated aspect of empirically validated treatments, there is little evidence to suggest that the popular written disclosure interventions introduced by Pennebaker (Pennebaker & Beall, 1986) are indicated for trauma victims. Written disclosure paradigms operate on the premise that they replicate the natural recovery mechanism that occurs when individuals engage in social disclosure. To the extent that this is true, the findings from the present study suggest that detailed disclosures occurring after a short delay are ideal. Ultimately though, it should be acknowledged that disclosure in isolation does not appear to have a strong impact on trauma-related psychopathology. Thus, written disclosure interventions are likely to be a poor stand-alone method of facilitating recovery.

On a final note, with large samples relatively small effects can be statistically significant and that was true of this study. Nonetheless, there are conditions under which

the impact of disclosure variables may be heightened and these warrant mention. By employing a sample of university students, the current study tapped into a population that is at-risk for some forms of traumatic victimization, but that is typically higher functioning than the general population. Therefore, larger effect sizes are likely to be found for trauma victims in the general population than were detected in the present sample. Indeed, in a meta-analysis of experimental disclosure studies, Frattaroli (2006) found greater effect sizes for studies drawing from the general population compared to those employing samples of college students. Victims of sexual and physical assault are also at increased risk for future victimization (e.g., Koss & Dinero, 1989; Norris & Kaniasty, 1994), thus the clinical impact of disclosure variables may be compounded over the course of multiple traumatic events despite small effect sizes. Similarly, evidence from experimental disclosure suggests that psychological and subjective benefits may be compounded over the course of multiple disclosures regarding the same traumatic experience (Frattaroli, 2006; see also, Smyth, 1998) – therefore, the cumulative effect of engaging in several detailed disclosures may be greater than that measured in the present investigation.

Future Directions

After more than two decades of empirical investigation, even the most prominent researchers of experimental disclosure continue to struggle with identifying the conditions under which it is beneficial or to establish a consistent effect on psychological health (Smyth & Pennebaker, 2008). Post-hoc efforts to explicate the contradictory results have produced what some authors have characterized as “untenable theoretical

contortions” (Consentine, 2002, p.217). One concern is that the impact of nondisclosure has been neglected in the theoretical progression of disclosure studies. Although there appears to be an underlying premise that withholding disclosure is deleterious, there have been few true examinations of nondisclosers. Thus, an important aspect of disclosure research has been relegated to conjecture. Evolving theoretical frameworks of trauma recovery and models of disclosure would now be best served by examining the recovery processes that occur independent of disclosure. Specifically, the investigation of nondisclosing trauma victims provides a rare opportunity to examine recovery in the absence of trauma-specific support, resources, or interventions. Doing so could clarify a number of factors hindering theoretical progress, such as whether early cycles of intrusions-avoidance are purely symptomatic or are an adaptive function. Studying nondisclosers can clarify whether withholding disclosure is reflective of general avoidant methods or if nondisclosers process the trauma in less direct methods. It would also provide evidence regarding the optimal timing of interventions, if a pattern of symptom remittance appears without receipt of formal support or intervention. The value of studying nondisclosing trauma victims extends beyond the delineation of natural recovery processes, in that it is likely to highlight those individuals who would derive the greatest benefits from disclosure. As a subset of nondisclosers appeared to be at heightened risk of PTSD in the present study, these trauma victims could provide valuable information regarding risk factors for PTSD. Identifying the qualities of these nondisclosers that put them at increased risk of psychopathology may be more informative than focusing in isolation on aspects of disclosure.

With the establishment of indicated treatment groups, aspects of disclosure may indeed have a clinically significant impact. Present findings and the current literature on early interventions suggest that emphasizing disclosure as a therapeutic element may be contraindicated in the immediate aftermath of trauma. Comparative studies are needed to evaluate the benefits of early interventions that focus on reducing psychophysiological distress compared to those that also incorporate direct processing of the trauma. Applying disclosure as an element of treatment requires determining appropriate timing. Once this has been established, detailed disclosures appear to be most beneficial. Expanding on what is known about extent of disclosure, treatment outcome research will need to evaluate whether engaging in a single detailed disclosure is sufficient for benefits, or if multiple detailed disclosures are necessary or advantageous. Support for multiple detailed disclosures would reinforce the theory that disclosure acts as a therapeutic exposure mechanism and may help clarify the avenue by which trauma victims derive benefits from disclosure.

Another issue that has delayed the theoretical maturation of disclosure studies is the difficulty in directly assessing the cognitive processing that is theorized to occur through disclosure. Most theories of trauma identify the symptoms of posttraumatic stress, particularly intrusions, as markers of maladaptively processed trauma memories. A reduction in intrusions signifies adaptive processing. Nonetheless, there are few methods for directly assessing the cognitive manipulation of trauma memories and future endeavors may wish to integrate cross-disciplinary methods, such as neuropsychology. Cabeza and Nyberg (2000) found that the patterns of neural activity typically activated to

process and produce language differ from those that are used to process and produce narratives (see also: Mar, 2004). As opposed to language with purely communicative intent (e.g., to obtain or provide information), narrative language entails causal-temporal ordering with a coherent theme. Considering that some trauma researchers believe that adaptive processing occurs via creating meaningful and organized accounts (i.e., narratives) of traumatic events, incorporating neuroimaging techniques may be informative for future testing and theoretical development. Ideally, any true test of disclosure as a cognitive processing mechanism would be prospective, initiated prior to disclosure, and span a sufficient time period to assess for immediate and delayed effects.

Although there remains questionable evidence to conclude that disclosure has a direct and clinically significant impact on symptoms of posttraumatic stress, this should not be misinterpreted as prescribing nondisclosure. Disclosure is likely to have advantages for the individual, community, and society that went unmeasured in the present examination. Thus, it will be necessary for future research to evaluate the domains that are impacted by disclosure in determining its overall contributions to recovery. At the individual level, there may be cause to assess satisfaction with social support, sense of self-efficacy, and changes in attributions. Though these factors may not impact symptoms of posttraumatic stress directly, they may be associated with other markers of well-being and recovery. If so, the comparative value of disclosure to nondisclosure may be highlighted when research assesses these benefits more globally.

Conclusion

Taken together, the findings from the current study of trauma and disclosure provide meaningful additions to the field of trauma psychology. A substantial contribution is that disclosure is not sufficient to procure recovery and evidence is lacking to suggest that it is even a necessary element. Cognitive theories of trauma do not directly implicate disclosure as the mechanism of change; however, they identify the creation of a coherent, meaningful trauma narrative and exposure to distressing elements of the trauma as necessary to reduce symptoms. These factors are often inherent to the disclosure process, resulting in a parallel theoretical framework for experimental research that conceptualizes disclosure as a therapeutic intervention. The small moderational influence detected for disclosure delay and extent of disclosure suggests that disclosure may indeed influence aspects of recovery. Engaging in detailed disclosure after acute levels of psychophysiological distress have subsided may minimize posttraumatic stress. Nonetheless, given the small effect sizes and potential for nondisclosure to have adaptive qualities, the most conservative interpretation is that disclosure is largely inconsequential. Characteristics of the individual, qualities of the socio-cultural environment, and elements of the disclosure experience itself likely form complex interrelations to predict the measured benefit of disclosing. The net effect appears to be a process that under an ideal set of conditions may contribute to recovery, but generally has minimal impact on symptoms of posttraumatic stress. In sum, the conclusions of the present investigation provide an intriguing framework from which to reexamine beliefs about trauma and disclosure and advance the emerging literature on recovery.

Footnotes

¹Sensitivity analysis is the study of how variation in the input of a model contributes to variation (uncertainty) in the model's output; it attempts to identify how sources of uncertainty weight on the conclusions drawn from a particular model (e.g., Cohen, Cohen, West, & Aiken, 2003). For the current study, sensitivity analyses were conducted using a priori weights to demonstrate that the values assigned to undefined intervals of disclosure delay did not significantly impact the findings for the overall model (advisement on application to the current study: K. Widaman, personal communication, October 18th, 2009). A priori weights for values between zero and one day (i.e., .02 - .42 days) and for values after 365 days (i.e., 547.5 - 5475 days) were selected and coded for the variable disclosure delay. A sequence of models was then estimated with various sets of weights reflecting the range of plausible values for the undefined intervals. Results of these analyses demonstrated that variation in the weights assigned to undefined intervals had no discernible impact on the estimation of the regression model; accordingly, the value for between zero and one day was set at three hours (.125 days) and the value for after 365 days was set at ten years (3650 days).

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APPENDIX A
TABLES & FIGURES

Table 1

Comparison of Current Study Subsample to Full Sample and 2003 ASU Population

	ASU population	Full sample	Study subsample
Total N (females only)	30923	2972	1087
Percent of female population	(100%)	(9%)	(4%)
<u>Student status</u>			
Undergraduates	41815	2332 (79%)	863 (79%)
Graduates	9419	635 (21%)	222 (20%)
n		2967	1085
Age (mean)	28	25	26
<u>Campus affiliation</u>			
Main	49171	2565 (87%)	945 (87%)
West	7348	248 (8%)	100 (9%)
East	3983	133 (5%)	33 (3%)
n		2946	1078
<u>Enrollment status</u>			
Full-time	44392	2524 (85%)	917 (84%)
Part-time	13764	431 (15%)	164 (15%)
n		2955	1081

Note. Percentages not provided for ASU population because data for female students were unavailable.

Table 2

Descriptive Statistics for Continuous Variables

	n	Min	Max	M	SD	Skew	Kurtosis
PTSD (mean)	1087	1	5	1.98	.95	.87	-.16
Subjective severity	1087	1	5	3.86	1.20	-.71	-.59
Extent of disclosure	966	1	5	3.97	1.19	-.96	-.10
Disclosure delay (days)	966	0	3650	339.54	1019	2.93	6.64
Time since trauma (years)	1087	0	57	6.19	7.25	2.23	6.11
Perceived disbelief (mean)	803	1	5	2.46	.79	.59	.67
Perceived blame (mean)	803	1	4.67	1.91	.70	.83	.44

Table 3

Descriptive Statistics for Continuous Variables by Disclosure Status

	n	Min	Max	M	SD	Skew	Kurtosis
<u>Nondisclosers</u>							
PTSD (mean)	121	1	4	1.89	.82	.80	-.32
Subjective severity	121	1	5	3.46	1.28	-.37	-.95
Time since trauma (years)	121	0	45	6.30	8.75	2.03	3.80
<u>Disclosers</u>							
PTSD (mean)	966	1	5	1.99	.96	.87	-.19
Subjective severity	966	1	5	3.91	1.18	-.76	-.51
Time since trauma (years)	966	0	57	6.18	7.03	2.26	6.54

Table 4

Frequencies of Categorical Variables

Variable	n	Responses	Frequency	%
Disclosure status	1087	Nondiscloser	121	11
		Discloser	966	89
Trauma type	1087	Sexual assault	548	50
		Physical assault	539	50
Ethnicity	1077	Caucasian	872	80
		Hispanic	95	9
		Asian	23	2
		African-American	14	1
		Multi-racial/Other	73	7

Table 5

Frequencies of Categorical Variables by Disclosure Status

Variable	n	Responses	Frequency	%
<u>Nondisclosers</u>				
Trauma type	121	Sexual assault	77	64
		Physical assault	44	36
Ethnicity	119	Caucasian	94	79
		Hispanic	12	10
		Asian	3	3
		African-American	2	2
		Multi-racial/Other	8	7
<u>Disclosers</u>				
Trauma type	966	Sexual assault	471	49
		Physical assault	495	51
Ethnicity	958	Caucasian	778	81
		Hispanic	83	9
		Asian	20	2
		African-American	12	1
		Multi-racial/Other	60	6

Table 6

Bivariate Correlations Between Predictor, Covariate, and Criterion Variables.

	1	2	3	4	5	6	7	8	9
1 PTSD	1								
n	1087								
2 Severity	.36**	1							
n	1087	1087							
3 Disclosure status	-.04	-.12**	1						
n	1087	1087	1087						
4 Extent of disclosure	-.01	.12**	--	1					
n	966	966	966	966					
5 Disclosure delay	.04	.11**	--	-.14**	1				
n	966	966	966	966	966				
6 Time since	-.11**	.13**	.01	.06	.18**	1			
n	1087	1087	1087	966	966	1087			
7 Trauma type	.06*	-.08**	.09**	-.22**	.06	-.16**	1		
n	1087	1087	1087	966	966	1087	1087		
8 Disbelief	-.14**	-.15**	--	-.20**	-.07	.01	.07*	1	
n	803	803	803	803	803	803	803	803	
9 Blame	-.01	-.10**	--	-.11**	-.09**	-.05	.11**	.59**	1
n	803	803	803	803	803	803	803	803	803

Note. Dummy codes: Disclosure status (1 = nondiscloser; 0 = discloser); Trauma type (1 = sexual assault; 0 = physical assault).

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table 7

Regression Predicting Level of PTSD Symptomatology from Trauma Severity and Disclosure Status with Outliers Included (n = 1087)

Variable	<i>B</i>	<i>SE B</i>	β	<i>t-value</i>
Time since trauma	-.02	.01	-.15	-5.10***
Trauma type	.13	.05	.07	2.38*
Trauma severity	.31	.02	.40	13.13***
Disclosure status	-.01	.09	-.01	-.06
Trauma severity by disclosure status	-.05	.07	-.03	-.79
Total R^2 for Model = .16				
F(5, 1082) = 41.56***				

Note. Values are based on the results of the regression analysis at the final step in the model, with all variables entered into the equation. Dummy codes: Disclosure status (1 = nondiscloser; 0 = discloser); Trauma type (1 = sexual assault; 0 = physical assault).

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table 8

Regression Predicting Level of PTSD Symptomatology from Trauma Severity and Disclosure Status with Outliers Excluded (n = 1066)

Variable	<i>B</i>	<i>SE B</i>	β	<i>t-value</i>
Time since trauma	-.02	.01	-.15	-5.38***
Trauma type	.14	.05	.07	2.59*
Trauma severity	.33	.02	.42	14.06***
Disclosure status	-.23	.09	-.07	-2.44*
Trauma severity by disclosure status	-.25	.07	-.11	-3.44**

Total R^2 for Model = .18

F(5, 1061) = 46.08***

Note. Values are based on the results of the regression analysis at the final step in the model, with all variables entered into the equation. Dummy codes: Disclosure status (1 = nondiscloser; 0 = discloser); Trauma type (1 = sexual assault; 0 = physical assault).

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table 9

Regression Predicting Level of PTSD Symptomatology from Trauma Severity and Extent of Disclosure with Outliers Included (n = 803)

Variable	<i>B</i>	<i>SE B</i>	β	<i>t-value</i>
Time since trauma	-.02	.01	-.17	-5.23***
Trauma type	.12	.07	.06	1.80†
Disbelief	-.11	.04	-.09	-2.73**
Trauma severity	.32	.03	.39	10.49***
Extent of disclosure	-.02	.04	-.02	-.49
Trauma severity by extent of disclosure	-.03	.03	-.04	-.94

Total R^2 for Model = .16

$F(6, 797) = 23.54***$

Note. Values are based on the results of the regression analysis at the final step in the model, with all variables entered into the equation. Dummy codes: Trauma type (1 = sexual assault; 0 = physical assault).

† $p < .10$; ** $p < .01$; *** $p < .001$.

Table 10

Regression Predicting Level of PTSD Symptomatology from Trauma Severity and Extent of Disclosure with Outliers Excluded (n = 787)

Variable	<i>B</i>	<i>SE B</i>	β	<i>t-value</i>
Time since trauma	-.03	.01	-.19	-5.72***
Trauma type	.12	.06	.07	1.96†
Disbelief	-.12	.04	-.11	-3.16**
Trauma severity	.31	.03	.39	11.67***
Extent of disclosure	-.06	.04	-.05	-1.46
Trauma severity by extent of disclosure	-.08	.03	-.08	-2.35**

Total R^2 for Model = .19

$F(6, 781) = 31.65***$

Note. Values are based on the results of the regression analysis at the final step in the model, with all variables entered into the equation. Dummy codes: Trauma type (1 = sexual assault; 0 = physical assault).

† $p < .10$; ** $p < .01$; *** $p < .001$.

Table 11

Regression Predicting Level of PTSD Symptomatology from Trauma Severity and Disclosure Delay with Outliers Included (n = 803)

Variable	<i>B</i>	<i>SE B</i>	β	<i>t-value</i>
Time since trauma	-.04	.01	-.33	-4.12***
Trauma type	.16	.07	.09	2.41
Disbelief	-.11	.04	-.09	-2.83**
Trauma severity	.31	.03	.37	11.24***
Disclosure delay (linear)	-.001	.001	-.84	-2.90**
Disclosure delay (quadratic)	.001	.001	.84	2.58*
Trauma type by time since trauma	.02	.01	.06	1.07
Disclosure delay (linear) by time since trauma	.001	.001	-3.71	-2.46*
Disclosure delay (linear) by trauma type	.001	.001	.73	2.74**
Disclosure delay (quadratic) by time since trauma	.001	.001	3.75	2.48*

Table 11 (continued)

Regression Predicting Level of PTSD Symptomatology from Trauma Severity and Disclosure Delay with Outliers Included (n = 803)

Variable	<i>B</i>	<i>SE B</i>	β	<i>t-value</i>
Disclosure delay (quadratic) by trauma type	-.001	.001	-.72	-2.37
Disclosure delay (linear) by trauma type by time since trauma	.001	.001	1.80	1.71†
Disclosure delay (quadratic) by trauma type by time since trauma	.001	.001	-1.85	-1.75†
Total R^2 for Model = .17				
F(13, 803) = 13.94***				

Note. Values are based on the results of the regression analysis at the final step in the model, with all variables entered into the equation. Dummy codes: Trauma type (1 = sexual assault; 0 = physical assault).

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table 12

Regression Predicting Level of PTSD Symptomatology from Trauma Severity and Disclosure Delay with Outliers Excluded (n = 786)

Variable	<i>B</i>	<i>SE B</i>	β	<i>t-value</i>
Time since trauma	-.06	.01	-.44	-6.47***
Trauma type	.05	.07	.02	.64
Disbelief	-.11	.04	-.09	-2.79**
Trauma severity	.31	.03	.38	11.45***
Disclosure delay (linear)	-.002	.001	-1.81	-5.22***
Disclosure delay (quadratic)	.001	.001	2.04	5.06***
Trauma type by time since trauma	.03	.02	.12	1.98*
Disclosure delay (linear) by time since trauma	.001	.001	-8.84	-4.82***
Disclosure delay (linear) by trauma type	.003	.001	1.52	4.89***
Disclosure delay (quadratic) by time since trauma	.001	.001	8.65	4.77***

Table 12 (continued)

Regression Predicting Level of PTSD Symptomatology from Trauma Severity and Disclosure Delay with Outliers Excluded (n = 786)

Variable	<i>B</i>	<i>SE B</i>	β	<i>t-value</i>
Disclosure delay (quadratic) by trauma type	-.001	.001	-1.7	-4.67***
Disclosure delay (linear) by trauma type by time since trauma	.001	.001	6.41	4.69***
Disclosure delay (quadratic) by trauma type by time since trauma	.001	.001	-6.23	-4.64***

Total R^2 for Model = .20

F(13, 773) = 16.05***

Note. Values are based on the results of the regression analysis at the final step in the model, with all variables entered into the equation. Dummy codes: Trauma type (1 = sexual assault; 0 = physical assault).

* $p < .05$; ** $p < .01$; *** $p < .001$.

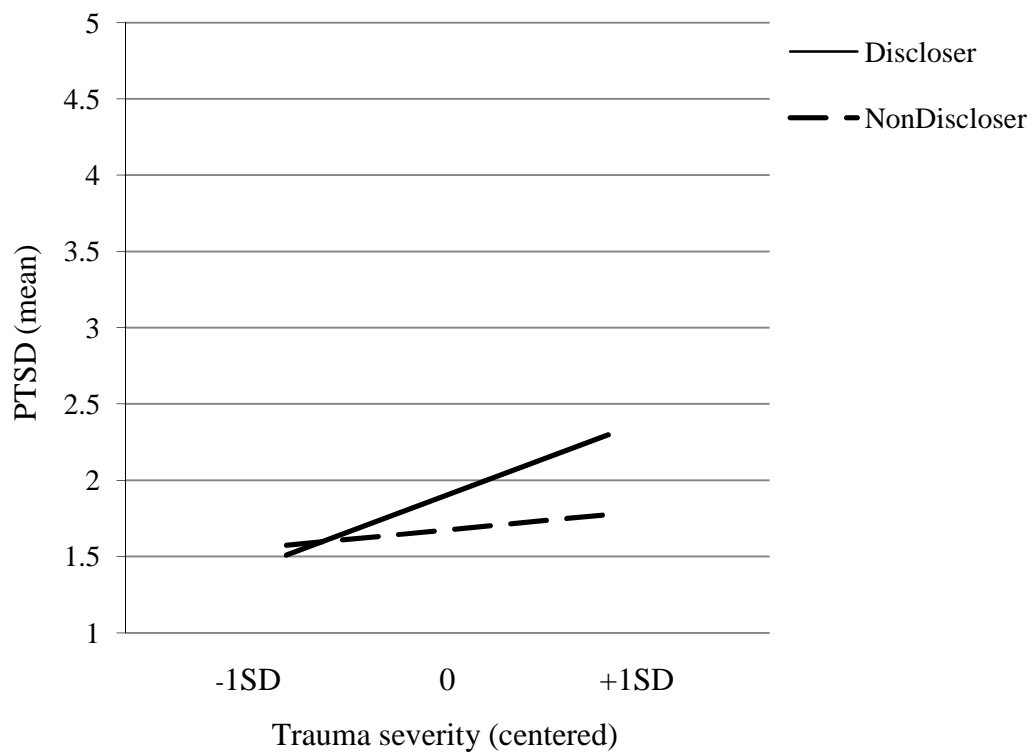


Figure 1. PTSD symptomatology at discloser and nondiscloser levels of disclosure status (n=1066).

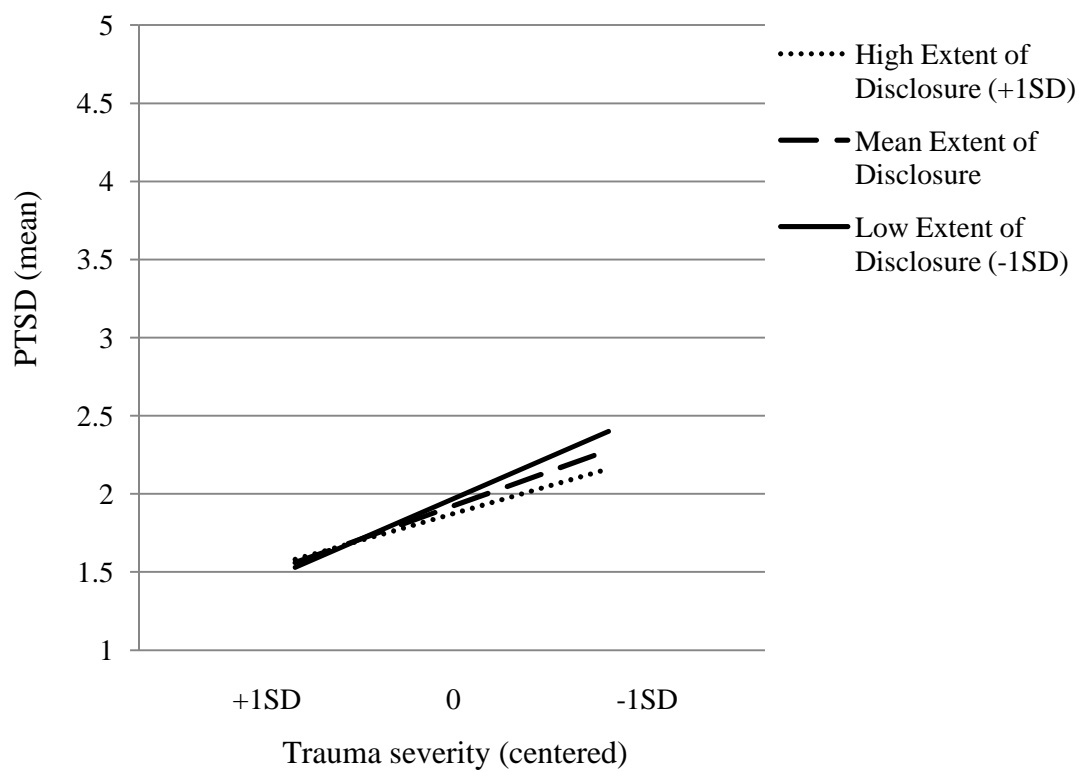


Figure 2. PTSD symptomatology by trauma severity at levels of extent of disclosure (n=787).

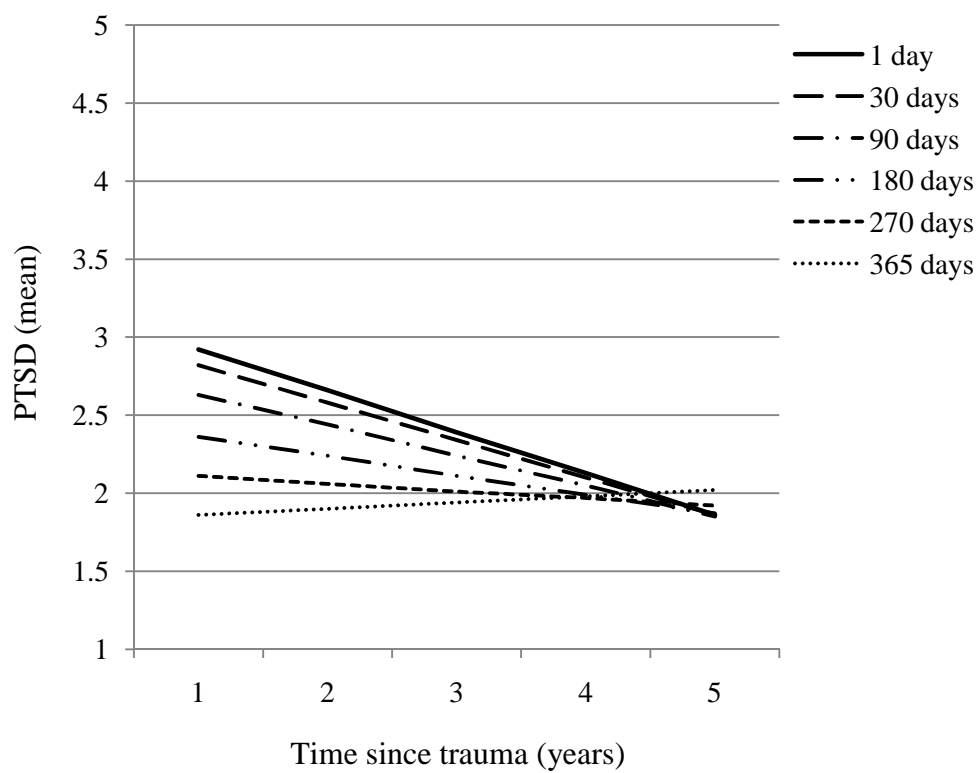


Figure 3. PTSD symptomatology by time since trauma at levels of disclosure delay for physical assault victims (n=421).

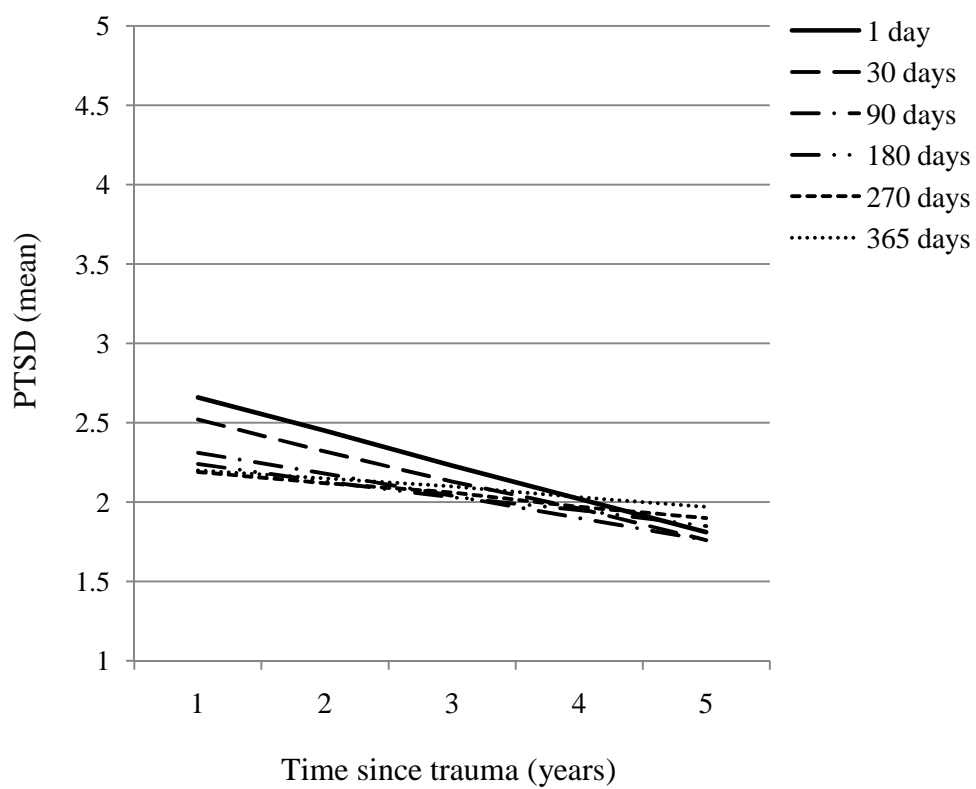


Figure 4. PTSD symptomatology by time since trauma at levels of disclosure delay for sexual assault victims (n=366).

APPENDIX B
MEASURES

Demographic Items

1. I am a:

Graduate student

Undergraduate student

2. How old are you?

3. I am a student at ASU's:

East campus

Main/Tempe campus

West campus

4. I attend school:

Fulltime

Parttime

5. I describe my ethnicity as:

African American

Asian American

Native American

Hispanic

White

Other

Sexual Experiences Survey – Short Form for Victimization (SES-SV)

Instructions: The following questions concern sexual experiences that you may have had. We know that these are personal questions, so we do not ask your name or other identifying information. Your answers are completely confidential. We hope that this helps you to feel comfortable answering each question honestly, even if you have never discussed these experiences with anyone before.

Response scale:

How many times in the past 12 months? 0 1 2 3 or more

How many times since the age of 14? 0 1 2 3 or more

Items:

Someone performed oral sex on me or had me perform oral sex on them after:

Oral sex means contact between the mouth and either the penis or the female genital area.

1. This person met me after I had been drinking alcohol or using drugs and was conscious but too drunk or out of it to consent or stop what was happening.
2. This person threatened to use some degree of physical force on me.
3. This person used some degree of physical force such as holding me down with his or her body weight or pinning my arms.

Someone put his or her penis, or fingers, or objects (such as a bottle or a candle) into my vagina after:

Even if the penetration was very slight and he did not ejaculate (cum).

4. This person met me after I had been drinking alcohol or using drugs and was conscious but too drunk or out of it to consent or stop what was happening.
5. This person threatened to use some degree of physical force on me.
6. This person used some degree of physical force such as holding me down with his or her body weight or pinning my arms.

Someone put his or her penis, or fingers, or objects (such as a bottle or a candle) into my anus (butt) after:

Even if the penetration was very slight and he did not ejaculate (cum).

7. This person met me after I had been drinking alcohol or using drugs and was conscious but too drunk or out of it to consent or stop what was happening.
8. This person threatened to use some degree of physical force on me.
9. This person used some degree of physical force such as holding me down with his or her body weight or pinning my arms.

Someone attempted to have oral sex with me, or attempted to make me have oral sex with them but it did not happen after:

10. This person met me after I had been drinking alcohol or using drugs and was conscious but too drunk or out of it to consent or stop what was happening.
11. This person threatened to use some degree of physical force on me.
12. This person used some degree of physical force such as holding me down with his or her body weight or pinning my arms.

Someone tried to put his or her penis, or fingers, or objects (such as a bottle or a candle) into my vagina but it did not happen after:

13. This person met me after I had been drinking alcohol or using drugs and was conscious but too drunk or out of it to consent or stop what was happening.
14. This person threatened to use some degree of physical force on me.
15. This person used some degree of physical force such as holding me down with his or her body weight or pinning my arms.

Someone tried to put his or her penis, or fingers, or objects (such as a bottle or a candle) into my anus (butt) but it did not happen after:

16. This person met me after I had been drinking alcohol or using drugs and was conscious but too drunk or out of it to consent or stop what was happening.
17. This person threatened to use some degree of physical force on me.
18. This person used some degree of physical force such as holding me down with his or her body weight or pinning my arms.

Violent Crime Victimization

Instructions: Not counting any incidents you have already mentioned, since the age of 14, have any of the following experiences ever happened to you?

Response scale:

How many times in the past 12 months?	0	1	2	3	or more
How many times since the age of 14?	0	1	2	3	or more

Items:

Someone stole or tried to steal cash or property (such as a purse, car, or other belongings) directly from me after:

1. They used or threatened to use some degree of physical force such as pushing me or hitting me.
2. They used or threatened to use a weapon such as a gun, knife, bat, etc. on me.

Now we'd like to ask you about violence you may have experienced since the age of 14. Not including events you have already told us about, have you had the following experience?

Someone physically attacked me or tried to physically attack me by:

3. Throwing something at me that could hurt or injure me.
4. Pushing, grabbing, or shoving me.
5. Pulling my hair.
6. Slapping, punching, or hitting me.
7. Kicking or biting me.
8. Choking or attempting to drown me.
9. Hitting me with an object.
10. Beating me up.
11. Threatening me with a gun, knife, or other weapon.
12. Shooting me or shooting at me with a gun.
13. Stabbing me with a knife or using another weapon on me.

Identification of Trauma Type

[participants will select the incident from a list of traumatic events they endorsed on the previous measures of victimization]

1. Of the events above, which incident was the most severe?

Please refer to this incident when responding to the remainder of the questions in this survey.

Trauma Report

1. When did this incident happen?
2. How old were you when this event happened?
3. How well do you remember the details of this incident?
 - 1=Not well, it is difficult to remember most of the details.
 - 5=Very well, I remember it in great detail.
4. How distressing was this incident for you?
 - 1=Not distressing, it didn't bother me very much.
 - 5=Very distressing, it upset me a great deal.
5. During the incident did you sustain any of the following injuries?
 - No, I was not injured.
 - Bruises, black eye, cuts, scratches, swelling, or chipped teeth.
 - Knife/stab wounds, gunshot or bullet wounds.
 - Broken bones or teeth knocked out.
 - Internal injuries.
 - Knocked unconscious.
6. During the incident, did you feel your life was being threatened?
 - Yes
 - No
7. At the time of the incident, the assailant was:
 - A stranger
 - Your spouse, boyfriend, or girlfriend
 - Your exspouse, exboyfriend, or exgirlfriend
 - Someone you were on a date with
 - Your parent, stepparent, sibling, or other relative

An employer, supervisor, or co-worker

A customer, client, or patient

A neighbor, roommate, or boarder

A friend

An exfriend

Other, please specify.

Impact of Event Scale – Revised (IES-R)

Instructions: Below is a list of difficulties people sometimes have after stressful life events like the one you described. Please read each item and then indicate how distressing each difficulty has been for you during the past seven days with respect to the incident you identified above, how much were you distressed or bothered by these difficulties?

Response scale:

Not at all

A little bit

Moderately

Quite a bit

Extremely

Items:

1. Any reminder brought back feelings about it.
2. I had trouble staying asleep.
3. Other things kept making me think about it
4. I felt irritable and angry.
5. I avoided letting myself get upset when I thought about it or was reminded of it.
6. I thought about it when I didn't mean to.
7. I felt as if it hadn't happened or wasn't real.

8. I stayed away from reminders about it.
9. Pictures about it popped into my mind.
10. I was jumpy and easily startled.
11. I tried not to think about it.
12. I was aware that I still had a lot of feelings about it, but I didn't deal with them.
13. My feelings about it were kind of numb.
14. I found myself acting or feeling as though I was back at that time.
15. I had trouble falling asleep.
16. I had waves of strong feelings about it.
17. I tried to remove it from my memory.
18. I had trouble concentrating.
19. Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea, or a pounding heart.
20. I had dreams about it.
21. I felt watchful or on-guard.
22. I tried not to talk about it.

Disclosure Items

1. Who did you tell about this incident?

I have not told anyone about it.

A friend(s)

A family member(other than your spouse)

Your spouse, boyfriend/girlfriend, significant other

A doctor/nurse/paramedic

A police officer/law enforcement

A counselor/therapist

A rape crisis center

A priest/pastor/member of the clergy

[the following items were asked for each type of disclosure recipient endorsed]

2. How soon after this incident did you first tell [disclosure recipient] about it?

They were present or showed up during the incident.

Immediately after the incident.

Within a day of the incident.

Within a week of the incident.

Within one month of the incident.

Within three months of the incident.

Within a year of the incident.

More than a year after the incident.

3. How much did you tell them about what happened during the incident such as where it happened, who did it, or your emotional reactions?

1=I mentioned it in passing or made some vague reference to it, but did not discuss it or provide details.

5=I told them what had happened and we talked about it in great detail.

Social Reactions Questionnaire (SRQ)

[the following items were asked for each type of disclosure recipient the victim endorsed that the victim also indicated a moderate to high degree of disclosure as determine by responses to disclosure item #3]

Instructions: The following is a list of behaviors that other people responding to a person with this experience often show. Please indicate how often you experienced each of the listed responses from other people by checking the appropriate box for each item.

Response scale:

Never

Rarely

Sometimes

Frequently

Always

Items:

1. Told you it was not your fault.
2. Told you he/she felt sorry for you.
3. Told you that you were not to blame.
4. Reassured you that you are a good person.
5. Told you that you were to blame or shameful because of this experience.
6. Saw your side of things and did not make judgments.
7. Told you that you could have done more to prevent this experience from occurring.
8. Reframed the experience as a clear case of victimization.
9. Told you that you were irresponsible or not cautious enough.
10. Was able to really accept your account of your experience.
11. Told you that you did not do anything wrong.
12. Believed your account of what happened.